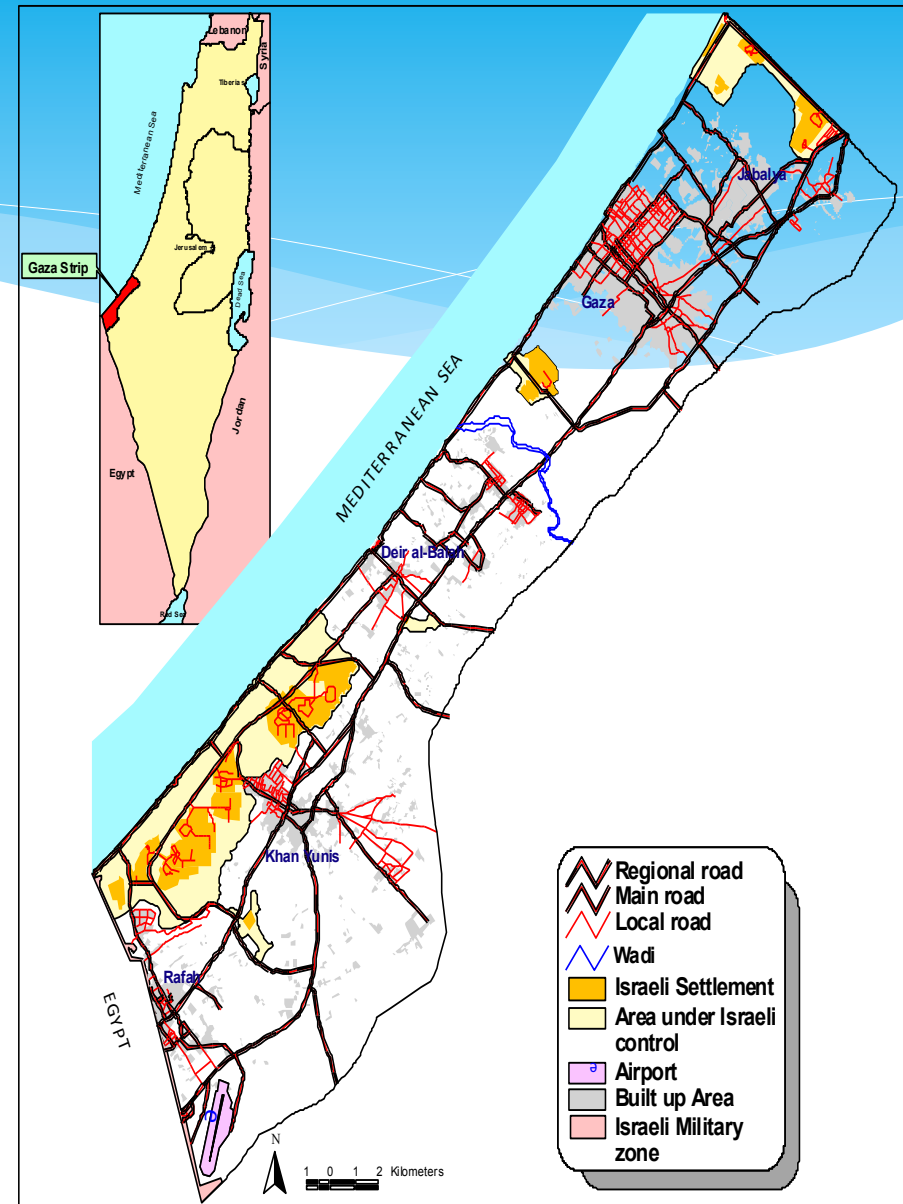


GAZA WATER MANAGEMENT



Fact Sheet (I)

- * Gaza Strip (Gaza) located on the south eastern corner of the Mediterranean Sea
- * 40km (24 miles) long and 6-12 km (3-7 miles) wide
- * Area = 378km² (146 sq miles), divided into 5 governorates: the North, Gaza, middle, KhanYounis and Rafah
 - Contain 25 municipalities that provide the population of the water services
- * 1.8 million inhabitants
 - 70% as refugees
 - Population projection for 2020 2.13 million with one of the youngest population worldwide (51% are younger than 18)
- * Population density 4931 inh./km²



Source: PWA in Gaza

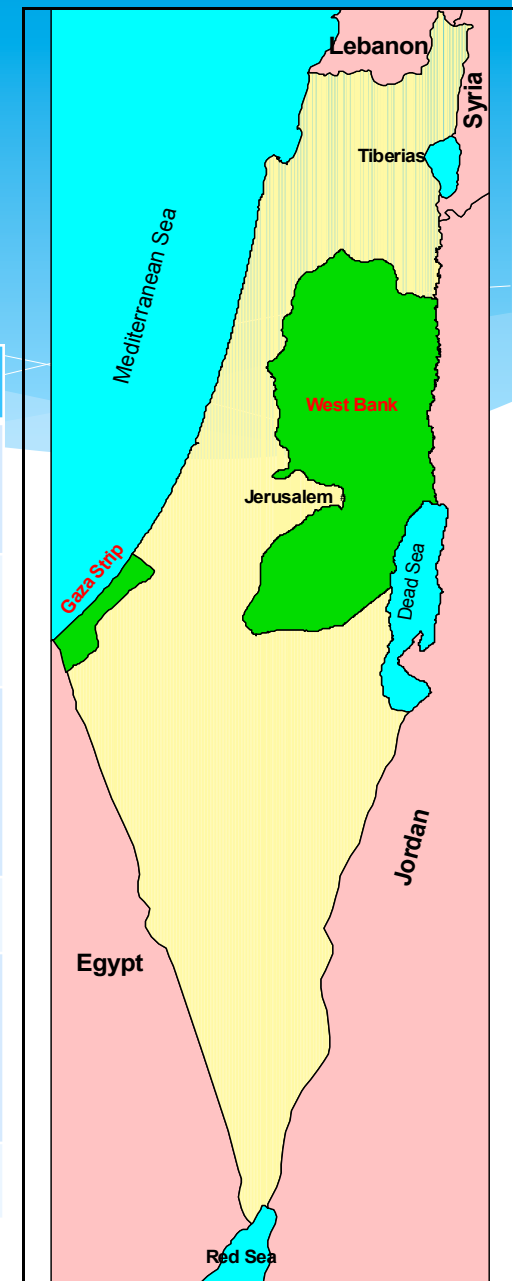
Brief Historical Timeline

- * Israel has been occupying former territories from Egypt, Jordan and Syria since the 6-day war of 1967 including the West Bank, much of the Golan Heights and the Gaza Strip
- * In 1993, following the Oslo accords, parts of the territories politically came under the jurisdiction of the Palestinian National Authority (West Bank Areas A and B and the Gaza Strip)
 - Israel maintained full military control and according to the Oslo Accords, civil control over 61% of the West Bank (Area C) with the exception of the land border with Egypt
- * The 2nd intifada broke out in September 2000 with waves of protests, civil unrest and bombings against Israeli military and civilians many done by suicide bombers, also marked the beginning of the rocket attacks on Israel by militants from Gaza
- * In 2005, Israel withdrew from Gaza under an unilateral disengagement plan
 - According to OCHA, between 2005 and 2007 Gaza fired about 2,700 locally made Qassam rockets into Israel; during the same period, Israel fired more than 14,600 155 mm artillery shells into the Gaza Strip
 - Between 2005 and 2008, over 100 Israelis (civilians and police officers/ military personnel) were killed and over 1,500 injured and over 1,700 Palestinians (civilians and militants) were killed and over 8,000 wounded in direct conflict related incidents
- * Since 2007, the Gaza Strip has been de-facto governed by Hamas
 - Israel has been controlling the Gaza's airspace, coastline and its part of the border with Gaza
 - Egypt controls its part of the border with Gaza as well
 - Israel and Egypt also control the flow of goods in and out of Gaza
- * The Gaza War, also known as Operation Cast Lead, was a 3-week armed conflict in Gaza between Israel and Palestinian militants that began on December 27th 2008 and ended on January 18th 2009 in an unilateral ceasefire
 - * > 1,000 Palestinian and a dozen Israeli death
- * Recent reconciliation between Fatah and Hamas (April 2014) as the Gaza Strip is claimed by the State of Palestine
 - Question remains if they manage to form a transitional government in the weeks to come to hold elections in early 2015

Fact Sheet (II)

Indicator	Value
GDP per capita in 1994	US\$ 1,327 (in 2004 constant USD)
GDP per capita in 2011	US\$ 1,165 (in 2004 constant USD)
GDP per capita in 2015 (based on IMF low-growth scenario)	US\$ 1,273 (in 2004 constant USD)
Unemployment rate in 2011	29%
Households that are food insecure or vulnerable to food insecurity in 2011	60% (including 44% food insecure households)
Below the poverty line	39%

Source: UN Report titled 'Gaza in 2020 - a liveable place?' August 2012



Source: PWA in Gaza

Groundwater = Main Source of Water in Gaza

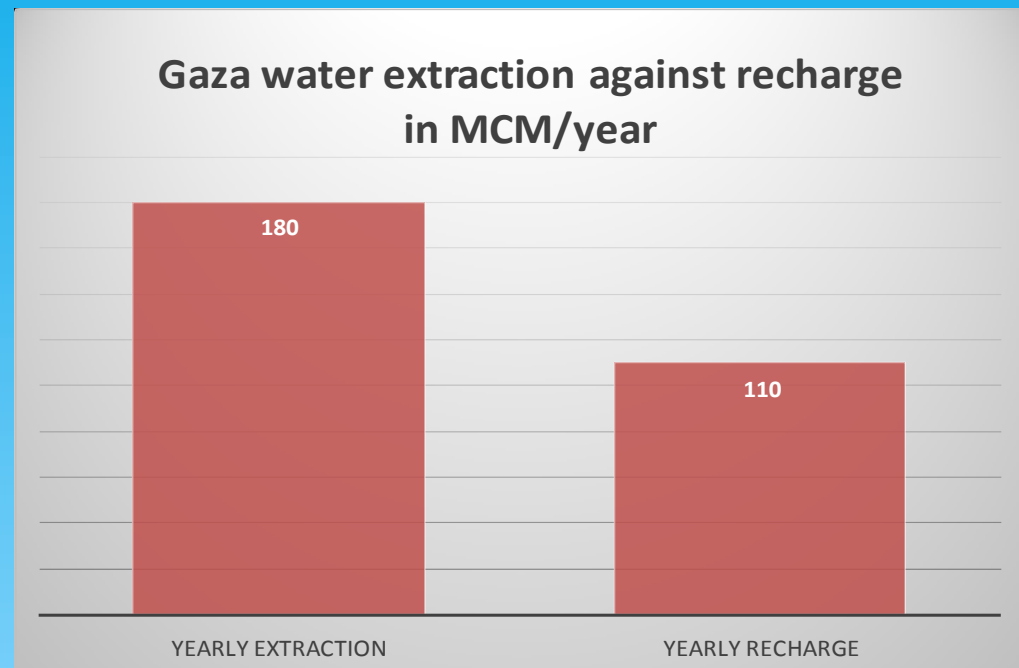
⇒ Denied access to Palestinians' rightful share of trans-boundary water resources

- * Groundwater (Coastal Aquifer) is the main source of water in Gaza
- * The Coastal Aquifer Basin stretches along the eastern Mediterranean coast from the northern Sinai Peninsula, via the Gaza Strip to northern Israel (~160km/ 99 miles with a thickness of 0-200 meter/ 0-656 feet)
- * Type: it is comparatively shallow, renewable and mainly unconfined
- * Groundwater: originates from the recharge areas inland and generally flows towards the sea where it discharges
- * Population: estimated at 6 million with about 3.8 million in the Israeli part, 1.8 million in the Gaza part, and ~400,000 in the Egyptian part
 - Its water used for domestic, agricultural and industrial purposes
- * Abstraction: Israel accounts for over 63 % of total abstraction (483 MCM/y) while the Gaza Strip is responsible for 23 % (180 MCM/y) and Egypt for 14 % (111 MCM/y)
- * Direct trans-boundary dynamics and inter-linkages: exist mainly in the central section of the aquifer, where Gaza is located in a groundwater flow position downstream of Israel and where lateral effects across the political borders may occur
 - A more defined delineation of the shared aquifer section would require the realization of specific groundwater dynamics and flow pattern studies in this area
- * The operation and management of this resource is almost entirely unilateral by Israel and marked by the absence of formal or informal agreements for the optimization of use, protection and sustainability

Source: UN-ESCWA – BGR 2012 Report titled 'Inventory of Shared Water Resources in Western Asia - Coastal Aquifer Basin'

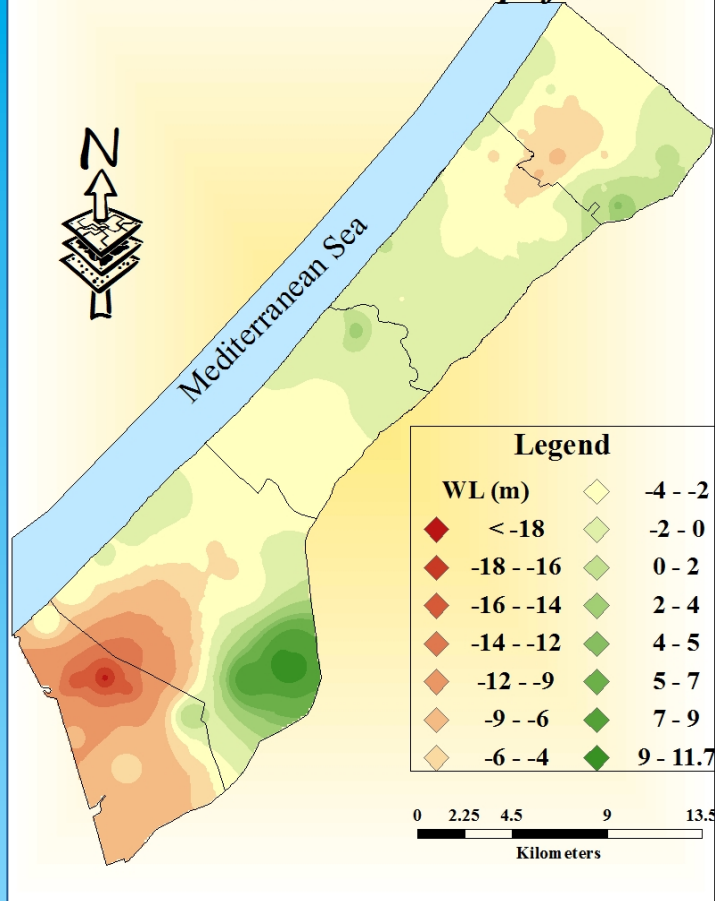
Problem Statement: Gaza needs access to water resources

- * Estimated annual recharge 110 Million Cubic Meters (MCM)
 - Rainwater direct recharge
 - Secondary recharge (agriculture, irrigation, network leakages , re-infiltration)
- * Annual abstraction of 180 MCM
- * Over- extraction results in intrusion of seawater causing excessive chloride levels, water is too salty to drink
- * The sea water intrusion phenomena occupied nearly about 15 % of the total domestic well



Source: PWA Gaza Roundtable Presentation April 2014

Groundwater Levels for summer 2012 in the Gaza Coastal Aquifer



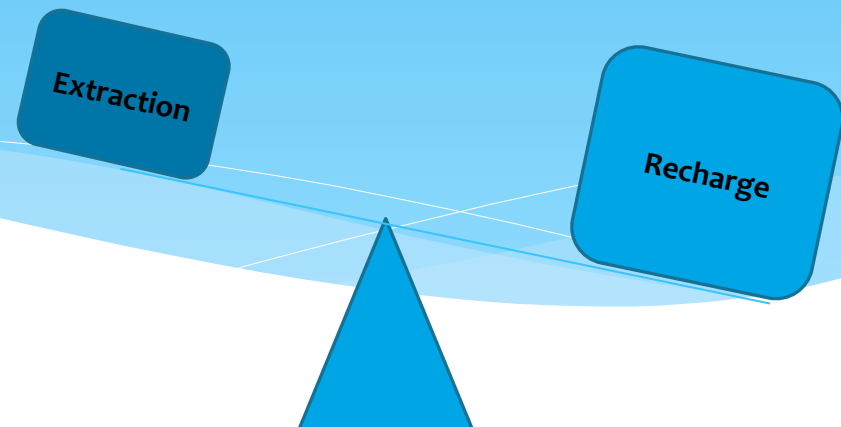
Source: PWA in Gaza - Water level map showing decline and variation in water level (unit = mean sea level)

* Over-extraction also results in reduced water levels

- Groundwater levels are declining with different magnitudes
- Decline water level rate ranges from a few centimeters (inches) to ~ 1 meter (1 foot) per year
- Large cone of depression have formed in the north and south where water levels are below mean sea level (-10 m)
- Expected that water levels will decline further

* Unbalance between extraction and recharge (= Water Scarcity) leads to water quality deterioration

- At present an about 95% of the domestic water pumped from the aquifer is far from the WHO standard in terms of Chloride (250mg/l) and Nitrate (NO₃)



Water Quality

- * As a consequence:

- 65% of water wells are contaminated with nitrates
- 90% of water wells are contaminated with chloride
- 92% water wells are contaminated with both nitrates and chlorides
- Water tests have shown some wells with high values of fluoride

⇒ This has the effect that most of the water supplied through the network is not directly used for drinking purposes yet most of the Gaza population depends on the desalinated groundwater for their drinking and cooking uses

⇒ Hence Gazans rely on purchasing water from private small-scale desalination plants, which purify brackish water from wells and sell to residents either wholesale by tankers or retail by jerry can

⇒ There are at least 100 private desalination plants

⇒ There are also estimated to be more than 20,000 home desalination plants

⇒ As this sector is unregulated, there are concerns as to water quality

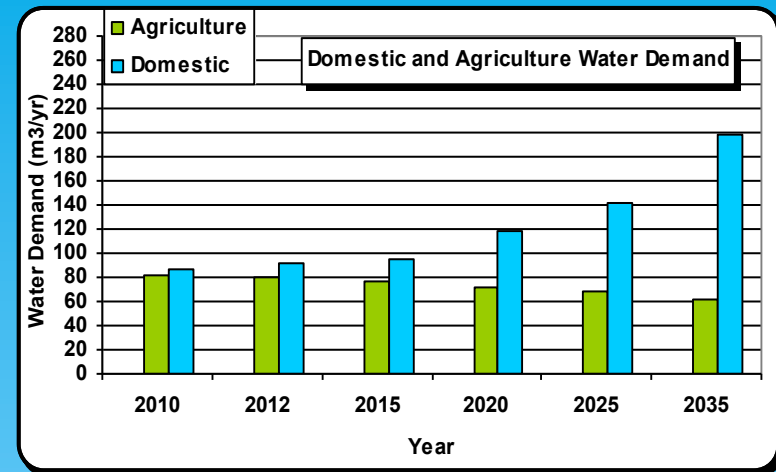
Water Supply and Demand

- * **Total supplied volume in 2014: 189 MCM/y**

- 180 MCM/y from aquifer including 8 groundwater desalination plants operated by CMWU (1 MCM/y)
- 5 MCM/y supplied from Israel
- 2.8 MCM/y from the brackish water small scale desalination plants (~ hundred private vendors)
- 0.25 MCM/y from Deir El Balah sea water desalination plant
- 1 MCM/ year from pilot schemes waste water reuse

- * **Total water demand in 2014: 180 MCM**

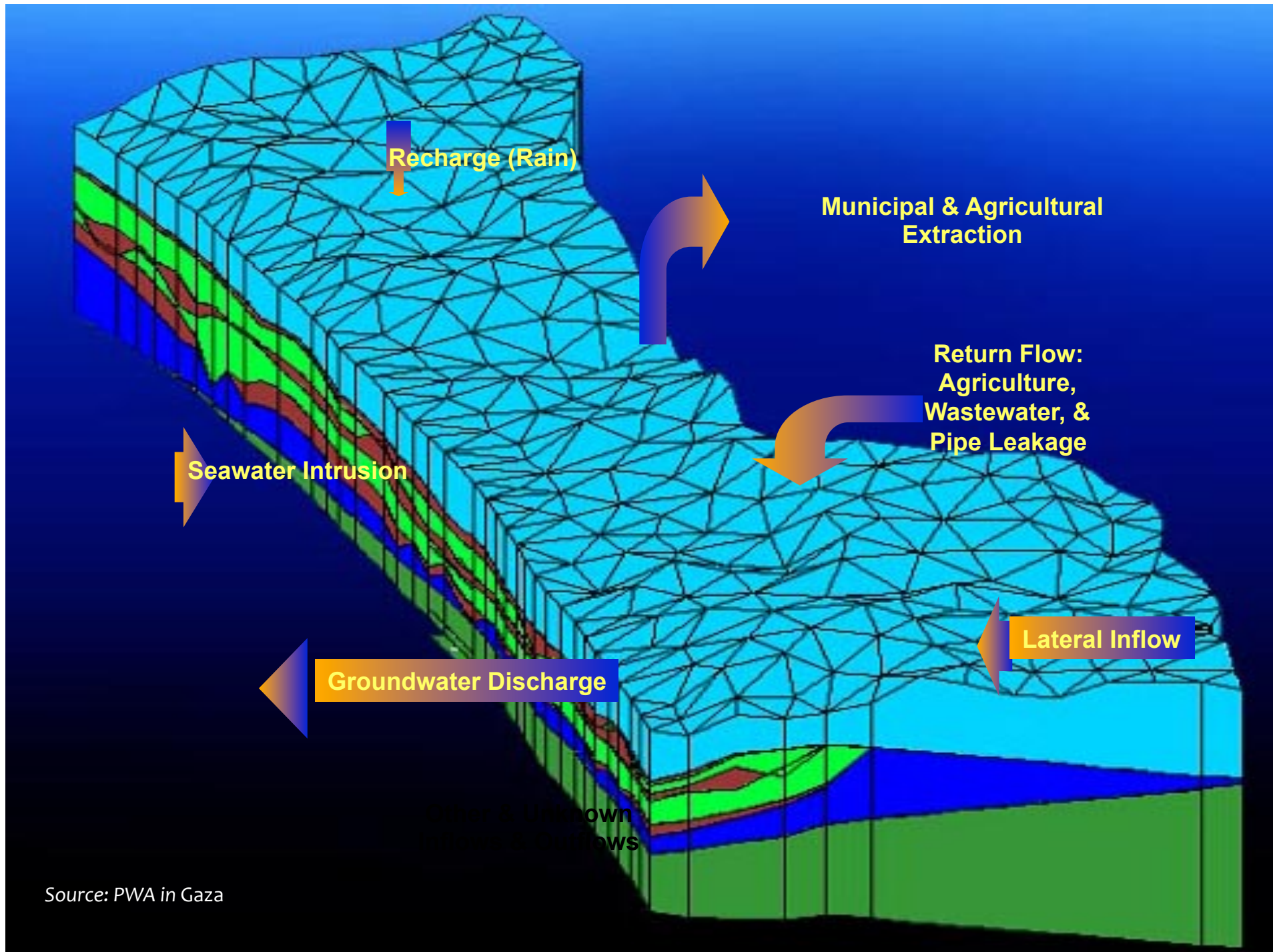
- In 2014, 55% of demand is for domestic use (including 3 % for industrial use) and 45% is for agricultural use
- Expected demand of 260 MCM by year 2035



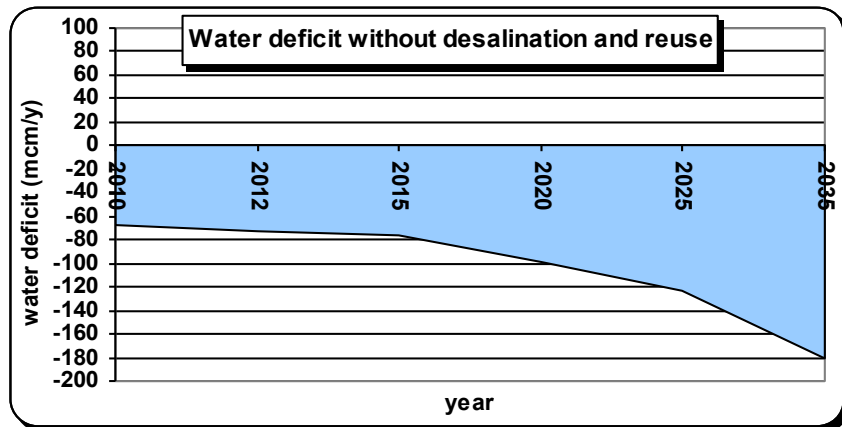
Source: PWA in Gaza

- * **This means that the total recharge (55-60 MCM/y) is only one third of total abstractions**

- This gap will only increase further with the expected population growth rate remaining very high over the coming years and a potentially drastic inflow of Palestinian returnees as a consequence of a final agreement with Israel
- Population expected to be 3.6 million by year 2035



Water Balance Deficit



Source: PWA in Gaza

- * Net deficit is about 70 MCM/y in 2014 and will reach to about 180 MCM/y in 2035 if there is no management actions taken
 - However, if you only consider natural rainfall recharge (without the return flow from agriculture with bad quality water or from waste water networks) then the deficit is 120 MCM/y
- The status quo is unacceptable, as 1.8 million Palestinians are at significant risk
 - Infants and children are at especially high risk.
 - The incidence of water-borne disease amongst the Gaza population is known to be very high
- * The aquifer is in the process of failure, with rapidly advancing saline intrusion and heavy contamination
- * With no management, the groundwater will be degraded significantly soon and the aquifer system will be collapsed and failed completely

Water Resources Management Plan

Domestic Water Management

- * The groundwater production for domestic to be decreased from the current quantity ~ 95 MCM/y in 2014 to ~ 48 MCM/y in 2035
- * Short Term Low-Volume (STLV); ~ 13 MCM/y of desalinated water is required in the interim period
- * Regional desalination plant with a total capacity of 55 MCM/y required by 2017 with a possibility to expand it to ~ 129 MCM/y by 2035 (?)
- * Import of additional water from Israel or other countries (?); with a total quantity of ~ 21 MCM/y in 2025
- * Increase rainwater/ stormwater collection
- * Accelerated upgrading and/or re-provision of the domestic water distribution and supply network in Gaza (currently 30% of losses in the networks)
 - According to PWA Gaza, if efficiency is increased by 20%, then 20 to 30 MCM/y could be saved

Agricultural Water Management

- * Minimizing the abstraction from the groundwater for agriculture by about 20-25% during the next 25-years
 - This means that the agriculture groundwater supply to be decreased from 85 MCM/y in 2014 to about 18 MCM/y in 2035
- * The remaining water quantities required should be compensated from the treated wastewater of ~ 43 MCM/y in 2035
 - Accelerated completion of the major wastewater treatment plants, with large-volume reuse being introduced
- * Improvement of the existing wastewater treatment plant
- * Greater regulation on unlicensed well drilling
- * Improving the irrigation system efficiency and changing crop types

Source: PWA in Gaza for numbers

Considerations

- * No 'magic bullets' exist at least in the absence of an equitable and reasonable reallocation of shared fresh water between Israel and Palestine and there will be a need for a major overhaul of the sector as a whole in Gaza
- * In the event of not being able to settle a final agreement with Israel on the final status (independent situation), there will be no possibilities to implement the long-term water strategy objectives (e.g. regional desalination plant)
- * Practical difficulties even for the short-term solutions: [a] the blockade must be dealt with; [b] water must be 'kept out of politics' and [c] there needs to be an interim government decided upon by Fatah and Hamas
 - Export restrictions are still in place and there are no clear rules (according to one INGO worker: "You never know what happens tomorrow which is the case for construction materials")
 - Delays in project approvals by Israel (9 months delay on average)
 - Donor money is slow
 - ❖ A lot of donors need to find a consortium of donors to finance such projects which takes years not months as donors cannot fund it individually
 - ❖ Moreover, donors are scared of context in Gaza (e.g. infrastructure could be demolished by a single Israeli air strike)
 - Affordability and willingness to pay: At ~US\$1.00/m³, the predicted costs for fresh water in Gaza are at the edge of affordability currently

Considerations (II)

- The availability of electrical energy
 - ❖ Production capacity is below 300 MW with a demand of 400 MW (on average)
 - ❖ Very often power plant in Gaza cannot produce at 100% of capacity because of insufficient fuel supply (12 hours of power outages in Gaza)
 - ❖ There are many ideas to increase supply (e.g. solar energy, expand Gaza power plant, connect Gaza with gas pipeline from Israel, additional supply from Egypt and connect Gaza to Arab grid shared electricity, etc.) but none of them materialized in the past years and unlikely to materialize in the coming years
- Big infrastructure project are costly
 - ❖ E.g. US\$ 500 million for the regional desalination plant which is a lot of money especially for Palestinian Authority (PA) that has not much resources
 - ❖ Will have to rely on donors which is not sustainable (who pays for running costs?)
- Weak private sector
 - ❖ Opportunity to make money are not that big as this time
 - ❖ There are good contractors to do the construction work and there are good suppliers but there are not any private sector contractors to operate for example a waste water management plant
 - ❖ Foreign companies are doing some work but are funded by their own governments (consultants)

Considerations (III)

- Ramallah approval is slow
 - ❖ All legal documents need to be approved by Prime Minister (PM) in Ramallah
 - ❖ New water law is still not approved by the President because there is a political blockage at the level of PA
 - ❖ Without the new water law, there will not be a water sector reform with a clearer differentiation of responsibilities between the players in the water sector to better manage the resources cannot be implemented (the new water law is built on a system recognized by the World Bank)
 - Fractioned stakeholders
 - ❖ PWA is linked to PA but there are other political actors that are outside the control of the PA including some municipalities, some ministries, etc. but to implement such a big water strategy you need everyone together
 - ❖ Not clear if new agreement between Hamas and Fatah will hold; it can only succeed if they can agree on a new government
 - ❖ If Hamas becomes part of the Ramallah government, not clear what Israel will do (will cut all or most of their ties with PA?)
- ⇒ Given all these challenging considerations and more, we need to ask ourselves if there are technical solutions for Gaza as long as Gaza is under siege?



One of the expatriates working on and in Gaza said the following:

“There are no technical solutions for Gaza. Why would it suddenly be possible if it was not possible in the last 12 years? Gazans have access to the water source within their prison. Rafah border is closed. CMWU lives of subsidized fuel from Qatar which runs out by June 2014. 50% of people are food insecure; there is no income. Desalination projects such as the regional one are not energy efficient. Technical solutions can only be used as advocacy tools!”



Thank You