Basic life for the Palestinian: Gaza water and environmental problems

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Abstract

Gaza has several water problems; inefficient water use by the agricultural sector, limited fresh water supply and high water demand, groundwater contamination, seawater intrusion and shortage of electricity. More water and electricity for the future development of Gaza that will give better life; a significant value of water should be added to the Palestinians living in blocked Gaza; more employment opportunities for this area; free the domestic market for operation and maintenance of their ongoing and exciting projects such as desalination, power and wastewater plants.

Reconciliation to reach compromise between the parties in Palestine is the main problem to solve in order to start any projects because so many countries oppose this idea. Several unsuccessful projects were stopped and destroyed in Gaza due to Israeli occupation. Egypt may naturally and peacefully increase its cooperation with and presence in Gaza, which should lead to increased security and peace in the region. In this study, discussion will be made from the past, the current and the future situation for the Gaza peoples as a part of this world. Different solutions will be listed as urgent for the Gaza life involving the building of a joint power and desalination plant, located in Egypt close to the border of Gaza and wastewater treatment plant for water reuse to agriculture purpose.

Keywords: Palestine-Gaza, Basic life, Environmental problems, Desalination, Electricity, Wastewater

1. Introduction

The Gaza Strip is a small part of Palestine, densely populated area in the Middle East in which groundwater is the main source of water. Gaza is running for so many years with several water and electricity problems; inefficient water use by the agricultural sector, limited fresh water supply and high water demand, groundwater contamination and seawater intrusion. Annual water availability from the Gaza aquifer is 147 decreased to 125 MCM/year, i.e. almost decreased by 15% (Aljuaidi *et al.* 2009). The Palestinian population in Gaza is having high growth rate with almost 4.8%, the increase of population is about 75,000 per year. The peoples in the Gaza consume about 100 MCM/year, which discharged mainly from the groundwater through the municipalities (Al-kitab, 2013). The inequality in access to water between Israelis and Palestinians is striking. In some rural communities Palestinians survive on 20 to less than 70 litres per day, which is less than the minimum amount recommended by the WHO for emergency situations response as 100 litres per day (WHO 2011). More than half of the available groundwater is used for domestic water supply, strictly limiting the available volume for industry and irrigated agriculture. In many recent researches it is believed that the Gaza aquifers are almost depleted and it has already passed the point with no return because the recharge can take decades to cover this problem (PWA, 2013).

Gaza Strip has been blockaded since year 2007 with hardly increasing these day by day due to Israeli and neighboring country situation. Thus, this causes a decline in the standard living of normal life and increasing unemployment. Since the Israeli and Egyptian blockade, Gaza has not had sufficient fuel to sustain its electricity supply and keep its minimum water and sewage facilities running. Resulting, pumping stations ceased operation and many places in the Gaza Strip streets are now inundated with human excrement especially in southern Gaza City (Tal & Abu-Mayla, 2013). In year 2012, the United Nations reported that 95 percent of the aquifer's water was unfit for human consumption because of pollution from seawater intrusion, fertilizers and sewage (Tal & Abu-Mayla, 2013). The UN also expected that in 2016 the water to become completely unusable and by year 2020, no one will be safe to live in the Gaza Strip. According to another official report from the UN Humanitarian News Agency said recently that Israel is effectively destroying "all essential services and life basics, including hospitals, clinics, sewage and water pumping stations" (Tal & Abu-Mayla, 2013). According to a recent UNICEF survey, 20 percent of Gazan children suffer from waterborne diseases.

Six large brackish water desalination plants and one seawater desalination plant are all operating with reverse osmosis in the Gaza strip and providing 4% of the total water demand (Mogheir et al., 2013). Almost 90% of the Gaza population depends on the desalinated water for drinking purposes.

The concern of infants and the growing children is highly important due to available chemical pollutant in the Gaza drinking water supply. It is highly recommended to apply water quality act and pollution control so that to reduce the contamination and consequently the health risk to the population and improving the current situation may reduce the problems (El-Nahhal & Harrarah, 2013).

In Gaza, abundance of solar radiation as source of energy can be used for seawater desalination either by producing thermal energy to drive the phase-change processes or by generating electricity to drive the membrane processes (Alaydi, 2014). Solar-desalination systems are available in many countries but in Gaza for instance it might have difficulties to start any project due to previous and current critical situation

In 2013, Adnan has studied and investigated the contamination in drinking during the water production and delivery process in the middle area of the Gaza Strip. His finding was clearly showing the value of biological contamination of storage tanks of private desalination plants, water tankers, drinking water distribution points and drinking water household storage tanks were higher than the guidelines for drinking water compared with World Health Organization (WHO) and Palestinian Water Authority (PWA) (Aish, 2013). Also, chemical analysis of municipal groundwater wells shows that the average TDS, Cl and Na values exceed the WHO and PWA acceptable level.

Feasibility studies showed that the wastewater reuse is playing as important part of water resources in water balance in the Gaza Strip (Vestner et al., 2013). Also the treated amount can improve agricultural water for irrigation conveyance and aquifer recharge to meet high technical standards and sustainable benefits which can improve the economical, environmental and socioeconomically situation in Gaza.

1.3. Purpose

This study is calling for urgent help that is needed for Gaza peoples trying to solve some of several available problems such as inefficient water use by the agricultural sector, limited fresh water supply and high water demand, groundwater contamination and seawater intrusion. Also the shortage of electricity is considered as one of the main driving force in their life, the less electricity is the less life standard. The More water and electricity for the future development of Gaza that will give better life; a significant values should be added to the Palestinians living in blocked Gaza; more employment opportunities for this area; free the domestic market for operation and maintenance of their ongoing and exciting projects such as desalination, power and wastewater plants.

The advantages are much greater than disadvantages and it is almost no disadvantages for the Egyptian. In this project Egypt will get their amount for free, improving water quality and quantity, employee’s opportunities, materials and tools for repairing and chemicals for treatment. This type of project is expensive, thus it might be more convenient to carry out the projects step by step. It is possible to get international support from donors such as counties in the Middle East, the World Bank, SIDA and the European Union. The most important incentives and advantages to Egypt and Gaza Strip are listed below as strong purposes:

- Building project to increase water quality and quantities and electricity for both,
- For Egypt, the project will employ more peoples from Sinai,
- To have permanent employment opportunities for the Gaza peoples,
- Improving the economical, politically and environmental situation for both,

- Increasing cooperation between Egypt and Gaza,
- Improving security around the border between Egypt and Gaza.

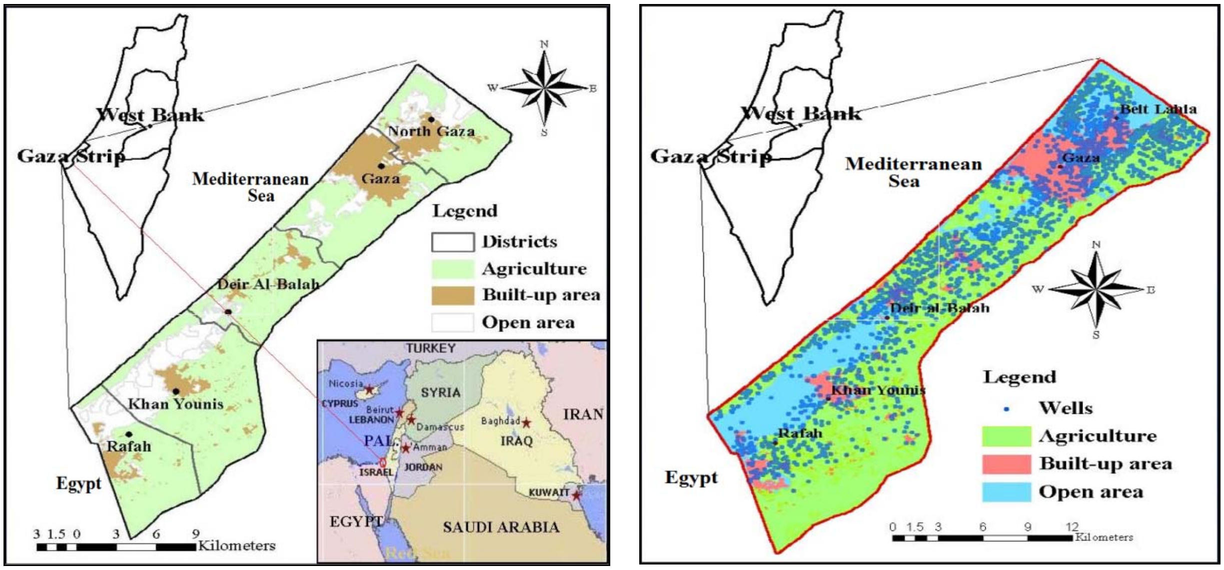
2. Study Area

2.1. An overview

Gaza has a semi-arid climate with a total area of about 365 km^2 and a population of almost 1.7 million with high growth rate. The Gaza Strip forms a transitional zone between the semi-humid coastal area in the north and the semi-arid Sinai desert in the south. The Gaza Strip is 40 km long and has an average width of about 9 km. Its area is surrounded by the Negev desert, Israel, Egypt and the Mediterranean Sea (Figure 1). The Gaza Strip area is part of the Palestinian Autonomous areas according to the Oslo agreement that was signed by the USA, Egypt and Israel in 1993. Gaza is divided in five districts known as Gaza, North Gaza, Deir Al-Balah, Khanyounis and Rafah. The locations of the agricultural areas are also shown in (Figure 1). Gaza is located on the western-most part of the shallow coastal aquifer that is exploited for municipal and agricultural water supply. The aquifer in the Gaza Strip is part of the coastal aquifer, which extends from Mt. Carmel in the north to the Sinai desert in the south with a variable width and depth. The total area of the coastal aquifer is about 2000 km^2 with 400 km^2 beneath the Gaza Strip (EXACT 1998).

Annual average rain in the Gaza Strip is about 300 mm, which falls mainly in winter in which rain is considered as the main source of groundwater recharge. The average amount of open water evaporation is about 1,300 mm/year (PBS 2000). The evaporation rate is very high compared with rainfall. Thus, water scarcity in Gaza is a significant problem and concerns have been highlighted in many studies. Immigration of Palestinian refugees after the 1948 Israeli-Arab war to the Gaza Strip, coupled with the high fertility rate, increased the population of that Palestinian coastal land strip from 50,000 in 1948 to more than 1.5M in the year 2009 (PBS 2000).

Table 1 is presenting the detailed indicators and targets for the Gaza Strip. These details shows that, with regard to quality service each sector reform its aims to accelerate equitable access and improves the quality of the service, while providing improved efficiency and cost-recovery. Also, with regard to water sector, managing water demand and improving public health awareness in line with the development of water conservation and improving environmental situation. Considering the above statements the major achievements on the medium-long term is the suggested indicators and targets that have been formulated in the PWA Draft for Water Strategy (2013-32), also for a short-term targets between 2012-2017 that is presented in Tables 1 (PWA plan, 2013).



a) b)

Fig. 1. Gaza strip overall map for a) districts and b) agricultural areas (from: Al-juaidi 2009)

Table 1. Detailed indicators and targets Gaza (excerpted from PWA plan, 2013)

Aims of the strategy	**Performance indicator**	**Gaza**	
		Baseline	**2012-17**
Increase the quantity of water delivered to customers	1. Water available per person (lcd)	96	102
	2. Hours of storage	2	4
	3. Unaccounted for water (%)	42%	36.5%
	4. Groundwater (MCM/yr)	93	58
	5. Desalination (MCM/yr)	4	55
	6. Import & purchase (MCM/yr)	5	10
Maximize the volume of water made available for irrigation	1. Water made available (MCM/yr)	32.3	47.5
Provide all citizens with a good access to a reliable source of water	1. Number of connections/100 inhabitants	14.0	14.8
	2. Number of connections	230,000	295,000
Reduce inequalities among regions and localities	Water available: minimal average/governorate (lcd)	96	102
Improve the sanitation to protect the natural water resources from pollution by wastewater	1. % of households living in sewered localities	92%	93%
	2. % of households actually connected to a sewer or a satisfactory on-site sanitation device	70%	80%
	3. % of sewered water that is treated in a WWTP	118%	164%
	4. % of treated wastewater that is reused for irrigation	3%	25%

2.2. Current situation in the Gaza Strip

The production capacity of the desalination plants in Gaza Strip varies. There are four sources of drinking water, namely municipal water wells (50 MCM/y), agricultural water wells (90 MCM/y), water from an Israeli company "Mekkorot" (~5 MCM/y) and brackish water reverse osmosis plants (4 MCM/y) (El-Sheikh 2003, El-Sheikh *et al.*, 2004). In 2012, the yearly total quantity purchased from "Mekorot" and available to Palestinian municipalities was about 57 MCM, of which 4 MCM for the

Gaza Strip. This was about 30% of all municipal water supplied available to the Palestinians (just 4% to the Gaza Strip) (PWA, 2013).

*1. **W**ater balance*

It is important to analyse the water balance in the Gaza Strip and to compare water supply with demand. In 2020, there will be more than 2 M Gazans, double the year 2000 population (PBS 2000), and the water demand could easily also double from 154 MCM/y, (Metcalf and Eddy 2000a,b). In Gaza there are no surface water resources except for an occasional water flow in Wadi Gaza during heavy rainfall, which temporarily occurs in 2-3 of the winter months. Baalousha (2004) reported that the net average annual groundwater recharge comes from precipitation is about 43.3 MCM. Although the total amount of annual inflow to the Gaza aquifer is about 109 MCM, only part of this amount can be considered as a safe yield (about 60 MCM/y).

2. Water quality

Of the approximately 50 L/capita/d of water delivered to the residents of the Gaza Strip, only about 13 L/capita/d meets WHO quality standards (PWA 2000). The problem of groundwater quality especially in Khanyounis city is rather complicated. Both NO_3 and Cl are major pollutants of the aquifer attributed to human use as well as the scarcity of the water resource (Al-Agha 2005). Maximum nitrate values of 433 mg L^{-1} and mean of 166 mg L^{-1} have been measured, exceeding the WHO standards (45 mg L^{-1}) (WHO 1996). The corresponding values have also been reported in the case of chloride, where the maximum value is about 1,290 mg L^{-1}, and the mean value is 491 mg L^{-1} compared to the WHO standard of 250 mg L^{-1} (WHO 1996). According to the PWA, more than 60% of the total amount of groundwater in the Gaza Strip aquifers is of bad quality and not potable according to WHO standards (PWA 1999). It is believed that fertilizers, in combination with the leached wastewater from septic tanks and non-treated wastewater, are responsible for this high level of nitrate.

3. Water prices

Large RO-plants have lower specific production costs despite location. The Ashkelon desalination plant, which is also located on the Mediterranean Sea coast, has presented cost figures as low as \$ 0.52/m^3 (Busch & Mickols 2004). Another example is the Perth desalination plant in Australia, which consumes only 3.7 kWh/m^3 fresh water (Gary 2006). Akgul *et al.* (2008) studied different designs for Mediterranean SWRO membranes. The average unit costs of RO processes have declined from

\$ 5.0/m^3 in 1970 to less than \$ 1.0/m^3 (at present approximately \$ 0.50/m^3) (Zhou & Tol 2005). El-Sheikh, 2003 and El-Sheikh *et al.*, 2004) reported that customers in Gaza are paying an average of \$ 0.25-0.50 per cubic meter for municipal water distribution and they will be able to pay 1.0 \$/m^3 of the desalinated water in the distribution network because they already pay \$ 1.25 for 1m^3 desalinated seawater. The energy prices were calculated in the range of 6–9 cent/kWh electricity (Akgul *et al.* 2008).

4. Electricity and energy

The current electricity demand in the Gaza Strip, according to the President's Office and the Gaza Power Generating Company (GPGC), the total needs about 450 MW of electricity so that the electricity works (24) hours. In which, 28MW comes from Egypt, 120MW from Israeli company lines and 100MW from the power generation company, these values are counted together 55% of the Gaza need and the missing amount is 45%. The situation in Gaza leaves most of the population without electricity for up to 18 hours per day and without water for more than 20 hours per day. In 2006, the supply to Gaza was about 184 MW, originates from three sources: Gaza Power Generating Company (GPGC) 60 MW (maximum), Israel Electrical Company (IEC) 107 MW and Egypt 17 MW. The Gaza Power Generating Company (GPGC) estimated that the maximum power generated from the power station did not exceed 60 MW while the potential of the original transformers was up to 140 MW (UNOCHA 2006). According to the ministry and PWA, every day needs generate the amount of electricity from the power plant about 650,000 liters of fuel, at a cost of \$500,000 US. At the same time the collection of the electricity cost from the customers in Gaza became very difficult day after day due to their unemployment, low salaries and blockade.

3. Study Area Parameters

3.1. Rainfall

Rainfall is the main source of surface and groundwater in the occupied Palestinian and the main source of feed water to the coastal aquifer of Gaza Strip but is not collected properly (PWA, 2013; Al-Yacoubi & Abdul, 2011). The Gaza Strip long-term annual average rainfall is about 327mm (PWA, 2013). Rainfall is very limited in Gaza which is falling mainly over the winter and spring months and very dry over summer months (Al-Yacoubi & Abdul, 2011). During the 2011/2012 season (1 September to 31 August) the total average annual rainfall was little higher reached to 372mm. This amount counted a rainfall volume of 136 MCM/y over the Gaza Strip; of this 64 MCM is estimated to have recharged the groundwater (PWA, 2013).

In Gaza Strip, there are 12 rain monitoring stations distributed over the whole area from Beit Hanon north to Rafah to the south. It was observed that the annual average rain increasing when moving from the southern from 225mm to the northern area up to 450mm, about 20% of the Gaza Strip areas are counted an annual average rain between 400-500mm, about 50% of the areas between 300-400mm and the rest of the area holds less than 300mm average rain annually (Al-Yacoubi & Abdul, 2011). Around 95% of the pumped water in the Gaza Strip is now brackish as a result of Israel occupation since 1967, controls all shared water resources including surface and groundwater, and utilizes more than 85% of these resources with no control, leaving less than 15% for Palestinian use (PWA, 2013).

4.2. Surface water

The topographical elevation of the Gaza Strip is almost same ground levels with small variation ranged from 0 to 80m, in which this might affects the rain collections. There are three Wadies in the Gaza Strip namely Beit Hanon Wadi, Gaza Wadi and Wadi Elsalka. Beit Hanon Wadi is at the north and almost dray, the Gaza Wadi is located at the south of Gaza city that start at Hebron Mountain and ends to the Mediterranean Sea with an area about 5000 km^2 and Wadi Elsalka is located at the middle part of the Gaza Strip that is almost dry except in the few rainy months (Al-Yacoubi & Abdul, 2011). Artificial recharging was previously planned as one possible solution for the Gaza aquifer, advocated in 1985 (Assaf & Assaf 1985) using floodwaters of Wadi Gaza and/or treated wastewater.

4.3. Groundwater

The groundwater is contaminated and continuously in a huge drought due too many reasons e.g. contamination from the seawater intrusion and untreated wastewater. Discharging untreated wastewater in the Gaza Strip is the most important contamination source to the Palestinian people's living in Gaza due to the high amount of wastewater compared to the available treatment plants capacity and ponds. Safe discharge of wastewater requires treatment to eliminate biological, economical, chemical and physical hazards for the Gaza peoples. The treated wastewater effluent is considered as one of the water resource and is added to the water balance in some countries. In Gaza, the problem of untreated wastewater that collected in several ponds as surface water and the rest plus semi treated amount flows directly to the Mediterranean Sea. When the untreated wastewater and the partially treated amounts send directly to the sea, polluted the coastline and then disturbs the fisheries because they are not allowed to go farther distance in the sea due to Israelis rule (Al-kitab, 2013).

The most problem facing the groundwater aquifers is the type of soil as it mostly sandy which easily infiltrates the polluted surface water and inters the seawater. The measured total dissolved solids TDS, was found very high level in most places of the Gaza Strip and it reaches more than 2000mg/l and chlorine is between 1000-3000mg/l (Al-Yacoubi & Abdul, 2011). The Gaza peoples are buying the drinking water, which increases their burdens in spite of the difficult economic situation and the existing imposed injustice blockade since long time from the world community especially those are surrounding Gaza. In Gaza, everything depending and running by electricity such as house unit, small desalination plant and water from the municipalities so this make it difficult to solve the shortage of water because they have shortage of electricity in Gaza (Eco & Universal, 2014).

4.4. Wastewater

In the Gaza Strip there was no significant improvement in the treated wastewater reuse and the collected amount too. The total amount of wastewater produced by the Palestinians living in Gaza Strip has increased in the recent years reached to about 120,000 cubic meters per day ($\approx$ 45 million cubic meters per year) which distributed as Northe Gaza about 25000, Gaza city about 60000, Gaza middle about 10000, Khanyounis about 15000 and Rafah to the south about 10000 cubic meters per day. The collected amount from five different plants is about 25 million m^3/yr can be used for the agriculture irrigation and the 20 million m^3/yr seeps to the groundwater through the leakage of the broken sanitation pipes and from the septic tanks and the rest infiltrated directly to the groundwater (Al-kitab, 2013). In Gaza about 65% are connected to the sewage sanitation network and the rest still using the septic tanks and the normal pipe that flows directly as surface collection which increases the disease chance for the Gazan's people.

The sewage collection ponds are distributed all over the Gaza coastline from the north to the south over the 36 km distance. These ponds were built in 1975 and designed for wastewater collection from 450,000 inhabitants but Gaza is counting about four times this population due to high growth rate. In 1976 the Israeli occupations built a wastewater treatment plant for the Northern part of Gaza to hold an capacity from 50,000 inhabitant but the population in this area has increased to about 350,000 inhabitance, thus appeared the so-called random basins (small ponds) (Al-kitab, 2013). Another problem, these ponds in Gaza were built on the sandy area which probably easily infiltrates the wastewater directly to the groundwater and contaminated it. Also these ponds are open surface and in some cases missing its fence which definitely increases the insects and chance for diseases and children might fall in it as it happened two times the last time was in 2007 when 7 children died (Al-kitab, 2013).

In 2010 was begin the emergency sewage treatment plant project for the Northern part of Gaza, the cost of the project was collected from the World Bank and the several donors countries but until now this project is not ready because of the blockade of Gaza. The Gaza Wadi is an important to discuss in which this Wadi is located at the middle of the Gaza Strip and receives wastewater amount around 15,000 m^3/day, this amount is collected from the middle parts. This problem was created because the Israeli occupation does not allow building wastewater plant for this area in which all collected wastewater will leave the Wadi towards Mediterranean Sea. Notwithstanding, in some cases the Israeli occupation send their excess contaminated water to the Gaza Wadi which create flooding every third year (Eco & Universal, 2014).

4.5. Desalination

Desalination, wastewater treatment and power plants projects are always related to a number of parameters and factors playing as the main driving force such as water scarcity, water quality, energy recovery, cost per cubic meter, capital cost, location, land use, operations and maintenances as well as environmental impact. A small scale desalination plant was built in Gaza but the larger one which was suggested has not yet been built due to the many reasons listed above started with the political issues and blockade. Even some of the small plants have been stopped and electricity production is limited in the Gaza Strip. Yet no significant progress has taken place on the desalination of sea water in the Gaza Strip, although it is urgent projects for alternative resources of water. There are 117 RO (reverse osmosis) desalination plants spread all over the Gaza Strip, using existing groundwater wells. The plants are owned and operated by the private sector, water vendors, who distribute this water for drinking/cooking purpose using a network of tankers and water shops (PWA, 2013). Also, there are six small scale desalination plants were funded by Turkish government in the last few years.

Solar plants have been suggested for power and desalination purposes. Three stages of a co-generation plant with a planned water capacity of 100 MCM/year, a power capacity of 2.5 billion kWh/year and a total panel area of approximately 13 km^2 have been proposed (Lubna *et al.* 2008). It was calculated that about 5 km^2 is required for the collector field to produce 1 TWh/year of electricity (Knies *et al.* 2005, Trans 2004). The estimated total cost of this proposal is approximately $ 1.1–1.3 billion, which is high compared to a joint project. The total land use would be huge and solar panels are expensive. In Gaza, there is no guarantee of a power supply to water projects. For example, no safe supply of operational and maintenance materials can be guaranteed. The interior situation in Gaza is characterised by lack of control of available water (chaos due to restriction) as well as leaks of information and technology. The energy availability and power supply is functioning most of the time despite the political problems.

4. Discussions and Recommendations

Four different technology types are mainly used for desalination: membrane processes containing reverse osmosis (RO), thermal processes including multistage flash evaporation (MSF), multiple effect evaporation (ME) and vapour compression (VC). The MSF and RO processes dominate the market for both seawater and brackish water desalination, sharing about 86% of the total installed capacity (Wangnick, 2002). The present challenging technologies for more than 20 years is presented in Figure 2, and it shows that installed capacity of RO processes increased significantly, while MSF declined steadily, since it cost more energy. Before 2001, there is no or little installed capacity of hybrid, but it increased to 4% in 2015. Nowadays, the RO alone is the main deriving for desalination technology, which mainly because RO has advantages over other technologies. After nearly 40 years development, RO desalination technology is already quite mature. Salt reduction with RO is higher than 99.3%, with the permeable flux, the range of available operating pressure, anti-pollution and anti-oxidation capacity continually increasing. In addition, RO also has smaller investment, less energy consumption, lower cost, and short construction period. After the treatment of RO, water can achieve the WHO standards for drinking water. This makes RO to be the most competitive method of seawater and brackish water desalination (IDA Year Books (2012-2015)).

Global distributions of fresh water production by different feed water types (raw water) are shown in Figure 3. There is no significant change in the distribution for more than 20 years, started 1990 until today. Seawater and brackish are main water sources. Wastewater should be more important (we have to stress on this), but in 2009 only 5% of all raw waters have their direct origin from wastewater system. The potential in reusing wastewater is thus very large since it is a stable and considerable source with relatively low salinity.

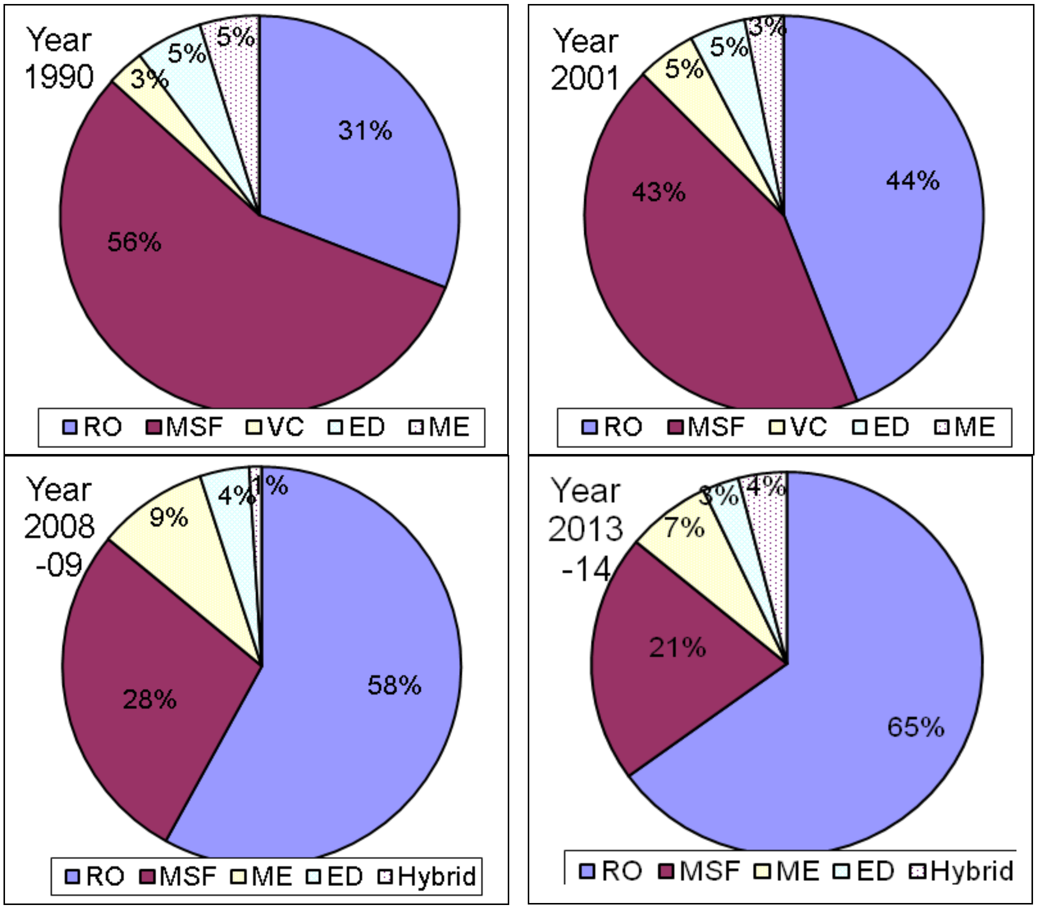


Fig. 2. Global distributions of technologies from year 1990 to in 2014-15 (Wangnick, 2002; IDA Year Books (2012-2015))

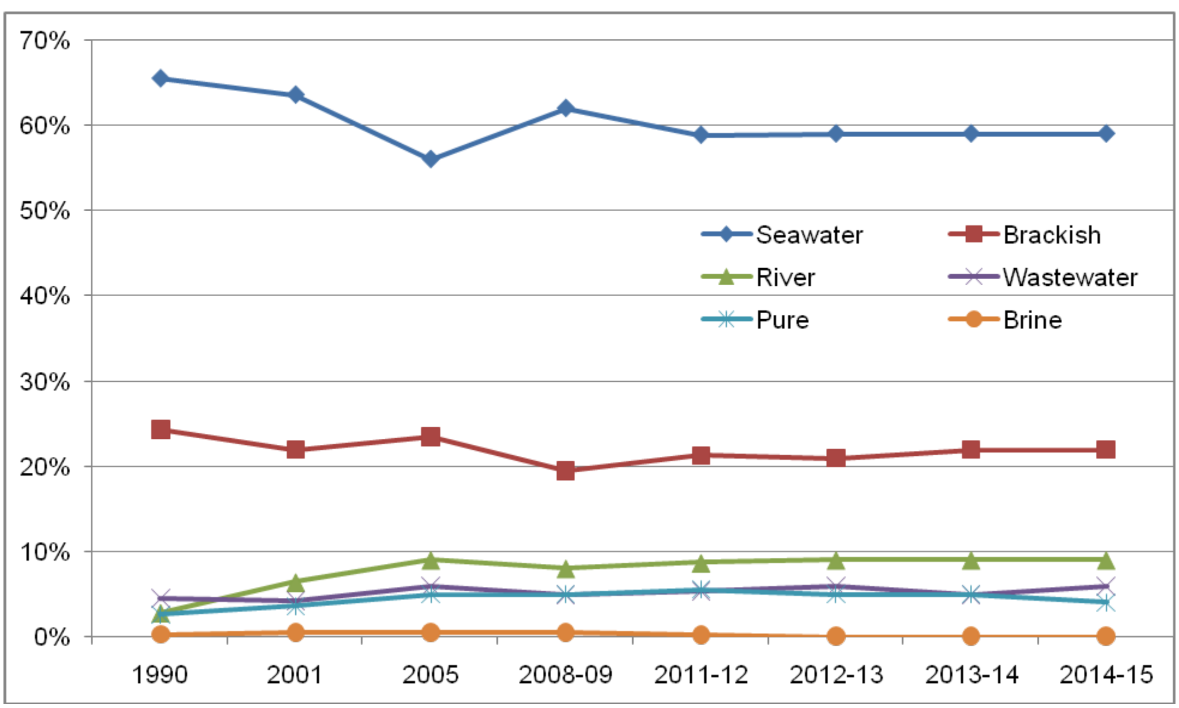


Fig. 3. Global distributions of feed water from year 1990 to in 2014-15 (Wangnick, 2002; IDA Year Books (2012-2015))

Bashitialshaaer & Persson (2010) extracted data from the International Desalination Association (IDA) yearbooks 2006-07, 2007-08, 2008-09 and 2009-10. These data were collected from 18 different projects mainly in the Middle East and some projects with similar intake concentration. The capital cost to produce 1m^3 of desalinated water per day was found to be about \$ 1080 (approx. \$ 1 million to produce 1000 m^3/d) (Bashitialshaaer & Persson 2010). Also, the mean cost of production for 1 m^3 was found to be about \$ 0.79 and the mean energy consumption approximately 4.5 kWh/m^3, for a raw water of Mediterranean Sea. Building desalination and power plants in the same location has been practised in Israel, Saudi Arabia and the UAE to supply electricity to the desalination plant directly and the surplus to the power grid. It was found that the average cost of producing 1 Watt from the power plant is about \$ 1 (approx. \$ 1 million to produce 1 MW) (Bashitialshaaer & Persson 2010). It should be clear to all of us that any kind of projects will be impossible to implement inside Gaza Strip without guarantee from Israeli and international community. We have had very bad experience about projects such as airport, seaport and power plants etc., for many years which causes the funders and donors not to cooperate in the future. Also, the solar energy is not the efficient project for the Gaza case because this needs a lot of free land which is not possible (Bashitialshaaer, 2014).

4.2. Recommendations

In the Gaza Strip, electricity and drinking water is the main driving force to give a basic life for the peoples just to being a normal human. Moreover, environmental pollution is the main sources that can effects the available water such as surface and groundwater. In the absence of stability and regulations for desalinated water, there is very little control of the quality of desalinated water or the brine discharge. Less cost maintenance and operational processes needs trained people to prevent damages to the RO membrane. Building this kind of projects in Egypt is possible to recruit qualified persons, operation and maintenance costs here could be similar or lower than world prices. The cost of energy in desalination plants is about 30 to 50% of the total cost of the water produced. Comparison of the cost components of reverse osmosis for two different energy supplies reveals that energy costs constitute the largest part of the operating costs (70%) (Akgul, 2008).

The suggested desalination and power plant is to be located in Egypt to serve two areas specifically Gaza and Sinai. This kind of projects was not possible to cooperate with the Israeli for some reasons such as controlling the whole production and the cost will be more expensive than Egypt. Also the purpose of this project is to make a bench-mark analysis of a seawater desalination plant for reverse osmosis with the aim to increase water availability in Gaza and Sinai for a maximum number of people.

Another purpose is also to stress the importance of joint projects between countries of the Middle East, to reduce tensions, disputes and fighting, and to increase cooperation, mutual trust and security. With examples from Europe, the century long conflict between France and Germany could be settled by political and economic cooperation.

HRH Prince El Hassan bin Talal of Jordan has in several presentations, speeches and articles argued for the urgent need of a similar development in the Middle East countries. Bridging towards peace and trust between countries must be reached through concrete actions. In the opening of WOCMES 2010 in Barcelona, Spain, HRH Prince El Hassan bin Talal said that “The need of stress to promote cultural ties among Middle East nations, noting the importance of developing joint policies to enhance contact at various levels”. The advantages are much greater than disadvantages and it is almost no disadvantages for the Egyptian. In this project Egypt will get their amount for free, improving water quality and quantity, employee’s opportunities, materials and tools for repairing and chemicals for treatment.

Desalination brine is the practical case to consider when studying environmental impact and assessment in connection with new projects such as joint project for Gaza and Sinai. Such study and practical suggestions concerning desalination brines and similar discharge of heavy wastes is to have an inclination and a bottom slope together is presented in (Bashitialshaaer et al., 2015). An efficient method is always suggested for increasing the dilution rate of brine water discharged into the sea is an inclined negatively buoyant jet from a single port or a multi-diffuser system.

5. Conclusions

Clearly both the desalination and the power plant are vital in the Gaza Strip to supply water and electricity to the people which can give the basic life for them. This is one of the important areas where the international community could get involved to bring a meaningful improvement to the Palestinian quality of life.

Desalination as a source of water supply has many advantages and few disadvantages. In the Gaza Strip, sources of energy for desalination and power plant projects are very important in order to create an independent source of electricity, but nothing is secure in this situation. The Gaza peoples having lack infrastructure and rely on a clean water supply in order for their services to function normally. Nowadays, the SWRO is a promising technology; highly professional people are required to operate the desalination plants.

Location of any projects for Gaza peoples is the main challenging part that must be considered for the safety of the planned project from destruction. However, running and operational costs of the project may be reduced by the use of natural gas to produce energy in the same location. The only we need is to start water and electricity project for the sake of the peoples life.

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