



MA'AN Development Center

Environmental Degradation and Impact on

Gaza's Groundwater

Introduction

Israeli restrictions on the material entry, fuel shortages, power cuts, and the lack of resources have greatly affected the development of safe and adequate sanitation and solid waste infrastructure for Palestinians in the Gaza Strip. This has resulted in damage to the environment, including degradation of Gaza's sole source of fresh water, the coastal aquifer, and deterioration of the ecosystem. These restrictions have undermined local authorities ability to meet the needs of the Palestinian population and weakened the sanitation and solid waste structures in the Gaza Strip.

Other factors include unrestricted use of agrochemicals, and seawater intrusion.

Obstruction of wastewater treatment

30% of households in the Gaza Strip are not connected to the municipal sewage discharge network relying instead on leaky cesspits, boreholes, and septic tanks, which are unsafe and porous.

Palestinians can't afford to empty their cesspits due to poor economic conditions. Thus, part of the sewage originating from domestic sources ends up released, untreated, into the environment

90 million litres of raw and partially treated wastewater is released in to the Mediterranean Sea¹ daily due to:

- Insufficient capacity of the existing temporary wastewater treatment plants to cope with demand, in addition to delays in the construction of the central wastewater treatment plant due to the blockade and Israeli military operations.
- Inability to maintain and rehabilitate wastewater facilities due to Israeli restrictions on material entry into Gaza. These restrictions have been compounded by the creation of the

1) Information collected from the Gaza Municipalities Water Utility on 12 October 2015



The Qainas family in Al Berka area in Der Al-Balah has three cesspits inside the house; one is only a meter away from one of the bedrooms.

Gaza Reconstruction mechanism (GRM), which imposes bureaucratic and lengthy procedures on material entry.²

- Repetitive destruction of Gaza's sole power plant during military operations.
- Power outages of up to 8-12 hours per day and a lack of fuel to operate backup generators to keep the wastewater facilities functioning.

2) Ibid



Wadi Gaza, a natural swamp

running across the Gaza Strip is now an open drain for sewage. Until 2011 it received up to 11,000 cubic meters of raw sewage from the middle Gaza district and 40,000 cubic metres of partially treated sewage from Gaza city every day and discharged it to the Mediterranean Sea. However, now, due to the closure of the Gaza sewage outlet and the increase in population, the Wadi directly receives up to 14,000 cubic meters of sewage from the middle area every day. Previously, Wadi Gaza was one of the most important wetlands and biologically diverse areas in Palestine. This Wadi was an open natural body of water coming from the Hebron Mountains in the West Bank, and northern Negev heights. Most of the water has stopped flowing into the Wadi because the Israeli authorities have built dams along the borders with Gaza, diverting all the water to Israel. Water samples taken from water wells in Wadi Gaza indicated dangerous concentrations of pollutants such as faecal coliforms, heavy metals, and Nitrates.³ Also, samples taken from the seawater opposite the Wadi showed high pollution levels of organic matter, faecal coliforms, faecal streptococci, and heavy metals.⁴ The area around Wadi Gaza is heavily populated and inhabitants often complain of a foul smell and health problems. A temporary wastewater treatment plant has recently been constructed to serve the middle area and households will be connected to a pumping station in order to pump the sewage to the plant. However, untreated or partially treated sewage will continue to be pumped into the sea due to the power cuts and fuel shortages.

3) ICRC, *Environmental Baseline Study for Wadi Gaza*, 2011.

4) *Ibid*

Unsustainable Farming practices:

Agricultural lands in Gaza are excessively treated with harmful and illegal pesticides and fertilizers which seep down from the surface into the aquifer system⁵ in a form of Nitrate and contaminate it⁶. This type of pollution is most severely affecting the southern and northern area of Gaza, such as Al-Mawasi and Beit Lahia respectively, where the sand dunes are thin and the transmissivity zone is relatively high, allowing agrochemicals to percolate quickly into the ground water.⁷

An example of an agrochemical used in Gaza is methyl bromide, a toxic material affecting the nervous, respiratory, and immune systems that is also known to deplete the Ozone.⁸

Samples of groundwater from 63 wells in the Gaza strip showed that the high levels of Nitrate in some areas are the result of intensive use of fertilizers and pesticides.⁹

Impact on water:

In the Gaza Strip, the over-exploitation of ground water by three times its sustainable yield rate in order to meet growing demands, sewage infiltration, and agrochemical percolation into ground water have contaminated over 95% of ground water with Nitrates and Chlorides. The WHO standards require nitrates to be less than 50 mg/litre and chloride to be less than 250 mg/litre. However, the vast majority of the Coastal Aquifer now has nitrates ranging from 100 to 800 mg/litre and chloride ranging from 500 to 3,000 mg/litre.¹⁰

5) Maan, *Restricted Access and Its Consequences* (2011) & the Palestinian Central Bureau of Statistics, *The Palestinian Environment to Where* (2010)

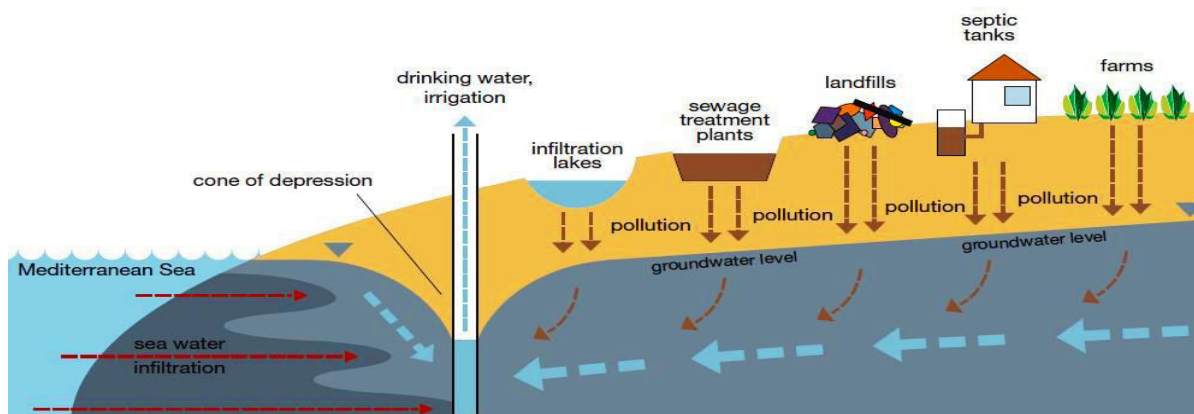
6) Institute of Hydraulic Engineering and Water Resources Management, *Analysis of Nitrate Occurrence and Distribution in Ground Water in the Gaza Strip Using Major Ion Chemistry* (2008).

7) Information collected from Eng. Ahmed Yaqoubi, a water expert on 11 October 2015.

8) The Ministry of Environmental Affairs, *Threats to Biodiversity in Palestine*. Accessed from <http://www.mena.gov.ps/part3/threats.htm>

9) Institute of Hydraulic Engineering and Water Resources Management, *Ibid*

10) EWASH, *Israel's Violations of the International Covenant on Economic, Social and Cultural Rights with Regard to the Human Rights to Water and Sanitation in the Occupied Palestinian Territory*, 2012.



Source of info graphic: UNEP report on environmental assessment of the Gaza strip in 2009.

Inappropriate solid waste disposal

In the Gaza Strip, there are three landfills; Johr al Deek Landfill east of Gaza City, El-Fukhary Landfill east of Rafah City, and Deir El Balah Landfill in the middle area of the Strip. Both Johr al Deek and El-Fukhary landfill sites are not equipped with soil protection measures¹¹ which present a potential contamination risk to groundwater resources due to waste leachate percolating

through the soil layers in the event of rainfall.¹² In addition, the three landfills are currently exceeding their maximum capacity.¹³

Due to limited access to the three overloaded landfills, a substantial part of the waste is dumped temporarily at transfer sites throughout Gaza. These sites lack control or protection.¹⁴

There are more than 20 random dump (transfer) sites in the Gaza strip that don't meet the basic environmental requirements.¹⁵ Currently the sites are too close to residential buildings and have no protective layer below to prevent pollutants from percolating into the soil¹⁶.

Groundwater samples taken from 18 water wells around two of the landfills showed high contamination with physical and chemical contaminants such as nitrate, chloride, and ammonia which were above the WHO and Palestinian recommended standards for potable and irrigation water.¹⁷

Beit Lahia Solid waste dump site was established as a temporary dump site in the north of the Gaza Strip in 2005. This site was necessary due to the inability of Beit Lahia municipality to transport solid waste to the Gaza central landfill, in Johr Ad-Deek area near the Israeli border, due to the security situation in the area, lack of municipality resources, and severe shortages of equipment, fuel, and trucks. The situation didn't change, resulting in the accumulation of thousands of tons in the site. 'The dump site should be emptied on a daily basis, but due to the lack of resources, we can only do that every 3-5 months depending on the availability of funds to cover operational costs' said Atef As-Sultan, Head of the Health and Environmental Department at Beit Lahia Municipality.



11) UNEP, *Environmental Assessment of the Gaza Strip* (2009)

12) EcoConServ Environmental Solutions and Universal Group, *Environmental and Social Impact Assessment (ESIA) for Gaza, Gaza Solid Waste Management Project*, 2012

13) UNEP, *Environmental Assessment of the Gaza Strip* (2009)

14) Ibid

15) Information collected from the Environment Quality Authority in Gaza.

16) UNEP, *Environmental Assessment of the Gaza Strip* (2009)

17) Tamer Alslaibi and etal, *Assessment of Groundwater Quality Due to Municipal Solid Waste Landfills Leachate* (2011).

This problem is because of:

- Impaired maintenance of existing landfills due to the blockade, which prevents the entry of maintenance materials into Gaza.
- Insufficient collection and inappropriate disposal of solid waste due to shortages of funds and equipment.
- Inability to access landfills due to their location near the borders with Israel, which causes security problems both for waste transport and for landfill operation.
- The rapid growth of Gaza's population, which continues to add pressure on existing infrastructure.
- The generation of huge quantities of solid waste during Israel's military operations against Gaza¹⁸, which overloaded the already inadequate infrastructure.

18) Operation Cast Lead in 2008/9, and Operation Pillar of Defense, and Operation Protective Edge 2014.

In 2014 alone, during Israel's 51-day offensive against Gaza, 2.5 million tons of solid waste were generated, resulting primarily from the destruction of infrastructure, including buildings, factories and other establishments. This kind of waste is often contaminated with hazardous materials. Components of around 3000 tons of explosives used by Israel during the war, have been accumulated on the soil's surface and are predicted to percolate into the ground water during rainfall, contaminating it with heavy metals, such as cadmium, copper and lead.¹⁹ Chemical testing of heavy metals in 157 municipal water wells in the Gaza Strip, following Israel's offensive against Gaza in 2012, showed a serious level of contamination with strontium and chromium.²⁰ Strontium can lead to bone disorders and bone cancer, while chromium is known to have carcinogenic properties, and can lead to DNA damage.

19) Palestinian Environmental NGOs Network, *2014 War on Gaza Strip: Participatory Environmental Impact Assessment*, 2015.

20) Palestinian Water Authority, *Heavy Metal Concentration in Gaza Water*, 2013.

Recommendations:

- ***The International community should pressure Israel to lift its blockade on Gaza and remove all the restrictions which weaken Palestinian efforts for environmental conservation, most urgently, they should enable adequate wastewater and solid waste management in the Gaza Strip.***
- ***The donor organizations should devote more funds for solid waste management in the Gaza Strip, including for the establishment of landfills and dump sites that meet international standards to avoid further deterioration of Gaza's ground water.***
- ***The local authorities should prevent the import of harmful agrochemicals from Israel, and should monitor the use and distribution of fertilizers and pesticides in the Gaza Strip, educate farmers about the harmful impacts of agrochemicals, and provide natural and organic alternatives.***

A sewage outfall pumping untreated or partially treated sewage into the sea