

# Water Crisis in Gaza: How Occupation Affects Palestinians Access to Water

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## Why a Water Crisis Exists in Gaza

Gaza has a water crisis. Most people in the international community do not know the details as to why it exists and the root causes of the resource deficiency.

For the more than 1.4 million Palestinians who live in Gaza water shortages and water deterioration affects their health. Moreover, the water crisis creates agricultural, economic, social, and political instabilities that have regional ramifications. Most of the existing problems are a direct and indirect result of Israeli policy.

If the resource inequalities are not rectified soon, the Middle East will be facing an irreversible human and environmental disaster.

## Water Resources, Consumption and Distribution - Facts and Figures

Gaza has a sub-Aquifer, which is a part of the Coastal Aquifer (that lies along "...the Mediterranean coastline of Israel and the Gaza Strip.)"<sup>1</sup> One estimate shows the people of Gaza over abstract (over-pump) between 120 - 140 million cubic meters (MCM) of water from the coastal aquifer per year, but the sustainable yield of the Gaza sub-aquifer is between 50 - 60 MCM/yr.<sup>2</sup> One way to interpret sustainable yield is that it is the amount of water that can be extracted from the aquifer annually, while still maintaining ground water levels and chemical composition (quality). Scientists such as hydrographers, hydrogeologists, hydrologists, and ecologists perform volumetric and qualitative measurements of water resources to not only make scientific determinations but future projections.

Another estimate states that the water exploitation (over-pumping) is around 155 MCM/yr, but the natural (such as rainwater) and anthropogenic (agricultural return flow and waste water) replenishments total 87 MCM/yr.<sup>3</sup> All of these scientific figures reveal that Gaza has a current water deficit of approximately 68 - 90 MCM/yr.

In addition, population density determines how much water is needed within a geopolitical area, even if the hydrogeological and topographical landscape does not have the natural resource capacity to satisfy the number of people living there. "The Gaza Strip is also one of the most densely populated areas in the world..."<sup>4</sup> and there are approximately 3,500 people per square km.

With a growing population expected to exceed 2.3 million by mid-2010<sup>5</sup> there will be over 5,800 people per square km. As a result of population increases the water deficit will be

more exacerbated if more water and resource infrastructure are not in effect within the next year.

“The present situation concerning water availability and quality in Gaza is little short of catastrophic,” Dr. Shaddad Attili explains. Attili is the Palestinian Authority’s policy advisor for water and environment. “As a result of such concerns the water situation in Gaza has been recognized for some years as a critically important issue, but the situation continues to worsen inexorably over time.”

Although the World Health Organization (WHO) calls for minimal water consumption of 100 liters per capita per day (l/c/d) for a quality level of health<sup>6</sup>; Attili shared that Palestinians average 50 -70 liters (l/c/d). Moreover, Israeli capita usage averages 400 l/d and Israel settlers in the Palestinian Occupied Territories average 800 l/c/d. Thus, Israelis average almost five times more water consumption than Palestinians.

For the 3.7 million Palestinians living in Gaza and the West Bank they consume approximately 260-290 MCM/yr; and this figure includes domestic, agricultural and industrial consumption. However, 6.4 million Israelis have a total water consumption of 2,129 MCM/yr.<sup>7</sup>

“A large groundwater aquifer basin underlies the West Bank and supplies high quality water to both Israelis and Palestinians. It is composed of three sub aquifers: the Western, the Eastern and the North-eastern Aquifer Basins.”<sup>8</sup> Since Israel controls the water, they allow Palestinians in the West Bank 114 MCM/yr only - they have to purchase another 30-40 MCM/yr for the West Bankers and 4 MCM/yr for Gazans from Mekorot, the Israeli water company.

The Palestinian Hydrology Group established the Water and Sanitation Hygiene Monitoring Project where people conducted field surveys from over 640 Palestinian communities. Their reports reveal that Mekorot “...has seriously reduced the quantities. In many cases Mekorot has completely stopped the provision of water to them altogether. Many of the surveyed Palestinian communities that still get some water from Mekorot receive insufficient quantity, and have expressed their fear that Mekorot will completely stop providing water to them.”<sup>9</sup>

When these communities cannot rely on Mekorot water service, they depend on other options, such as rainfall in community water cisterns - if they are available and accessible.

In Gaza, Palestinians consume roughly 150 MCM/yr of which around 85 MCM is due to over abstraction of the Gaza Aquifer. How are Palestinians over-pumping the aquifer? Attili reports there are over 4,200 wells within Gaza. Although most of the wells are used for agricultural purposes, there are 2,400 illegal wells. Moreover, illegal welling drains the already stressed aquifer.

How is the exploitation of the water table affecting the Coastal Aquifer? It is increasing the rate at which saline ground water naturally flows from the eastern part of the Coastal Aquifer toward Gaza, which is salinizing the freshwater in the western part of the aquifer at an accelerated pace.<sup>10</sup> Moreover the study concluded: “If pumping continues at these unsustainable rates, it will destroy the aquifer’s capacity to resist sea water intrusion from the west and saline ground water from the east, thereby making it totally unsuitable for human consumption or for irrigated agriculture with the next few decades.”<sup>11</sup>

The exploitation of the aquifer has damaged the water's quality already. Attili reports 70 per cent of the aquifer's water is brackish water: saline water due to over-abstraction.

Unfortunately, as there is no alternative, Palestinians are drinking this water and they are experiencing health problems.

### **Water Chemical Composition and How it Impacts Human Health**

WHO established international standards for salt levels of chemical compounds in water, such as nitrate and chloride. For safe and healthy human consumption of drinking water these salt compounds cannot exceed the WHO guidelines. For nitrate, the WHO standard is 50 mg/l and for chloride it is 250 mg/l.[12](#) The Gaza aquifer has nitrate levels over 100 mg/l and chloride levels averaging 1000 mg/l.[13](#) How are these unsafe levels affecting the health of Palestinians?

The following are some of the findings by an author who compiled health problems from numerous publications. The health problems are: 50 per cent of Gaza's children have a parasitic infection; children and adults suffer from diarrhea; high chloride levels causes kidney disease; consumption of saline water leads to salt levels in humans that causes kidney dysfunction, heart failure, neurological symptoms, lethargy, and high blood pressure; excessive levels of fluoride are toxic, causing gastritis, ulcers, kidney failure, bone fluorosis (bone fractures and crippling), and teeth fluorosis (black lines around gums and tooth decay); and high nitrate levels causes "blue baby" syndrome, also know as methaemoglobinaemia and gastric cancer.[14](#)

Since people do not have other water alternatives they consume the brackish water for daily survival. Palestinians have no other options currently and the current numerical figures show the demand for water exceeds the water supply. As long as the Middle East and the international community does not address the root causes of the water crisis and the impact it is having on the health of 1.4 M people; then the Israelis and Palestinians, as well as the people living in neighboring Arab states who share co-riparian rights to natural water resources in the region will continue experiencing escalating geopolitical instability.

When the shared aquifers can no longer meet the future needs of the Israelis and Palestinians using it, then regional civil war is inevitable.

Before exploring the expert's solutions that could prevent future civil war a brief examination into the effects of military occupation on Palestinians' access to water will help readers understand the obstacles Palestinians face for this vital, life need.

### **How Occupation Affects Palestinians Access to Water**

Palestinians access water from wells, but they also have water springs, tankers, roof tanks, cisterns, and reservoirs. Unfortunately, over 70 per cent of the people in Gaza live in poverty[15](#), so most people cannot afford to replace damaged tankers, let alone have money to pay water bills. In fact, "numerous families suffer from a lack of funds to pay for wastewater evacuation tankers. The resulting pollution is having a direct negative effect on the state of sanitation and hygiene."[16](#)

How much waste water is in the aquifer? More than 30 MCM returns to the aquifer without any prior treatment, therefore polluting it.[17](#) When open waste water and water containing

fertilizer for irrigating crops and pesticides has not been subjected to purification it drains into the ground water. Hence, it contaminates the existing water supply.

As a sidebar to the health ailments discussed in the previous section, human consumption of water with "...pesticides can lead to paralysis, heart failure, and gradual damage to the nervous system."<sup>18</sup> These problems illustrate the importance of ground, roof and wastewater tankers to people living with an archaic water network in the Mediterranean region.

Moreover, what compounds Palestinian health problems is the violence they are subjected to by Israeli forces and Israeli settlers. For example in December 2004, The Khan Younis and Rafah Governorates experienced an Israeli incursion that resulted in: "destruction of rainwater harvesting ponds and agricultural well near Morag settlement. This includes eight green houses and 24 dunums that were damaged..."<sup>19</sup> and throughout the incursion "...four wells located near Gosh Katif settlement compound were maintained with difficulties by the maintenance team....were risking their lives since the Israeli forces were prohibiting any one from reaching the area."<sup>20</sup>

This violence is not isolated to incursions because the field survey went on to explain that a municipal well in Al Naser that served two communities with a population of 13,000 had been closed for three months. As a result, "...the communities are forced to buy water from the nearby agricultural wells."<sup>21</sup> When Palestinians approached Israeli forces to arrange for access to the well "...Israeli forces forced them to go back after firing on them."<sup>22</sup>

Since Israel transferred the Israeli settlers out of Gaza and into the West Bank during the Gaza Withdrawal in August 2005 some people may think that problems with violence between Israelis and Palestinians no longer exist in Gaza. However, Palestinians still live under occupation because Israeli forces still control all entry points (checkpoints), borders and border crossings, as well as sea and air space. In essence, Israeli soldiers decide who and what flows in and out of Gaza.

The other dimension of occupation that may not come to mind immediately is the fact that 38 years of occupation left a path of destruction in Gaza. A recent survey by a well-known Palestinian political figure and doctor explains there are "...charred and uprooted palm and fruit trees, acres of fields and dozens of kilometers of roads and infrastructure bulldozed, water mains ploughed out and electric lines torn down."<sup>23</sup> In addition, the tons of sand Israelis removed before leaving the settlements will intensify the sea water intrusion of the aquifer already taking place. Therefore the Gaza Withdrawal caused considerable environmental damage that Palestinians have to take into account when rebuilding the area.

By the way, the 7.9 MCM/yr of water the former Israeli settlers of Gaza were consuming consisted of 4.1 MCM from the aquifer and another 3.8 MCM transported by Mekorot at a subsidized price.<sup>24</sup> Palestinians have the opportunity to purchase the 3.8 MCM at 3 NIS (.67 U.S. cents) per cubic meter. How much is the annual cost? The Palestinian Water Authority would have to spend NIS \$11.4 M or U.S. \$2.6 M for the transport of Mekorot water to Gaza's borders.

With current, desperate conditions and the violence that has caused severe damage to Palestinian infrastructure why should Palestinians have to pay for a natural resource that should already be available to them?

The next and final section will explore briefly other, viable solutions to Gaza's water crisis.

### **Water Solutions from the Experts**

When internecine, political entities are trying to reestablish diplomatic relations, financial compensation acknowledges committed crimes and demonstrates a commitment to peace building. The facts illustrate that Israeli policy has caused severe damage to Palestinian infrastructure and Palestinians should receive reparations for this destruction. Payment for these damages is sine qua non if there is going to be resolution to the Israeli-Palestinian conflict.

With regards to equipment relating to Palestinian water networks the Israeli Government should pay the P.A. to replace what damage has been done to water sources. If an Israeli military base dumped its sewerage onto Palestinian farmland, then Israel is responsible for clean-up costs. Regardless of where they live now if settlers destroyed wells and cisterns then the Israeli Government should pay for the repairs. If an Israeli soldier fired gunshots that destroyed a Palestinian family's water tanks, then the Israeli Government should give them compensation for damages to their personal property.

With regards to water solutions, an article published recently that I quoted earlier states that the Coastal Aquifer "...could serve as a source of environmental peacemaking"[25](#) since Israel is the upstream user of this aquifer and the P.A. is the downstream user. Their proposal is that Israel continues pumping the groundwater because it will decrease the salinization in the western part of the aquifer: Gaza. Moreover, they explain that Palestinians should cease pumping the aquifer because over-pumping it causes sea water intrusion. They suggest desalination plants as alternative water sources.[26](#)

According to Attili this is not the shortcut way to solve the problem. Water rights should be solved based on international standards. Gaza is not part of the moon; it is the integral portion of the Palestinian state that is composed of the West Bank and Gaza Strip. Reallocation of the available resources including the Jordan River Basin is the solution. This will enable both Israelis and Palestinians to sustainable management of these shared resources. It will then enable the Palestinians themselves to proper of water between the West Bank and the Gaza Strip. Attili further explained that it is inevitable that the Gaza water crisis solution on the medium term consists of transferring part of the Palestinian rightful share from the Jordan River to Gaza.

The United States Agency for International Development (USAID) began building a regional desalination facility in Gaza costing US \$70 M and the project allocated another \$60 M for a future North-South carrier, which would run throughout Gaza.[27](#) In 2003, the project halted because three American personnel were killed.

Yet Attili emphasizes "...they (the plant and carrier) are critically required and construction must be recommenced without delay." He explains that the proposed water carrier for construction will address the 60 per cent network loss of water they are experiencing presently. For instance, water leakages in conduits and pipes. Moreover,

the P.A.'s Ministry of Planning map, which is a summary of the Coastal Aquifer Management Program (CAMP), a project funded by the USAID, the CAMP project is proposing the construction of three wastewater treatment plants that will address water consumption for agricultural and industrial purposes. Although there are nine existing ground tanks the CAMP

sees the need for an additional 16 ground tanks. The construction of the water carrier will connect all ground tanks, booster pump stations and cities throughout the Gaza Strip. However, without funding from the international donor community, construction is at a standstill. The end result is that the postponed projects prevent viable solutions from resolving a dire situation.

One major water source in the region is the Jordan River Basin. The co-riparians of the Jordan River are: Israel, Jordan, Lebanon, Palestine, and Syria.<sup>28</sup> According to Attili, Palestinians have not had access to the Jordan River since 1967 and they are the most stressed co-riparians in the region. Jordanians are not far behind. He further explained that "...Israel violates the international law by diverting the river through the national water carrier."

Some experts agree that joint management of the water in the region will enable government leadership to meet the needs of their people. Moreover, they concluded that international law with regards to water distribution should be based on "...the equitable and reasonable allocation of share watercourses; the avoidance of significant harm; and the need of prior notification of any development plans which could affect shared watercourses."<sup>29</sup>

It is in the best interests of the riparian parties to manage water resources through a cooperative approach. If political entities work together then they can develop the most innovative, efficient and effective strategies to meet the needs of people while avoiding water exploitation and deterioration of water resources. The probability of environmental damage increases when a co-riparian user has no outside controls in place to balance its usage. Israel is an example of this real-life scenario. When co-riparians manage water together then they have shared responsibility and liability for what happens to the region's society and environment.

By 2010, the Palestinian Water Authority (PWA) predicts the demand for water in Gaza will be a minimum of 300 MCM/yr, but the sustainable yield is 50 - 60 MCM/yr. The math reveals there is a 75 per cent gap of water to be had. What will people drink? Whether the Middle East will survive this impending human and environmental disaster is up to the political entities involved and the international community who can provide the much-needed funding to rectify this water crisis.

Some people say that life problems sometimes require that we look at situations from different angles. In this case, the reality in Gaza and the people's future is not just above ground.

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## Notes

1 E. Weinthal, A. Vengosh, A. Marei, A. Gutierrez, and W. Kloppmann "The Water Crisis in the Gaza Strip: Prospects for Resolution," **Ground Water**, September-October 2005, p. 654.

2 <http://www.nad-plo.org>

3 Weinthal, Vengosh, Marei, Gutierrez, and Kloppmann p. 654



4 Ibid. p. 653

5 According to the Palestinian Authority's Ministry of Health, the combined populations of Palestinians in the West Bank and Gaza were 3.7 M by the end of year 2003. By mid-2010, the MOH projects their combined populations will be 6.2 M. Since Gaza is approximately 37 per cent of the 2003 figure, I calculated the mid-2010 population growth projection on this percentage. However, I did not take into consideration demographic variables such as age (more than half of the population in Gaza is under fifteen years of age and population densities vary in Palestinian governorates. For example, Gaza Governorate, one of Gaza's four governorates is the second highest area for population growth rate (13 per cent), only second to Al Khaleil (13.9 per cent).  
[http://www.moh.gov.ps/pdf/files/dem\\_palestine2003.pdf](http://www.moh.gov.ps/pdf/files/dem_palestine2003.pdf)

6 [http://www.who.int/water\\_sanitation\\_health/](http://www.who.int/water_sanitation_health/)

7 <http://nad-plo.org>

8 Shaddad Attili "Israel and Palestine: Legal and Policy Aspects of the Current and Future Joint Management of the Shared Water Resources" June 2004 p. 3.

9 <http://www.phg.org/campaign.about/about.html>

10 Weinthal, Vengosh, Marei, Gutierrez, and Kloppmann p. 655

11 Ibid.

12 <http://whqlibdoc.who.int/hg/2000/>

13 <http://nad-plo.org>

14 <http://www.wws.princeton.edu/~wws401c/manan.pdf>

15 <http://www.palestinemonitor.org>

16 <http://www.phg.org/campaign/about/about.html>

17 <http://nad-plo.org>

18 <http://www.wws.princeton.edu/~wws401c/manan.pdf>

19 [http://www.phg.org/campaiging.reports/SR0419\\_19-12-04%20.htm](http://www.phg.org/campaiging.reports/SR0419_19-12-04%20.htm)

20 Ibid.

21 Ibid.

22 Ibid.

23 Mustafa Barghouthi, "One down, many to

go"

[http://www.palestinemonitor.org/nueva\\_web/articles/barghouthi/1\\_down\\_many\\_2\\_go.htm](http://www.palestinemonitor.org/nueva_web/articles/barghouthi/1_down_many_2_go.htm)

24 <http://www.nad-plo.org>

25 Weinthal, Vengosh, Marei, Gutierrez, and Kloppmann p. 659

26 Ibid.

27 <http://nad-plo.org>

28 D.J.H. Phillips, S. Attili, S. McCaffrey, J.S. Murray and M. Zeitoun "The Water Rights of the Co-riparians to the Jordan River Basin"

29 D.J.H. Phillips, S. Attili, S. McCaffrey, and J.S. Murray "Factors Relating to the Equitable Distribution of Water in Israel and Palestine" p. 8.

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