

Systematic Review on Water and Public Health in Palestine

1. Introduction

“The emerging Palestinian state is located in southwest Asia on the eastern shore of the Mediterranean. It is composed of two separate areas, Gaza Strip and the West Bank. The eastern boundaries of the West Bank are the Jordan River and the Dead Sea, the western, northern and southern are Israel. There are two distinctive climatic seasons a wet winter and a dry summer. Annual average rainfall in the West Bank and Gaza is approximately 450 and 400 mm, respectively. The present problems that are related to water are many and varied. Palestine, Jordan, and most other mid-eastern countries, which are generally characterized by aridity have very limited water resources. Future population projections in these countries place severe demands on already fragile reserves”¹.

Water quality and quantity issues in Palestine have received ample attention in recent years. Ranging from scoping studies to descriptive reports to policy recommendations, local and international non-profits, academics, international development agencies, and governmental bodies have pumped in considerable resources into drawing attention to Palestine’s dismal water conditions. In spite of the proliferation of water studies, water quality and quantity are deteriorating at an alarming rate.

The main aim of this report is to provide an overview of the ramifications of water scarcity on public health in Palestine. In exploring health ramifications of water scarcity, the report aims to accomplish the following:

- A review of existing national policies or regulations pertaining to the supply of sufficient domestic water supply.
- A comprehensive overview of trends in water quality, quantity, and service level of domestic water supply.
- National challenges of domestic water supply and safety management systems in the country.
- Identification of qualitative and quantitative assessment and research on water scarcity impact on health.

2. Available water resources

Water resources in Palestine consist primarily of surface water and groundwater resources. Other sources include springs and rainwater that is harvested² in cisterns. The major surface water resource is the Jordan River. However, since the Israeli occupation of the Palestinian Territories, and as agreed to in the Oslo Accords, Palestinians do not have any access to water from the Jordan River. Consequently, groundwater resources have become the major source of fresh water supply.

“The total number of the Palestinian wells in the West Bank tapping all aquifer systems is 383, of which 119 wells are not pumping or abandoned and in need for rehabilitation...the total annual abstraction from these wells is approximately 64

¹ Mimi and Jamous, 2010: 184

² UNEP, 2003.

MCM in year 2012 of which 36 MCM for domestic use and 28 MCM for agricultural use...in Gaza, the total abstracted volume in 2012 for municipal/domestic use was about 102 MCM; for agricultural use it was about 83 MCM so the total volume was about 185 MCM³.



Figure 1. Jordan River Basin (Rand Corporation 2005)

Table 1 “shows the annual average abstraction from Palestinian wells during the period of 2007-2012. The number of Israeli wells inside West Bank is 39, and the average annual abstraction of these wells is estimated at about 54 MCM. Furthermore, Israel uses more than 500 wells inside the Green Line (mainly in the Western Basin), which abstract more than the annual recharge rate of all aquifers. As a result, the Palestinians are inevitably affected due to general decrease of water level in the aquifers, as the total annual abstraction greatly exceeds the recharge rates⁴.”

Table 1: Summary of total abstraction from Palestinian wells per use

³ PWA, 2013a: 9.

⁴ PWA, 2013a: 9.

Basin	Palestinian Abstractions (MCM) in 2012		
	Domestic	Agriculture	Total
Western Basin	12.3	18.1	30.4
Eastern Basin	11.0	9.9	20.9
North-eastern	10.0	3.0	13.0
Total West Bank	33.3	31.0	64.3
Gaza	102	83	185

Source: PWA (2013)

“It is important to note that water supplies for agriculture are either shallow small old wells or natural springs. Natural springs face severe problems of discharge variability and thus these sources are not reliable. Although the average discharge of these springs is about 49 MCM/year, this discharge is low in dry years and high in wet years. Due to lack of storage structures, large volumes are lost in wet years, thus the actual average of the amount utilized from springs is much lower than the arithmetic mean of spring discharge”⁵.

3.2 Total Future Water Needs

“Future water needs for both the municipal and the industrial sectors were estimated based on their current consumption levels and the expected growth in population, including some estimates for returnees. Future water needs for the agricultural sector however were estimated based on the average crop need for water. Total future water needs by the three sectors for 2020 is shown in Table 2 below. According to these calculations, the Palestinian water sector should develop a total amount of around 860 MCM/year by the year 2020. This amount is about three fold the supply available at present. According to those estimates, Palestinians should develop some 550 MCM/year in addition to the quantities available at present. At the same time, however, it is not higher than the Palestinian water rights according to international water laws or the amount potentially available from the renewable sources and other nonconventional water resources”⁶.

Table 2. Projected Total Water Needs in MCM/year

Year	2020
Municipal	268
Industrial	39
Irrigation	552
Total	859

Source: MAS (2009)

Water Scarcity

Water scarcity is effectively “the lack of access to adequate quantities of water for human and environmental uses”⁷ Water scarcity can be measured through four different methods: the Falkenmark indicator or water stress index; a criticality ratio; the IWMI⁸ measure; and the water poverty index⁹. For the purposes of this preliminary report, we will only look at the most straightforward of these water stress measures: the water stress index or the Falkenmark indicator. In accordance

⁵ MAS, 2009: 29.

⁶ Ibid: 49.

⁷ White, 2012.

⁸ International Water Management Institute

⁹ White, 2012.

with this indicator, there are three levels of inadequate water access—in order of increasing severity, these are: water stress, water scarcity, and absolute water scarcity. Water scarcity is assessed “by looking at the population-water equation...when water supplies drop below 1,000 m³ per person, the population faces water scarcity, and below 500 cubic meters ‘absolute scarcity’”¹⁰. As the United Nations points out, water scarcity can exist as a natural reality or be induced anthropogenically. On a global level, humankind does not face water scarcity, “but...[water] is distributed unevenly and too much of it is wasted, polluted and unsustainably managed”¹¹.

It has been shown that water scarcity in Palestine is largely caused as a result of inequitable distribution¹². Within Palestine, the West Bank and Gaza do not suffer from water scarcity as a result of natural causes¹³. However, due to Israeli policies, water scarcity is a daily reality of Palestinian life.

2.1 Surface water

The Jordan River is considered, under international conventions, to be an international watercourse shared between Jordan, Palestine, Israel, Lebanon and Syria (Figure 1). The river originates from three main springs—Banias in the occupied Golan Heights, Dan in Israel, and Hasbani in Lebanon—to form the upper part of the Jordan River. The water of the river flows southward to Lake Tiberias. The lower part of the river is downstream of Lake Tiberias and joins the Yarmouk and Zerka Rivers originating from Syria and Jordan, respectively. The river continues to flow southward until it spills into the Dead Sea at approximately 400 m below sea level. The natural flow of the river in the absence of extraction is estimated to be 1250 MCM/year at the entrance to the Dead Sea (**RAND Corporation 2005**).

2.2 Groundwater

Groundwater is the major source of fresh water supply. In the West Bank, groundwater is formed in three major drainage aquifers (Figure 1): the Western Aquifer, the Northeastern Aquifer and the Eastern Aquifer as follows: (**PWA 2013**).

Western Aquifer Basin: Is the largest aquifer in the West Bank¹⁴. “It has a sustainable yield estimated at 362-400 MCM per year. However, this basin is heavily exploited by the Israelis at an estimated range of 340-430 MCM. In some years, it reaches more than 520 MCM¹⁵, while the Palestinians consume only 28 MCM through wells in 2012. The main aquifer system in this basin is the upper and lower Cenomanian aquifers”¹⁶.

¹⁰ UN, 2014.

¹¹ Ibid.

¹² Messerschmid, 2011.

¹³ Al-Haq, 2012.

¹⁴ Ksia-Amb, 2010:4.

¹⁵ It can reach up to “560 MCM/y which represents around 94% of its annual safe yield, while the Palestinians consume only 6% 922 MCM/y) of the sustainable yield” (ibid).

¹⁶ PWA, 2013a: 8.

North-eastern Aquifer Basin: Most of the recharge areas of this basin are located within the West Bank boundaries and it has an annual sustainable yield of 100-145 MCM. Despite this, the Israelis exploit the aquifer at a rate of 103 MCM/Y. The Palestinian utilization in 2012 from this basin reached around 23 MCM/y from wells and springs”¹⁷.

Eastern Aquifer Basin: “All the recharge areas of the basin are located within the West Bank area, giving the Palestinians the right to control its water and not to share it with Israel”¹⁸. “The annual sustainable yield of this basin is estimated at 145-185 MCM. However, the Israelis exploit the aquifer at a rate of 50 MCM/y from wells in addition to 100 MCM/y from the Dead Sea Springs that are controlled by Israel; while the Palestinians utilized about 53 MCM/y by wells and springs in 2012”¹⁹.

Gaza Coastal Aquifer: “The Coastal Aquifer is the only source of water in the Gaza Strip...the yearly recharge volume, equaled to the sustainable yield for this limited volume aquifer, is in the range of 55-60 MCM/yr. The Palestinian utilization from this aquifer in Gaza Strip is about 185 MCM in 2012”²⁰. This over-pumping has resulted “in a lowering of the groundwater table below sea level and saline water intrusion in many areas”²¹.

“It is obvious that...17 years after the Oslo Agreement came into force, the Palestinians in the West Bank are still utilizing less than 14% of available shared groundwater resources, while the Israelis are utilizing more than 86%”²².

3. Present Water Supply

3.1 Present Domestic Water Supply and Consumption

Impeded access to water is one of the most pressing issues that Palestinians face. With Israel controlling over 80%²³ of the groundwater in the West Bank, Palestinians are deprived of the majority of the freshwater in their land. While West Bank cities and large towns are connected to the water network, some villages are not: “approximately 113,000 West Bank Palestinians live in about 70 villages that are not even hooked up to the central water grid”²⁴. As a result, the water supply to these areas is intermittent and, by default, precarious. When the West Bank receives little rainfall, spring water is not abundant, and the rainwater harvested is insufficient to meet people’s needs. To add insult to injury, the Israeli water company Mekorot cuts off the supply to Palestinians, in order to secure a steady amount for Israelis. Rural and urban disparities become particularly pronounced during years with little rainfall.

While WHO and UNICEF’s Joint Monitoring Programme for Water Supply and Sanitation (JMP) data shows trends in drinking water coverage from 1990 until 2015²⁵, disparities in water access between rural and urban areas is not covered. The country-specific data on Palestine indicates that access to improved water sources

¹⁷ PWA, 2013a: 8.

¹⁸ Ksia-Amb, 2010: 4.

¹⁹ PWA, 2013a: 8.

²⁰ PWA, 2013a: 8.

²¹ Ksia-Amb, 2010: 5.

²² PWA, 2013a: 9.

²³ B’Tselem, 2014a

²⁴ Ibid.

²⁵ WHO/UNICEF JMP, 2015

(including piped water) is declining; moreover, and perhaps counter-intuitively, this decline is most prevalent in urban areas in Palestine. In 1990, according to JMP estimates, urban areas in Palestine received 100 percent of their drinking water from improved water sources, specifically piped sources. In contrast, in 1995²⁶ this figure in rural areas is 87 percent, out of which 60 percent was from piped sources. Unimproved drinking sources in rural areas is estimated to have been around 10 percent, with approximately 3 percent of drinking water being obtained from surface water sources. In urban areas, the decline in safe drinking water began in 2000 with the onset of the second *intifada*²⁷. The sharpest decline²⁸ can be seen in 2005, with 79% of drinking water being supplied from improved sources. In 2010, this figure went down to 65% and in 2015 it is currently at 51%. In rural areas, this trend of declining supplies from improved sources is less much severe, with the figure falling from 87 percent in 1995 to 81 percent in 2015. At the same time, in rural areas, piped water has covered a greater portion of drinking water, rising by 14% between 1995 and 2015. Palestine’s overall reliance on “other improved” water sources and unimproved water sources—the origins of which are not specified in either case—has consequently increased over the 25-year study period. Drinking water trends can be seen in Tables 3 and 4, below.

Table 3: Urban Drinking Water Estimates

URBAN WATER					
Estimate coverage 2015 update					
Year	Total improved	Piped onto premises	Other improved	Other unimproved	Surface water
1990	100%	100%	0%	0%	0%
1995	100%	100%	0%	0%	0%
2000	93%	87%	6%	6%	1%
2005	79%	72%	7%	20%	1%
2010	65%	57%	8%	34%	1%
2015	51%	50%	1%	48%	1%

(Source: JMP, 2015)

Table 4: Rural Drinking Water Estimates

RURAL WATER					
Estimated coverage 2015 update					
Year	Total improved	Piped onto premises	Other improved	Other unimproved	Surface water
1990					
1995	87%	60%	27%	10%	3%
2000	85%	64%	21%	12%	3%
2005	84%	68%	16%	13%	3%
2010	83%	72%	11%	14%	3%
2015	81%	74%	7%	16%	3%

(Source: JMP, 2015)

²⁶ Estimated data for rural areas is not available until 1995.

²⁷ Since data is provided in 5-year increments, the first decline appears in 2000, though decline may have occurred prior to this year.

²⁸ Actually, over the last fifteen years, total improved drinking water in urban areas has decreased by 14% consistently every 5 years. Again, since data is provided in 5-year increments, we can only conclude that the decline *appears* to have occurred every 5 years.

The data provided by the JMP is descriptive, without providing any explanation of the findings. However, the observed trend of declining drinking water availability from improved sources is likely to be indicative of a political phenomenon most prevalent in Gaza. Due to Israeli military assaults on water infrastructure during 2003 in the West Bank, and repeatedly in Gaza (most recently, the attack in July 2014), water infrastructure in Palestine has been systematically destroyed. As explained below, since building materials were barred from entering Gaza, due to the Israeli blockade, the re-construction of the water infrastructure has been impeded. This is most likely the reason that Palestinians in urban areas lost a significant amount of piped water. However, the declining trend in rural areas is less pronounced, since many villages and rural towns were not initially connected to the piped water system (in 1995, 40% of drinking water did not come from piped sources. In five-year increments, this figure went down to 36%, 32%, 28%, and finally 26%). Furthermore, it is likely that rural areas are not targeted by Israel to the same extent that urban areas are. Urban areas contain most police stations, government buildings, political party centers; and encompass most refugee camps, which are often targeted most intensively.

“For the West Bank, no accurate records of domestic water consumption rates are currently available, as quantities allocated to the various sectors (i.e., domestic, public, industrial, touristic, and commercial) cannot be separated. Domestic water consumption rates were grossly estimated to vary between approximately 50 L/c/d and 90 L/c/d. For Gaza Strip, the per-capita domestic consumption rate was estimated to be approximately 80 L/c/d. These domestic water consumption rates are lower than the World Health Organization (WHO) minimum value of 100 L/c/d due to the Israeli restrictions on water usage by the Palestinians”²⁹.

“According to PWA estimates and the suggestions and proposals of Palestinian ministries and institutions, it was found that the present industrial water demand in Palestine represents 6 - 8% of the total municipal water demand”³⁰.

4. Water Quality (drinking)

The water sector in Palestine is comprised of multiple official bodies that are responsible for planning, implementing, and monitoring activities. “The enactment of the Water Law no. 3/2002 on 18 February 2002 resulted among other things in formalization of the scope of the authorities of PWA and more salient, it deemed water as publicly owned and managed by the PWA on behalf of the public for the public good”³¹. In its capacity as owner and manager, the PWA also delegates tasks to other regulatory bodies. This delegation of tasks is done through the National Water Council (NWC), which is comprised of thirteen regulatory bodies. The Council is responsible for creating the national water policy, and regulating the work and finances of the PWA. What follows is a brief description of the key water-related functions undertaken by various NWC members. The Environmental Quality Authority is responsible for national strategy and policy vis-à-vis water resources (surface and groundwater). The Ministry of Planning and International Cooperation is responsible for national “policies, plans and programmes for the spatial planning”, while the West Bank Water Department (WBWD) is responsible for the

²⁹ MAS, 2009: 22.

³⁰ Ibid: 25.

³¹ Shuval and Dweik, 2004: 9.

provision and distribution of water to local water providers, as well as the maintenance of water facilities. Planning and implementation of local (municipal) systems falls under the remit of the Ministry of Local Government³². The Ministry of Industry (MoI) is “responsible for effluent standards, re-use of industrial wastewater”, while the Ministry of Health is responsible for ensuring water quality standards are maintained. In Gaza, “they do all the water quality testing”³³. In Gaza, the CMWU, which is comprised of Gaza’s Municipalities, performs the “water supply and sewage services”³⁴.

This system of water management is in the process of being reformed, which is described in an updated action plan recently published by the PWA³⁵. This plan includes overall management and legislative reforms: capacity building, improvement of sanitation, ensuring equitable access, raising public awareness about water demand, and developing Palestine’s water laws.

4.1 Overview

Water quality is defined as the condition of the water—which includes chemical, physical, and biological characteristics—in relation to its suitability for a particular purpose, such as drinking. Water quality could be partially evaluated by determining several parameters, such as the concentration of dissolved oxygen, bacteria levels, the amount of salt (or salinity), or the amount of material suspended in the water (turbidity). Other parameters may include the concentration of microscopic algae and quantities of pesticides, herbicides, heavy metals, and other contaminants, which may be measured to determine water quality.

Groundwater quality problems in Palestine are significant. Although no water quality database exists, individual studies and monitoring projects indicate severe contamination and water quality problems in all major aquifers. Poor water supply and sanitation conditions, intrusion of salt water, health and environmental impacts are predictably severe in the Gaza Strip.

Mountain aquifers underlying the West Bank are contaminated with untreated wastewater. These aquifers have seen increases in chloride concentrations; in the Northeastern Aquifer sections, concentration has increased at a rate as high as 19 mg/l annually, mostly because of the influences of irrigation and untreated sewage³⁶.

“In the Gaza strip, water quality is affected by many different issues including soil/water interaction in the unsaturated zone due to recharge and return flows, mobilization of deep brines, and seawater intrusion”³⁷. Many public health indicators are worsening, and access to safe drinking water, which is a basic human right, is becoming a challenge. A major reason for this crisis is that Palestinians almost have no control over their water resources.

4.2 Water quality parameters

³² Shuval and Dweik, 2004: 13.

³³ Ibid: 13.

³⁴ Ibid: 13.

³⁵ PWA, 2013b

³⁶ PWA, 2010.

³⁷ Abbas, et al., 2013: 54.

The Palestinian Water Authority (PWA) and the Gaza Project Coordination Unit (G-PCU)³⁸ selected the following parameters to evaluate the water quality in Gaza strip based on data availability rather than their relevance: nitrates, fluorides, bacteria, parasites, heavy metals, light metals, chloride, total dissolved solid, and pH were selected to evaluate.

Chloride (Cl)

Chloride concentration exceeded standard limits; internationally accepted safe levels are 250 mg/l or PWA values of 600 mg/l. The major parts of the Gaza strip aquifer have a Cl concentration ranging between 600-2,000 mg/l, while along the coastal line Cl concentration exceeds 2,000 mg/l and can reach more than 10,000 mg/l at some spots due to effect of the seawater intrusion. A 2014 Palestinian Water Authority status report stated that 24.6% of them have chloride concentration less than 250 while the remaining (75.4%) exceeds the WHO chloride level³⁹.

Nitrate

Almost 90% of the groundwater wells of the Gaza strip have nitrate concentrations two to eight times higher than the WHO guideline values. These high levels are attributed to wastewater, agricultural fertilizers, pesticides and industrial pollutants⁴⁰.

Total Dissolved Solid (TDS)

Groundwater in most of the Gaza Strip exceeds the WHO and PWA TDS guideline limits, which is 1000 mg/L. More than 50% of the groundwater quality database showed TDS of more than 2,000 mg/L. These high values are attributed to seawater intrusion and over water abstraction in comparing to aquifer balancing.

Fluoride

Centre for Health Research, part of Gaza's Department of Health in 2013, found that the level of fluoride in Gaza's drinking water range between 0.8 – 3.8 ppm. These levels are higher than normal levels of 0.7 – 1.2 ppm. According to fluoride quality data monitored by PWA for the period 2009-2013, the concentration at majority of Gaza strip is within the normal range set by WHO and PWA guideline values except the eastern part of Gaza and segments in eastern Khanyounis and Rafah⁴¹.

Cations

“Most of the cations Magnesium (Mg²⁺), Sodium (Na⁺) and Potassium (K⁺) show concentrations higher than the WHO guideline values of 30, 200 and 10 mg/L, respectively”⁴². Most of groundwater in Gaza is classified as hard to very hard⁴³.

Microbiological quality of drinking water in Gaza strip

Reports for Gaza show that 19% of groundwater, 27% of desalinated water, and 20% of water network samples, are microbiologically contaminated by total Coliform while 13%, 14% and 12%, respectively, are contaminated by fecal coliform bacteria⁴⁴. Many local researchers published their results in international

³⁸ PWA and G-PCU, 2015.

³⁹ Ibid.

⁴⁰ Ibid.

⁴¹ PWA and G-PCU, 2015.

⁴² p.98:

www.scirp.org/journal/PaperDownload.aspx?DOI=10.4236/jwarp.2010.

⁴³ PWA and G-PCU, 2015.

⁴⁴ Ibid.

journals. However, gaps in the monitoring data of the MoH and PWA exist for microbiological indicators

Radiological quality of drinking water

Independent studies have been conducted to test the radiological quality of drinking water in the West Bank and the Gaza Strip. These studies find very low levels of radioactive material in Palestine’s water, concluding that its effects on public health are minimal to negligible. One study tested the mean and range levels of radiation in Gaza’s tap water. It concluded that, “in general most water samples have very low levels of the natural radionuclides, and the average alpha concentration was 35.95 Bq/m³ or 0.95 pci/L...levels low enough to not be considered a public health concern”⁴⁵. Nevertheless, “Israel has dumped both industrial toxic waste and radioactive waste”⁴⁶ in Gaza (including over the Coastal Aquifer), the effects of which need to be studied with greater rigor.

Another study⁴⁷ conducted in Nablus tested tap-water, as well as water from springs and wells. It concluded that radon levels found in spring water and well water tested below US EPA standards, with tap-water levels testing even lower. In contrast, a study⁴⁸ conducted in Hebron detected higher levels of radiation in the sampled drinking water; the authors speculated that this could be “attributed to the abundance of uranium-bearing minerals associated with granite rocks commonly found in Hebron district”⁴⁹.

4.3 Infectious diseases related to water contamination

Despite the volume of studies on water quality in general, there is no available study that assess the links between water scarcity and health while few studies specifically assess the link between water quality and health effects. Several diseases are transmitted through contaminated water. The Health report of the Ministry of Health (2014) has listed several of these. In Table 5, a summary of the incidence rate /100,000 population for five diseases (two viral and three parasitic diseases).

Table 5. Incidence rate of infectious diseases that could be transmitted by water

Disease	Incidence Rate /100,000		
	Gaza	West Bank	Total
Hepatitis A	48.9	6.1	22.7
Viral meningitis	246.9	6.8	99.7
Giardiasis	114.3	0.4	44.5
Ascariasis	4.5	8.5	7.0
Amebiasis	390.7	24.8	166.3

Source: MOH 2014

4.1.1 Hepatitis A

“Palestine as one of developing countries is still endemic for acute hepatitis A”⁵⁰. Feces contaminated water is the major source of infection. In 2014 (1,031) cases was reported with an incidence rate 22.7/100,000 of population; 171 cases in West

⁴⁵ El-Ghossain and Abu Shammala, 2012: 25.

⁴⁶ Eyre, 2010.

⁴⁷ Al Zabadi, H., et al., 2012.

⁴⁸ Thabayneh, et al., 2012.

⁴⁹: Ibid: 31.

⁵⁰ MoH, 2014: 31.

Bank with an incidence rate 6.1/100,000 and 860 cases in Gaza with an incidence rate 48.9/100,000⁵¹.

4.1.2 Mumps

“A total of 18535 mumps cases were reported with an incidence of 1053/100000 population...the disease affected mainly children aged more than 6 years”⁵². This indicates the fragility of the health system that could be worsened by lack of clean and safe water.

4.1.3 Typhoid fever

“Typhoid fever (enteric fever) is a septicemic illness caused by *Salmonella typhi*. This disease is endemic in Palestine...in the year 2014, a total of 61 cases were reported to the epidemiology department with an incidence rate of 3.5 per 100,000 population”⁵³ in Gaza strip and 0.1 per 100,000 in West bank for both typhoid and paratyphoid⁵⁴.

4.1.4 Diarrheal diseases

“Diarrhea is a common problem that generally lasts for few days. In Gaza strip, acute diarrhea is one of the most common childhood illnesses and the main cause of outpatient visits and hospitalizations...the high incidence of diarrheal disease in some governorates often linked to contaminated food, poor water quantity and quality and due to bad sanitation and hygiene. The most effective control measures to prevent diarrhea are maximizing access to sanitation, safe water, safe food supplies, and improving personal hygiene practices”⁵⁵.

4.1.4.1 Diarrhea in children under three years of age

The incidence rate in 2014 was “27.9% comparing to the incidence rate reported during the year 2013 where it was 41.5%. This reduction could be attributed to the underreporting during the Israeli war on Gaza in July and August 2014”⁵⁶, where an access to clinics was not feasible.

4.1.4.2 Diarrhea in children over three years of age

In Gaza strip alone, “a total of 35095 cases were reported during the year 2014 with an incidence rate of 2.28%, while a total of 35284 cases were reported during 2013”⁵⁷.

4.1.4.3 Bloody Diarrhea

“Bloody diarrhea is a potentially critical condition in which there is blood mixed with loose watery stools. Under this disease all cases with bloody diarrhea are included regardless the cause which could be bacterial infection or parasitic infestation...during the year 2014 a total of 7112 cases of bloody diarrhea were reported with an incidence rate of 404/100,000”⁵⁸. This is extremely hazardous and life threatening condition and is usually related to poor water quality.

4.1.5 Ascariasis

⁵¹ MoH, 2014: 31.

⁵² MoH, 2014: 29.

⁵³ Ibid: 36; emphasis added.

⁵⁴ MoH, 2015.

⁵⁵ MoH, 2014: 40.

⁵⁶ Ibid: 41.

⁵⁷ Ibid: 42.

⁵⁸ Ibid: 43-4.

Is a disease “caused by *Ascaris lumbricoides*, a large intestinal roundworm... Ascariasis is an endemic disease in Palestine...during the year of 2014...an incidence of 5 per 100,000 population was reported”⁵⁹.

4.1.6 Amebiasis

“Amebiasis is an infection of the intestine (but there are extra-intestinal forms) caused by a protozoa called *Entamoeba histolytica*. In Palestine, the disease is endemic and confirmed cases were reported from the laboratories”⁶⁰. See the above table for Incidence rates/100,000.

4.1.7 Giardiasis

“Giardiasis is an infection of the small intestine caused by protozoa called *Giardia lamblia*, which lives in the duodenum and jejunum. In Palestine, the disease is endemic and confirmed cases were reported from the laboratories”⁶¹. See the above table for incidence rates/100,000. It is worth noting that both Amebiasis and Giardiasis are water-borne diseases.

Public health authorities could consider investigating whether the high rates of viral meningitis are associated with poor water quality in the area. Further research into the levels of heavy metals and pesticide contamination in water and the resulting effect on human health should be considered.

5. Water scarcity and its impact on health

According to a recent WHO study⁶², resource scarcity has many detrimental effects on public health in developing countries. While data is sparse/incomplete, the general global trend is that primary health care facilities are the hardest-hit, with hospitals in tow. This report does not include country-specific data, so figures for Palestine are not available.

In the Gaza Strip, nearly 90 per cent of the water is unfit for human consumption⁶³. Prior to Israel’s 2014 assault on Gaza, water quality was a serious issue, with both Israel and the Coastal Municipalities Water Utility (CMWU) over-pumping from the Coastal Aquifer. The excessive extraction of groundwater resulted in years of seawater intrusion, rendering this source saline. Salinity and pollution of Gaza’s only freshwater source has been continuously aggravated by Israel’s repeated military assaults. Israel has persistently attacked Gaza’s power stations and sewage facilities. As the ICRC elucidates, water and power are inextricably linked. Gaza faces severe electricity shortages, compelling Gazans to resort to fuel-powered generators. However, with Israel’s blockade, importing fuel is extremely difficult—sometimes impossible—rendering fuel a precarious resource. This, in turn, impedes the CMWU’s ability to purify, desalinate, and distribute drinking water (ICRC). The effects are particularly egregious on hospitals, which depend on a constant supply of clean water to treat patients, and of course, to maintain satisfactory standards of sanitation and hygiene. The lack of continuity in clean water supply to hospitals increases the risk of patients contracting infections⁶⁴. “In addition, the poor quality

⁵⁹ Ibid: 47; emphasis added.

⁶⁰ MoH, 2014: 48.

⁶¹ Ibid.

⁶² WHO and UNICEF, 2015.

⁶³ UNICEF 2013:1; B’Tselem 2014b. .

⁶⁴ WHO and UNICEF, 2015.

of the water that is available – particularly its high salinity – is adversely affecting services such as haemodialysis which depend on pure water”⁶⁵.

There are wastewater treatment facilities throughout the West Bank (in Jenin, Tulkarem, Hebron, and Jerusalem) that “do not function adequately”⁶⁶. There are an additional six facilities that face impediments to operate due to Israeli restrictions. The only facility that operates in the West Bank is in Al-Bireh. This leaves “the vast majority of wastewater in the West Bank”⁶⁷ untreated. This is unsurprising when “only 20 percent of Palestinian homes...are connected to sewerage systems”⁶⁸. Untreated wastewater produced by Palestinians and Israeli settlers in the West Bank enters the environment through open disposal, leaky cesspits, and rundown sewage pipes. Non-governmental organizations, such as the Applied Research Institute of Jerusalem (ARIJ) have taken the initiative to create wastewater reuse systems for agricultural use. However, wastewater reuse on a national scale is still only a proposal. Through Israel’s veto power in the Joint Water Committee (JWC), Israel is able to delay and reject Palestinian proposals for wastewater treatment plants.

The Gaza Strip contains four wastewater treatment plants (Rafah, Beit Lahiya, Gaza City, and Khan Younis), the wastewater from which is dispensed from households connected to the sewerage system; these comprise 60 percent of households⁶⁹. While this figure is impressive in comparison to the West Bank wastewater system, Israel has damaged or destroyed these treatment plants during its repeated military assaults on Gaza.

Several studies⁷⁰ cited in the B’Tselem report have found the existence of several pollutants from wastewater; however, “to date, no comprehensive epidemiological research has studied the effects of the free-flowing raw wastewater on West Bank water sources”⁷¹. Similarly, a recent WHO report simply stated that in the West Bank, “the water supply situation represents a clear risk for the public health”⁷² without providing specific implications. In regards to Gaza, the report states that “the deterioration or destruction of the sewage system constitutes a high risk for contamination [sic] and water borne diseases. Up to date, there is however no clear epidemiological data confirming a [sic] massive impact on health at short term (outbreaks) or long term (chemicals) attributable to the water problem. The absence of data does not preclude the urgency of retuning the quality of water to internationally acceptable levels”⁷³.

Water scarcity affects human at four levels; health, hunger, education and poverty. The scarcity of water is due to the dry climate and groundwater aquifers with insufficient yield for the growing population. People are forced to drink low quality water "contaminated" or with high content of undesirable chemicals. People die of many water-borne diseases. Less water also means sewage does not flow properly resulting in the spread of many infectious diseases. Scarcity of water of water force clinics, local restaurants, public places of convenience and other places to use very little water for cleaning. This compromises the health of the staff and people who use the facilities. Hunger, poverty and lack of education all are factors that threaten the life of people directly and indirectly.

⁶⁵ ICRC, 2014.

⁶⁶ EWASH, 2011.

⁶⁷ B’Tselem, 2009.

⁶⁸ (ibid: 19)

⁶⁹ EWASH, 2011.

⁷⁰ E.g. Al-Quds University, 1998; Bethlehem University, 1999; MoH, 2001; UNEP, 2002.

⁷¹ B’Tselem, 2009: 27.

⁷² WHO, 2015b: 14.

⁷³ WHO, 2015b: 13.

Despite the absence of universal consensus over the precise definition and method of measuring "water scarcity", there is a global realization of its devastating effects. The latest review of the situation in Gaza strip performed by the PWA and the Austrian Development Agency has examined the following indicators of Public Health Diseases (diarrhea, malnutrition, hepatitis A, typhoid and paratyphoid, parasitic diseases, meningitis, skin diseases, dental caries, renal diseases, and anemia) and attempted to correlate some of the water indicators with such diseases⁷⁴.

Many gastrointestinal infections (parasitic, bacterial or viral) are water-related. Fecal-oral route is the major route of transmission. Parasitic infections such as *Giardia lamblia* and *Entamoeba histolytica* are highly prevalent among the Palestinian population as reported by several researchers. Diarrhea is still common among children below five years of age in Palestine.

Chemical pollution of drinking water increases as the water quantity decreases due to concentration effect. The most prominent issue in this regard which represent a health concern, is the nitrate content is the most worrying due to risk of methaemoglobinaemia, especially for infants.

Vulnerable groups in the population include Infants up to six months⁷⁵, children between six months and five year, pregnant or lactating women⁷⁶ and the elderly⁷⁷. Diarrheal disease is a leading cause of child mortality and morbidity in the world. Most deaths are due to severe dehydration and fluid loss⁷⁸.

In a Palestinian Hydrology Group (PHG) survey, "more than one-fifth of all communities reported that at least 1 percent of the population had water-related health problems. Some communities reported that 17 percent of the population had water-related health problems (PHG, 2003).

Many acute and chronic health problems can be caused or exacerbated by poor water quality and exposure to untreated wastewater. Water scarcity and high salinity can result in kidney dysfunction or failure, which can be exacerbated by the hot weather common in this region (Bellisari, 1994). Chemicals, such as nitrates, found in the water supply cause other water-related illnesses, including diarrhea. The PHG survey found that more than 10 percent of children less than five years old were reported to have had diarrhea episodes during the two weeks previous to the survey. In addition, there are long-term health consequences of ingesting contaminants in the water. For example, high nitrate concentrations can increase anemia and induce spontaneous abortion (Bellisari, 1994). Exposure to raw sewage as a result of the lack of sewage infrastructure also has significant short- and long-term health implications, especially in such vulnerable populations as children and the elderly. Finally, communicable diseases such as hepatitis are 'the most prevalent and most serious of all health problems associated with the water supply' (Bellisari, 1994)⁷⁹.

⁷⁴ PWA and G-PCU, 2015

⁷⁵ Shomar, 2011; Knobloch, et al., 2000.

⁷⁶ WHO, 2015a; Sappenfield, 2013.

⁷⁷ Smith, 1998.

⁷⁸ WHO, 2013; Walker, et al., 2013.

⁷⁹ RAND, 2005: 179-80.

“Epidemiological studies assessing burden of disease associated with consumption of low quality water in Palestine are needed. Epidemiological studies and quantitative risk assessments using data on water quality could give some estimates on acute and chronic illness, such as dental fluorosis, renal illnesses and cancers linked to chemical and microbiological contaminants in drinking water as well as those linked to low mineral content in desalinated water”⁸⁰.

6. Existing national law and polices and regulations pertaining to the supply of sufficient domestic water supply

“The West Bank and Gaza strip do not form a singular geographical unit and were, at times separate legal units”⁸¹. The Palestinian National Authority “found that the roles and responsibilities in the water sector were scattered, fragmented and unclear during the occupation period, which lent itself to inefficient management and uncoordinated investments. In 1995, when the Palestinian Water Authority (PWA) was established, it found that there was an urgent need to restructure the water sector in order to regulate, monitor and control the managerial, technical and financial performance at the national, regional and local levels”⁸².

1. Palestinian Water Law

In “1995, the Palestinian Authority established the PWA. The PWA derives its authority from By-Law No. 2 of 1996 and Law No. 3 of 2002, according to which PWA is the official body that regulates, and is responsible for, overall water resources in the West Bank and Gaza”⁸³.

“Legislation for the regulation and management of the water sector is encompassed in the Water Law No. 3”⁸⁴ (2002). “The Water Law includes the vision, goals, policy and strategic principles for the management of the Palestinian water sector and will function in parallel with other relevant legislation, particularly within the sectors of environment, agriculture and health.

The objectives of Water Law No. 3 are to:

- Secure sustainable development of water resources based on environmentally sound and enabling bases
- Provide and satisfy societal and individual needs for water in an optimal and equitable way in the Occupied Palestinian Territories (oPt)
- Protect all water resources from pollution and secure water quality, ensure an environment not harmful to human health or well-being, and sufficient water for production and self renewal”⁸⁵.

Recently, “the President of the State of Palestine issued a decree endorsing the new Water Law, which is considered the result of the Water Sector Reform Program that has been led by the Palestinian Water Authority over the last four years”⁸⁶. “The new water law grants the establishment of Water Sector Regulatory Council independent from the PWA. The Regulatory Council has been established by the Cabinet which has a Board of Directors derived from the public sector, private

⁸⁰ NIPH and WHO, 2014: 30.

⁸¹ Shuval and Dwiek, 2004: 4.

⁸² Ibid: 7.

⁸³ UNEP, 2003: 21-2.

⁸⁴ Ibid: 23.

⁸⁵ Ibid: 23-4.

⁸⁶ PWA: <http://www.pwa.ps/page.aspx?id=zgU4xia1791199146azgU4xi>.

sector and civil society. Its mandate makes it responsible for water prices and monitoring the performance of Water and Wastewater Service Providers. It will issue licenses for operators to establish the infrastructure needed to supply, desalinate, and treat water and set the framework for quality assurance of services and manage consumer complaints. It will set the foundations to represent service providers in Regional Water Utilities and in addition, monitor the performance of Bulk Service Providers, and ensure that their services are compliant with the accepted standards.

The Water Law includes directives to transform the West Bank Water Department into a governmental company which will be owned by the State of Palestine...The Law includes articles protecting water resources and defined protection zones...It also contains articles which allows for sanctions for the infringement of Water resources. The Law provides for the need to present the decree of law to the legislation council in its first session for endorsing the law and subsequently revoking all previous nominated legislation pertaining to that law”⁸⁷.

2. Water Strategy in Palestine

In 2013, the PWA finalized the Water Strategy, which includes two phases: a short-term phase (2012-2017) and a long-term phase (2017-2032). “The objectives to be achieved in the strategic water resources and transmission plan to implement the national water strategy for public water supply for the West Bank include:

- Develop a stage development plan of water resources included in the strategy over the lifetime of the plan, showing their location and anticipated volumes.
- Development of an effective plan to develop the inter-Governorate transmission infrastructure required to deliver those bulk resources to a location where they would become the responsibility of a regional service provider to deliver supply to its customers.
- A sufficiently detailed transmission plan that can be taken to outline design by others”⁸⁸.

“PWA operations – and water resource management - in Gaza are effectively”⁸⁹ affected after Hamas control Gaza on 2007.

3. Water quality guidelines

“A review of water quality guidelines has shown that national and international water quality standards are generally based on the WHO guidelines. In few cases, guidelines are less restrictive than the WHO guidelines for specific parameters. This is the case for PWA, which mandate several parameters which deviate from the WHO guideline values. Those parameters that differ from the WHO guidelines are parameters that are concerns in the Gaza Strip and are generally related to natural chemical constituents in the water. These are not directly of health concern, with the exception of nitrate, which is most often related to anthropogenic activities such as agriculture”⁹⁰.

7. Impact of Occupation on the Water Resources

⁸⁷ PWA: <http://www.pwa.ps/page.aspx?id=zgU4xia1791199146azgU4xi>.

⁸⁸ PWA, 2014: 4.

⁸⁹ World Bank, 2009: xi.

⁹⁰ NIPH and WHO, 2014: 20. ,

“Prior to 1967, Israel had developed the water resources to which it had access and established a national water carrier, Mekorot, that conveyed water from existing sources of supply to the various centers of demand from agricultural, municipal and industrial customers. Following the 1967 War, Israel took control of water resources, and developed wells, throughout the West Bank, together with a water supply network serving settlements that linked into the Mekorot network...The amount that Mekorot supplies to the settlements is unofficially estimated at some 75 MCM, of which 44 MCM is produced from wells controlled by Israel or settlers within the West Bank”⁹¹.

“In 1995, the Oslo II agreement Article 40 contained provisions on water and sewage that recognized undefined Palestinian water rights, and returned some West Bank water resources and services responsibility to the Palestinian National Authority. Essentially Article 40:

- Set governance arrangements for a five year interim period, notably a Joint Water Committee (JWC) to oversee management of the aquifers, with decisions to be based on consensus between the two parties.
- Allocated to either party specific quantities of the three West Bank aquifers underlying both territories - the share allocated to the Palestinian West Bank was about one quarter of the allocation to Israel and the settlements.
- Provided for interim extra supplies from new wells and from Mekorot - an extra 28.6 MCM was to be allocated to Palestinian needs.
- Estimated “future needs” for the Palestinian West Bank at 70-80 MCM.

The general expectation was that this interim agreement would be revised within a five year period. However, it still governs the water sector today, twenty years after Oslo”⁹².

“Israel’s policies and practices in the West Bank have been to expropriate and assert control over Palestinian water resources...maintain an unequal and discriminatory allocation of water resources to benefit both Israeli citizens living in Israel and those living in West Bank settlements, and prevent Palestinians from developing or accessing their own resources and thus undermining their right to self-determination. This situation has been achieved primarily through the issuance of military orders subsequent to the occupation, which transferred the power over water resources and water resource management to the occupation authorities”⁹³.

The Palestinian water rights in the Jordan River have been violated by Israel since 1967. In the early beginnings of fifties, the Jordan River had an annual water flow of 1,250 MCM. However, as a result of the diversion of the river water through the Israeli National Water Carrier, which diverts the water from Lake Tiberias to Negev desert, as well as other regional projects, the river is currently running with high salinity and deteriorated quality water at a flow of 200 MCM. “Concerning groundwater, the Israelis are currently utilizing about 82% of the annual safe yield of the groundwater basins to meet 25% of their water needs, whereas the Palestinians in the West Bank consume about 18% of the annual safe yield”⁹⁴.

⁹¹ World Bank, 2009: iv.

⁹² Ibid.

⁹³ EWASH and Al-Haq, 2011.

⁹⁴ Hilal, 2011: 14.

In West Bank cities/towns connected to the water grid, average Palestinian water consumption is 73 l/c/d; whereas in northern West Bank cities/towns even lower: 52 l/c/d in the Tubas governorate and 38 l/c/d in the Jenin governorate⁹⁵. In contrast, the average Israeli daily per capita consumption is about four times the Palestinian average (300 -350 liters per person per day)⁹⁶.

“Israel has also actively prevented the construction and maintenance of water and sanitation infrastructure in the West Bank. This has primarily been achieved through Israel exercising its effective veto through the Joint Water Committee (JWC), which is mandated to approve all water and sanitation projects in the West Bank. In areas of the West Bank that remained under direct Israeli control following Oslo (around 61 per cent of West Bank territory) further layer of bureaucracy exists, as the Israeli Civil Administration must grant a permit for any construction, including water and sanitation projects. The vast majority of applications for a permit are denied, and any structure built without a permit faces the risk of demolition by the Israeli authorities. As well as prohibiting the construction of wells necessary for Palestinians to secure additional quantities of water to support population growth and socio-economic development, such policies have denied communities access to water and sanitation facilities, including water and sewage networks and cisterns for rainwater harvesting.

Israeli 'security' measures inside the West Bank such as roadblocks, checkpoints and the construction of the Wall have also obstructed Palestinian access to water resources, services and facilities. Areas that have been designated closed military areas, nature reserves and 'settler only' roads have left large areas of the West Bank inaccessible to Palestinians, or movement within these areas highly restricted. Such measures isolate Palestinian communities from their springs, wells and water points, force Palestinians to travel long distances to access water, and obstacles to movement have hindered water tankers and sewage disposal trucks from accessing certain areas, causing them to make long detours which due to increased time and fuel costs have rendered such services unaffordable in many cases⁹⁷.

In Gaza, “90 to 95 percent of the Coastal Aquifer, on which Gaza inhabitants are dependent for water, is contaminated due to over extraction and sewage contamination making it unfit for human consumption...the aquifer is depleted and in danger of collapse⁹⁸ “Restrictions imposed by Israel as part of its ongoing blockade make the rehabilitation of the aquifer and the search for alternatives extremely difficult. Palestinians in Gaza are not allowed to access water from the Mountain Aquifer. Israel also limits the entry of construction materials for construction, repair and rehabilitation of infrastructure that would allow for improved water management. Mass desalination of sea water as an alternative is too costly and unsustainable within the current context given frequent electricity shortages in Gaza associated with Israel’s blockade⁹⁹.

Many Israeli settlements damaged the main water pipes that provide the nearby Palestinian villages with water in addition to the damage caused by the Israeli tanks during the incursions into the Palestinian localities, resulting in high water losses and denying the Palestinians from using it. The PWA reported that more than 200

⁹⁵ B’Tselem, 2014.

⁹⁶ Amnesty International, 2009.

⁹⁷ COHRE, 2008: Executive Summary.

⁹⁸ EWASH: <http://www.ewash.org/en/?view=79YOcy0nNs3D76djujAnkDDT>.

⁹⁹ Thirsting For Justice: <http://www.thirstingforjustice.org/?question=what-is-the-reason-for-this-discrepancy>.

localities suffered from water cut off by Israel for long periods, which created a severe water crisis in those localities. Moreover, the siege imposed on the Palestinian localities as well as the movement restrictions have exacerbated the situation and impeded the delivery of water to the villages unconnected to water network by water tankers. It was estimated that more than 350,000 Palestinian residents in the West Bank depend on regular water supplies by water tankers but as a result of the siege and closure they obtain less water quantities which are far below the minimum water requirements and at high prices¹⁰⁰.

The construction of the Wall has resulted in the confiscation and shaving of Palestinian lands, but also has resulted in the isolation of several Palestinian groundwater wells and springs used for domestic and agricultural purposes. This will result in cutting the Palestinians from their water sources or at least imposing more restrictions on their use¹⁰¹.

8. Social and Economic Dimensions of the Current Water Situation

As shown in the previous sections, “in some areas the water supply services are still highly fragmented and inefficient, with poor data collection and information systems, poor cost recovery, decaying infrastructure and insufficient resources”¹⁰².

“Under the prevailing security, economic, water resource and institutional constraints, the performance of the utilities is deteriorating. Utility performance is typically poor, with unaccounted for water averaging 34% and bill collection rates averaging only 50%”¹⁰³. The water service providers are not doing their best to collect the water bills. In addition, the prevailing social, economic, and political conditions in Palestine have resulted in many public groups either refusing or being unable to pay their water bills to the service providers¹⁰⁴.

“There are negative impacts on household budgets and on health, particularly for the poor. Water is a significant item in household expenditure, 8% of West Bank Palestinian household income on average, twice the globally accepted standard. In the current economic situation, low capacity to pay is undermining utility bill collection and finances. It is, however, the poor unconnected consumers who pay the highest costs – up to one sixth of their household budget or more. Tanker water costs have been driven up by movement and access (M&A) restrictions, and communities are reducing consumption by up to half. A preliminary study estimates that the extra cost to users of tanker water may add up to 1% of GDP”¹⁰⁵.

9. Principal Causes of the Current Situation

9.1 Failings in West Bank Water Resources Development and Management

“The policies and practices outlined above have restricted the ability of the Palestinian authorities to provide an adequate service to the Palestinian population, and in some cases prevented humanitarian organizations from providing aid and assistance to vulnerable communities. As an occupying power, Israel is primarily

¹⁰⁰ COHRE, 2008; Amnesty International, 2009.

¹⁰¹ ARIJ, 2004.

¹⁰² PWA, 2006: 14.

¹⁰³ World Bank, 2009: viii.

¹⁰⁴ PWA, 2009.

¹⁰⁵ World Bank, 2009: vi.

responsible for the welfare of the Palestinian population in the West Bank and is under an obligation not to obstruct the Palestinian authorities from carrying out their duties in areas for which they are responsible, including water and sanitation provision”¹⁰⁶.

“The PWA is unable to conduct integrated management of the resource in the West Bank within the current governance framework. The governance system established by Article 40 requires the approval by Israeli authorities of any proposed PA management measure or infrastructure project within the West Bank. This arrangement, together with the way it has been implemented, gives Israeli authorities control over the allocation and management of West Bank water resources. Israeli territorial jurisdiction in Area C (60% of the West Bank) consolidates this control, which makes integrated planning and management of water resources virtually impossible for the PA”¹⁰⁷.

9.2 Constraints Stemming from Oslo and the Occupation

“JWC has not fulfilled its role of providing an effective collaborative governance framework for joint resource management and investment”¹⁰⁸. “The JWC does not function as a “joint” water resource governance institution because of fundamental asymmetries - of power, of capacity, of information, of interests – that prevent the development of a consensual approach to resolving water management conflicts”¹⁰⁹ and have reduced the development of water resources and services for Palestinian people below levels expected at the time of Oslo¹¹⁰.

9.3 Constraints stemming from Palestinian Institutional Weaknesses reference

The institutional architecture proposed for the sector has not been fully implemented. “PWA is not performing up to expectations, and has lost capacity because of a range of governance and management problems. One yardstick of institutional capability is PWA’s weak ability to negotiate effectively in the JWC”¹¹¹.

“PWA operations – and water resource management - in Gaza are effectively suspended”¹¹². PWA developed a relatively strong presence in Gaza, which is now effectively suspended. As a result, PWA’s regulatory function is in abeyance and unlicensed wells are proliferating. The political situation has reduced the effective linkages with Ramallah...Gaza’s CMWU¹¹³ is the most advanced of the regional utilities and some benefits have been won, but the model is now vulnerable to the political and economic situation”¹¹⁴.
(<https://openknowledge.worldbank.org/bitstream/handle/10986/3056/476570SR0P11511nsReport18Apr2009111.txt?sequence=2>).

9.4 Israel’s obligations

¹⁰⁶ EWASH, Executive Summary: http://www.ewash.org/files/library/policies_of_denial_-_water_in_the_west_bank_dec_2008.pdf.

¹⁰⁷ World Bank, 2009: vii.

¹⁰⁸ PWA, 2013a: 9.

¹⁰⁹ World Bank, 2009: ix.

¹¹⁰ Ibid.

¹¹¹ Ibid: x.

¹¹² After Hamas won the Gaza elections and took power in 2007.

¹¹³ Coastal Municipalities Water Utility.

¹¹⁴ World Bank, 2009: xi.

“Israel is the Occupying Power in Palestine. Under international humanitarian law, an occupying power is responsible for the welfare of the civilian population and must ensure that civilians are provided with or allowed to secure the basics for survival including food, water, medical supplies and shelter. Palestinians are guaranteed access to drinking water, water for personal hygiene and sanitation under the Geneva Conventions. Israel ratified the International Covenant on Economic, Social and Cultural Rights (ICESCR) where the right to water is enshrined. In September 2010, the UN Human Rights Council affirmed for the first time that the human right to water and sanitation is legally binding. Israel however is one of three countries that do not recognize both of these rights”¹¹⁵.

“In the interim, Israel as an occupying power must immediately and without delay take the following actions to ensure the right to water and sanitation for Palestinian people in the occupied West Bank:

- Ensure that adequate quantities of water are available to enable the satisfaction of basic personal and domestic needs as well as ensure the realisation of the rights to food and livelihood, particularly for subsistence farmers.
- Remove all obstacles to water and sanitation service provision, including facilitating access for water tankers and sanitation removal trucks at checkpoints, and opening extra filling points in communities that are not connected to the water supply network”;¹¹⁶
- Remove barriers that restrict the PWA in addressing its duties and responsibilities in the water and wastewater sector;
- Ensure Palestinians get the allocations of fresh water cited in the Oslo II agreement, until the Permanent Status negotiations secure equitable and reasonable volumes and;
- Allow Palestinians in Gaza to rehabilitate their aquifer and develop alternatives¹¹⁷.

9.5 PWA’s obligations reference

“Essentially, integrated resource management is impossible under current conditions”¹¹⁸. “Clearly, the resolution of all problems will require movement on the political front. Reforming the way in which the JWC and Civil Administration address Palestinian development needs is a priority until such time that the political issues are resolved in final status”¹¹⁹.

“In considering reform of the PWA, there is a need to be realistic about the huge challenges”¹²⁰. A reform program has already been emerged, but prioritization and integration will be a key. It should be noted here that any attempt to reform the water and wastewater institutional or organizational framework should take into account the impact of the Permanent Status negotiations.

10. Conclusions and Recommendations

- The present problems in Palestine that are related to water are many and varied.

¹¹⁵ Thirsting For Justice: <http://www.thirstingforjustice.org/?question=what-are-israels-obligations>.

¹¹⁶ EWASH, 2008: 43

¹¹⁷ COHRE, 2008; World Bank, 2009.

¹¹⁸ World Bank, 2009: xii.

¹¹⁹ Ibid.

¹²⁰ Ibid: x.

For Gaza Strip, shortage of electricity in some parts, scarcity of economic resources, and supplies of essential materials such as cement, pipes, spare parts and special electro-mechanical treatment equipment, in addition to the significant tension between Israel and the Palestinians over the ownership of water rights and adherence to agreements over water control, constitute additional barriers. These factors made the water and wastewater services unreliable and even hazardous, which poses a formidable challenge for the population to obtain adequate hygienic water. The supply of drinking water is in complicated intermittent schemes and the quality is failing, making its drinkability questionable.

- “Israel as an occupying power must immediately and without delay take the following actions to ensure the right to water and sanitation for Palestinian people in the occupied West Bank”¹²¹.

“Groundwater quality problems in the West Bank and Gaza are also significant. Although no water quality database exists, individual studies and monitoring projects indicate severe contamination and water quality problems in all major aquifers”¹²².

- Despite the volume of studies on water quality in general, there is no available study that assess the links between water scarcity and health while few studies specifically assess the link between water quality and health effects. This was mostly justified by the fact that data gaps exist. Data collection, mean of collection, periodicity, availability, validity and many other issues regarding the accuracy and reliability of data makes it difficult to draw a clear picture of the existing water contamination contribution to morbidity and mortality.
- “Targeted studies are needed to investigate the burden of disease associated with water [scarcity] from different sources and districts in the Gaza Strip, including an estimation of long term effects of consuming substandard water”¹²³. “Epidemiological studies assessing burden of disease associated with consumption of low quality water in Gaza Strip are needed...further research into the levels of heavy metals and pesticide contamination in water and the resulting effect on human health should be considered”¹²⁴.

¹²¹ EWASH, 2008: 43.

¹²² RAND, 2005: 170.

¹²³ NIPH and WHO, 2014: 4.

¹²⁴ Ibid: 30.

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