Desalination and Power Plants Together for Water and Peace
A Case study of the Gaza-Strip, Palestine

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ABSTRACT

Desalination can be a cost-effective way to produce fresh water and possibly electricity. The Gaza Strip has had a complex hydro-political situation for many years. Gaza is bordered by the Mediterranean in the west, by Israel in the north and east and by Egypt in the south. Water and electricity consumption in the Gaza Strip is expected to increase in the future due to the increasing population.

In this paper, a solution for Sinai and the Gaza Strip is suggested involving the building of a joint power and desalination plant, located in Egypt close to the border of Gaza. The suggested joint Egypt-Palestine project would increases water supply by 500,000 m^3/d and the power supply by 500MW, whereof 2/3 is suggested to be used in Gaza and 1/3 in Sinai. The present lack of electricity and water in Gaza could be erased by such a project. But Egypt will probably gain more. More water and electricity will be available for the future development of Sinai; a significant value will be added to the sale of Egyptian natural gas; more employment opportunities for people living in Sinai; the domestic market for operation and maintenance of desalination plants can be boosted by the suggested project; Egypt may naturally and peacefully increase its cooperation with and presence in Gaza, which should lead to increased security around the border. This type of project could also get international support and can be a role-model for cooperation and trust-building between neighbours in the Middle East region.

This paper is also concerned with the water resources and water availability of in the Middle East as a baseline for cooperation between countries such as reach and poor peoples. Especially the water situation in Palestine (Gaza and West Bank) relationships to the Jordan and Egypt Basins will be considered.

Keywords: Desalination; Power plant; Palestine-Gaza Strip; Unit costs; Water resources; Environmental impact.

1 INTRODUCTION

The Gaza Strip is a small, densely populated area in the Middle East in which groundwater is the main water source. 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 wastewater disposal. In the Gaza Strip area of Palestine, there is a large gap between water resources and demand. Groundwater is also diminished by pollution, increasing demands, misuse by local people and control by neighbouring countries of Palestinian water resources (Baalousha, 2006). The citizens of the Gaza Strip have pursued several alternatives to increase water supply; water desalination (house units), use of bottled water, imported water and storm water harvesting (El-Nakhal, 2004). Agriculture accounts for 70% of fresh water use (Al-juaidi, 2009). Water resources in the Gaza Strip have a water balance deficit of about 30% (El-Sheikh et al, 2003). Annual water availability from the Gaza aquifer is 147 decreased to 125 MCM/year, i.e. almost 15% (Aljuaidi et al., 2009).

The lack of progress was due partly to deteriorating security conditions, which have made implementation of development projects problematic, and partly to the inadequacy of existing agreements with Israel which impede Palestinian water sector development (Gray, 2009). The present average water consumption per capita by the Palestinian population is approximately 55 L/cap/d, or 55% of the WHO design value of 100 L/cap/d (Abu Zahra, 2001). According to the United Nations Environment Programme, the total inputs and outputs of the Gaza coastal aquifer (in 1998) were estimated at 123 and 154 MCM, respectively (UNEP 2003). The Palestinian Water Authority has studied the water quality of 111 municipal wells in the Gaza Strip. Only 9% of these wells are suitable for human consumption (PWA, 1995). One of the major options for the remedy of water shortages in the Gaza Strip of Palestine and the protection of its coastal aquifer is the utilization of desalination technology (Assaf, 2001). Desalination is already practised in Gaza but on a small scale.

In this study, a bench-mark analysis of seawater desalination was performed for reverse osmosis systems. The basic parameters of cost analysis such as capacity, recovery, membrane life, energy, chemical costs and flux were evaluated based on the effects on capital, operating and total production costs (Akgul et al. 2004). A reverse osmosis desalination project to improve water quality and quantity was previously proposed (El-Nakhal, 2004). It has been estimated that the Gaza Strip will need to develop a seawater desalination capacity of about 120,000 m^3/d by 2008 and an additional 30,000 m^3/d by 2016 (Ghabayen et al., 2004). Desalination plants in the Gaza Strip area with a capacity of up to 150,000 m^3/d have also been suggested, but very little has been implemented until now, partly due to political conditions (Baalousha, 2006). To address this, the new desalination plant is suggested to be located in Egypt but/and also in Gaza to serve two different countries.

1.1 Current Situation in Gaza

The production capacity of the desalination plants in Gaza varies between 20 and 150 m^3/d (Jaber & Ahmed, 2004). These private plants are very small and produce a total of about 2000 m^3/d of desalinated water (El-Sheikh, 2004). 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 and Hamdan, 2003).

There are two RO desalination plants located in Khanyunis City: El-Sharqi, built in 1997, and Al-Saada, built in 1998, with a total production capacity of 2760 m^3/d, of which 1200 m^3/d comes from El-Sharqi and 1560 m^3/d from Al-Saada (El-Sheikh, 2004). In 1998, USAID financed a BWRO plant built by an American company Metcalf and Eddy in Gaza Industrial Zone with production capacity of 1000 m^3/d (El-Sheikh and Hamdan, 2003). France and Austria have also financed two seawater RO plants with a capacity of 2400 m^3/d and 5000 m^3/d respectively (El-Sheikh and Hamdan, 2003).

The desalination plant for the Gaza Strip was designed with a production capacity of 60,000 m^3/d in the first phase and 150,000 m^3/d in the second phase (El-Sheikh et al., 2003; El-Sheikh, 2004). 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. Even some of the small plants have been stopped and electricity production is limited in the Gaza Strip. It was reported in UNOCHA (2006) that the electrical capacity in the area remains insufficient most of the time despite the installation of new transformers. This leaves most of the population in Gaza without electricity for up to 18 hours per day and without water for more than 20 hours per day. Without electricity, the reverse osmosis plants cannot operate either. The current electricity demand in the Gaza Strip, according to the President's Office and the Gaza Power Generating Company (GPGC), is 215 MW but this is expected to increase to 225 MW during the winter months (UNOCHA, 2006).

The current supply available to Gaza, which totals 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). In general, the cost of water and source of energy is important for the production of fresh water in low income and poor countries. The existing agricultural water system in Gaza has a low economic water use efficiency of about $0.34 /m^3 compared to a water cost of about $0.60/m^3 for seawater desalination (Issac, 2000; Metcalf & Eddy, 2000; MoA, 2007; PWA, and PHG, 2004). 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 (Zhou & Tol, 2005). El-Sheikh (2003) reported that customers in Gaza are paying an average of 0.25-0.50 $/m^3 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).
Egypt's natural gas sector is expanding rapidly with production of about 1.9 trillion cubic feet (Tcf) and consumption of 1.1 trillion cubic feet in year 2008 (1000 ft^3 = 28.3 m^3). According to the Oil and Gas Journal, Egypt’s estimated proven gas reserves stand at 58.5 Tcf, the third highest in Africa, and continue to be an important supplier of natural gas to Europe and the Mediterranean region (U.S. Energy: last update June, 2010).

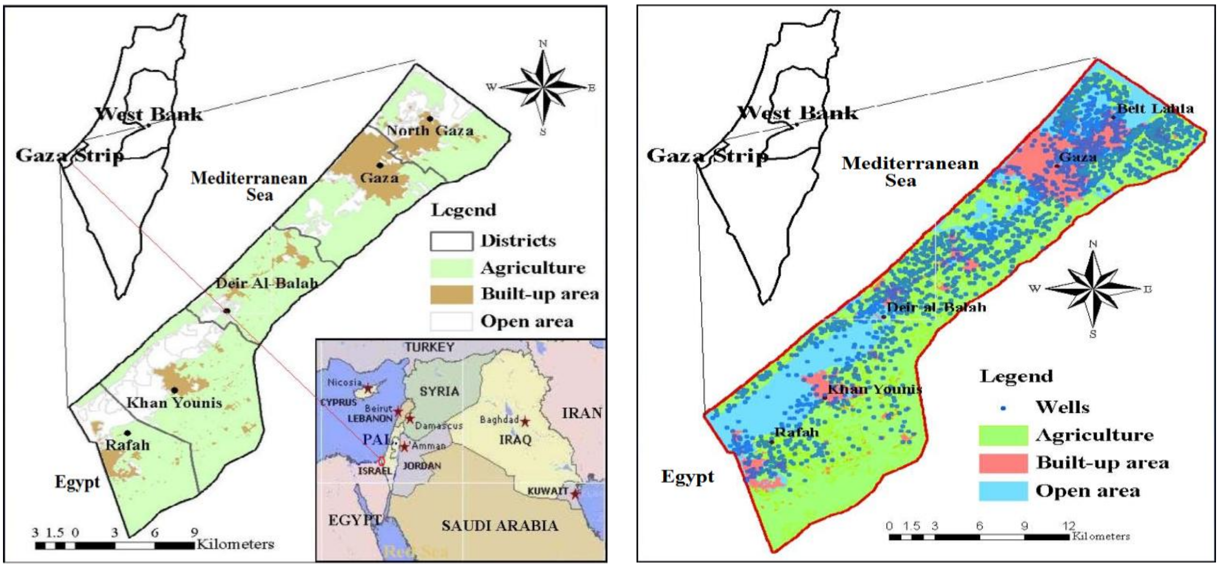
1.2 Purposes

The purpose of this study 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. The 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 economical and political cooperation. In 1950, the Schuman declaration stated that “Europe will not be made all at once, or according to a single plan. It will be built through concrete achievements which first create a de facto solidarity.” Through initial cooperation on coal and steel, the countries could gradually work towards a position where they formed the EEC in 1957 and further on to the EU. In 2010, 27 European countries cooperate closely within the EU and more European countries want to join. 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. He has been asking for several years why a plant for solar desalination and electrification of Gaza on the Egyptian side of the Gaza border could not be established. 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”. That answers the main question in this paper: Why Egypt? It would be a great opportunity for the Palestinians if Egypt agrees to construct a combined desalination and power plant in the first 5 km from the Gaza border. Cost effective energy that is cheaper than Israeli pricing and possibly less politically sensitive should be of interest to both Egypt and Gaza. A good alternative could be the use of Egyptian natural gas in the power plant supplying electricity not only to the desalination project, but also to Sinai and the Gaza Strip. The suggested project suits very well with the abovementioned need for concrete achievements to tighten the cooperation and relations between neighbours of the Middle East.

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 1.55 million with a growth rate of 3.2% (Aljuaidi et al., 2009). 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).



a) b)

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

Annual average rain in the Gaza Strip is between 200 mm (in the south) and 400 mm (in the north), which falls mainly in winter. Groundwater is the main water source in Gaza (El-Nakhal, 2004). The evaporation rate is very high compared with rainfall. The average amount of open water evaporation is about 1,300 mm/year (PBS, 2000). Increased demands for water for domestic and agricultural use dry up most of the agricultural areas. 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). Still Gaza faces a high population growth rate and the majority of the population has relatively low incomes (Aljuaidi et al., 2009). Economic development is restricted, among other things by water scarcity and unreliable power supply.

2.2 Water Balance in Gaza

It is important to analyse the water balance in the Gaza Strip and to compare water supply with water 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, a conservative projection being 216 MCM/y (Metcalf and Eddy, 2000). 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. Another environmental problem is the infiltration of nitrates into the aquifer from the uncontrolled and excessive use of fertilizers by vegetable growers in their irrigated fields to increase productivity. Pollution resulting from saline water intrusion, inadequate wastewater treatment, waste disposal and intensive agricultural activities continues to reduce the amount of water available per capita (Ghabayen et al., 2004).

Baalousha (2004) reported that the average annual net sustainable groundwater recharge 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). The result reported in this table excerpted from (Baalousha, 2004). Based on PWA records, the domestic water demand for 2000 was 55 MCM. This domestic demand was predicted to be increase to 182 MCM in 2020 (Metcalf and Eddy, 2000). Also the annual deficit was found about 37 in the year 2000 and predicted to about 107 MCM in 2020 (Metcalf and Eddy, 2000). Water resources should thus be increased by 110-120 MCM/y (330,000 m^3/d) to meet this shortage.

2.3 Water quality in the Gaza Strip

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). PWA suggested in year 2000 that the Gaza Strip should develop a seawater desalination plant of about 150,000 m^3/day in order to maintain a fresh water balance in the coastal aquifer and meet water demand for different uses (PWA, 2000).

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}) (World Health Organization, 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} (World Health Organization, 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 METHODOLOGIES

3.1 Proposal Overview

Desalination projects are always related to a number of parameters and factors 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. In general, any project has to meet at least the minimum requirements such as:

- Desalination plant allocation systems
- Consumer income and economic acceptance
- Availability of operational materials and chemicals in the area
- Annual cost optimization including workers
- Costs of supply, conveyance and pre and post treatments
- Study different scenarios and comparisons
- Environmental impact analysis
- Economic benefits of water use and net benefits of overall operations.

Figure 2 shows the border line between Egypt and Palestine as well as the end point along the Mediterranean Sea coastline. In Figure 2, the triangle on the south-west part of the map encloses possible locations for the proposed project within a 10 km area on and around the Mediterranean coast. It is suggested that the brine from the desalination plant first be mixed with the power plant cooling water and then discharged to the sea to minimise the impact. The closer the plant to the Gaza border, the cheaper it will be to distribute external power, environmental electricity and water to the Gaza Strip.

Energy is also considered as the major component of the cost which usually lasts up to 30 years for major plants. The O&M cost ranges between 15% and 30%, mainly depending on plant capacity (Bushnak, 1996). More information and details regarding the equations calculation can be found in

(Poullikhas, 2001). The model yielded a minimum specific capital cost of 0.224±0.064 US$/m^3 and the minimum operation and maintenance cost was found to be 0.59±0.11 US$/m^3. This unit cost was planned for a production capacity of 140,000 m^3/d for desalinated water quality at 400 ppm TDS, at a recovery rate of 50% (Ghabayen et al., 2004).

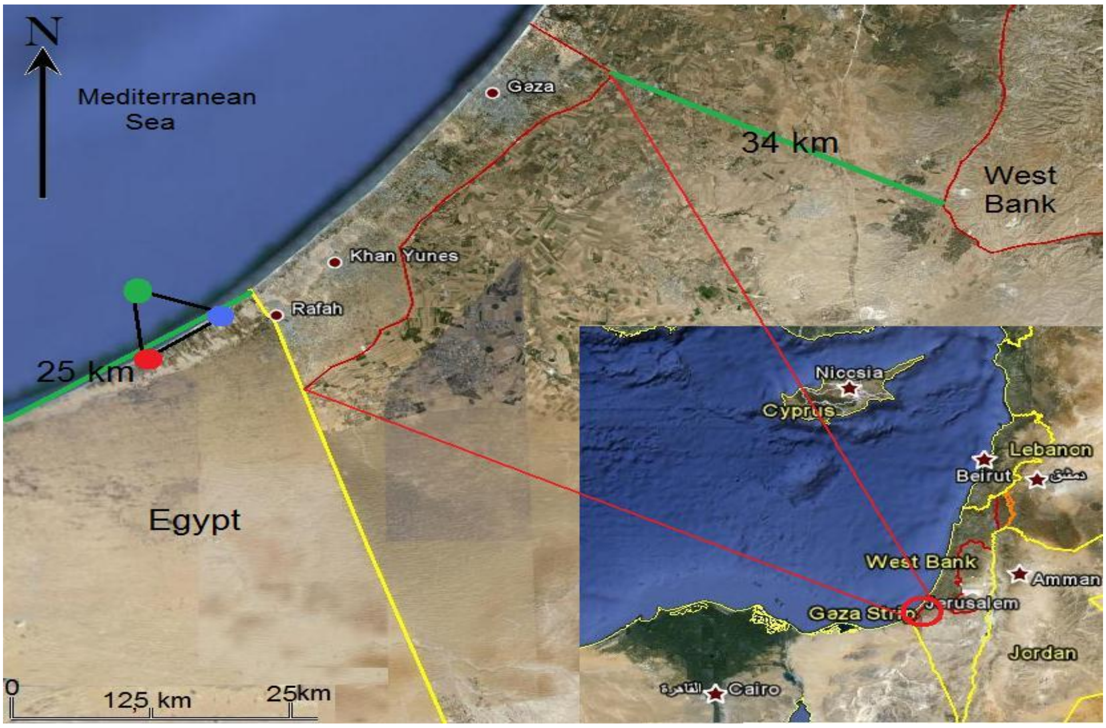


Figure 2: Proposed desalination and power plant projects in the study area (From: Google Earth 2009)

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 war) as well as leaks of information and technology. A joint plant catering to both Egyptian and Palestinian needs may decrease the tension. At present it is not realistic to suggest a joint Israeli-Palestinian desalination or power project. Therefore, as safely as possible and away from any political escalation in the region, the proposal should be planned to supply people with fresh water. To build desalination and a power plant in the same area will currently be the best solution for producing fresh water and electricity to both Gaza and Sinai.

3.2 Examples of Water Transport

The transfer water from Sinai to Gaza should not cause any problems. There are many practical examples of water transport from one city to another or from one country to another, see Table 1. Some calculations on transportation costs of water are presented in (Zhou & Tol, 2005). Comparison of these estimates to those of other studies suggests that Kally (1993) may have been overly pessimistic, but most of these studies suggest that the actual costs would have been higher, see Table 1. Kally's estimation is still used because his calculation takes account of not only horizontal distance but also vertical lifting cost. It is important to search for independent sources of energy that might be as cheap as Israeli pricing. A good alternative for energy supply to the power plant could be off-shore gas discovered in the sea close to Gaza (Baalousha, 2006). Gas from Egypt may also be a good solution for long term use.

3.3 Previous Studies

Solar plants have been suggested for 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 US$, which is high compared to a joint power and desalination plant. The total land use would be huge and solar panels are expensive. A large scale seawater desalination system set up in the Gaza Strip has been suggested previously (Assaf, 2001). A model for a set up like this with a BOO (build, own and operate) contract was demonstrated on the Florida coast in the USA with a fresh water cost of only $0.6/$m^3$ (Metcalf and Eddy, 2000).

Table 1: Cost of water transport to selected projects (from Zhou & Tol, 2005)

City Country	Project Name	Distance Km	Amount MCM	Cost $/$m^3$	Reference
Gaza Palestine	Nile to Gaza	200	100	0.214	Zhou & Tol, 2005
Turkish Cyprus	Turkey to Turkish Cyprus	78	75	0.25-0.34 0.26	Gruen, 2000 Kally, 1993
Barcelona Spain	Ebro to Barcelona	900	1000	0.36 0.52	Uche et al. 2001 Kally, 1993
Colorado USA	Colorado river to Phoenix and Tucson	550	1800	0.05 0.74	Hahnemann, 2002 Kally, 1993
Yangtze China	Yangtze to China's north	1150	32	0.10-0.16 0.38	Liu & Zheng, 2002 Kally, 1993

Connecting the West Bank to the Gaza Strip is one possibility, first proposed by Assaf (1985, 1986). It entails connecting the West Bank and the Gaza Strip using a 60-70 km long pipeline of fresh water derived from Lake Tiberia (with Israeli permission) from the West Bank mountain aquifer and/or from the Israeli National Water Carrier. This solution was considered to be highly politically dependent and is now not possible because its level has dropped in recent years due to drought. Water resources are not abundant on the West Bank. Another possible solution is artificial recharging of the Gaza aquifer, advocated in 1985 (Assaf & Assaf 1985) using floodwaters of Wadi Gaza and/or treated wastewater. There are many problems with this supply due to poor water quality in the Wadi of Gaza and lack of wastewater collection systems.

4 RESULTS AND RECOMMENDATIONS

4.1 Unit and Capital Cost Results

The reported production unit cost of seawater desalination dropped significantly from 1955 to 2020 and will probably reach less than US 0.5 $/$m^3$ in 2020, as shown in Figure 3. Four different technology types were studied and compared for long-term seawater desalination: membrane processes containing reverse osmosis (RO), thermal processes including multistage flash evaporation (MSF), multiple effect evaporation (ME) and vapour compression (VC), see Figure 3. Bashitialshaaer & Persson (2010) extracted data from the International Desalination Association (IDA) yearbook 2006-07, 2007-08, 2008-09 and 2009-10. The data presented in Table 2 were derived from these yearbooks to help us achieve a better result. These data were collected from 18 different projects mainly in the Middle East countries and some projects with similar intake salt concentration.

Also, the mean cost of production for 1 m^3 was found to be about 0.79 $US and the mean energy consumption approximately 4.5 kWh/m^3, for a raw water with Mediterranean Sea salt concentration. 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. The calculated mean desalination plant capital cost is about 1080 $US/$m^3$ a day (approx. 1 million $US to produce 1000 m^3/d and/or 1 $US to produce 1 l/d). It was also found that the average cost of producing 1 Watt from the power plant is equal to about 1 $US (approx. 1 million $US to produce 1 MW) (Bashitialshaaer & Persson, 2010).

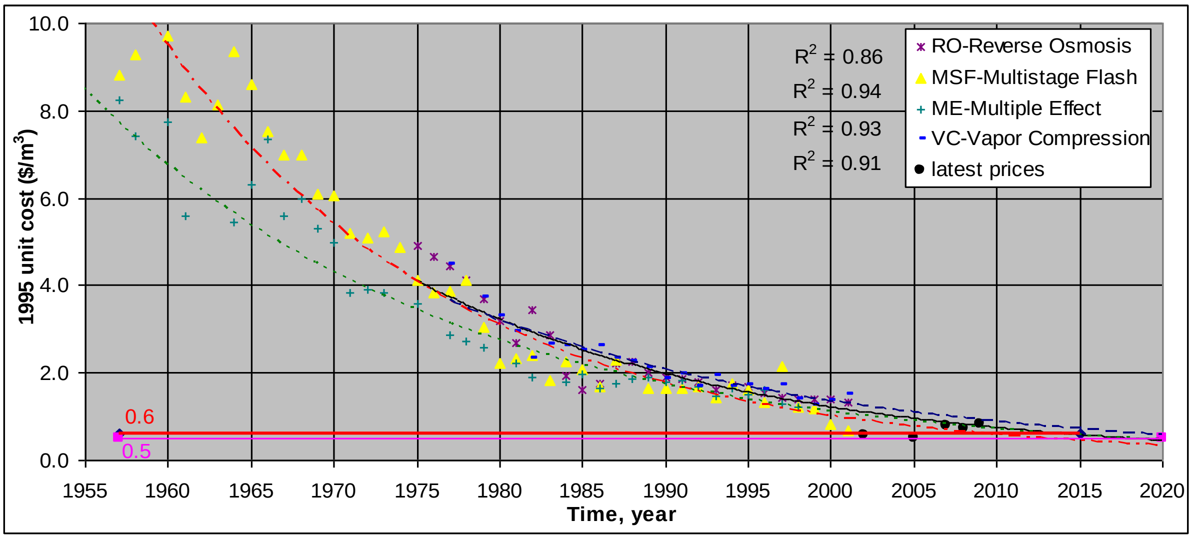


Figure 3: Unit costs for seawater desalination 1955-2020 for four technologies

The amount of fresh water needed for the Gaza Strip can be calculated from census and population progress data. If we consider a population of about 2 million living in Gaza in 2020 and that the daily fresh water requirement is about 100 litres per capita, the water supply should be 200,000 m^3/day. The expected electricity demand is about 350 MW. A combined water production and power plant will have a capital cost of about US $200 million in addition to the energy cost used for the desalination plant. The people in the Gaza Strip will also increase this amount. The proposal put forward in this study is projected to produce up to 500,000 m^3/day of desalinated water and about 500 MW electrical energy. The total amount will be distributed to the Gaza Strip in Palestine and Sinai in Egypt. It will also be possible in the future to transport any excess water from the Gaza Strip to the West Bank. The distance from the last point in the Gaza strip to the closest point on the West Bank is approximately 34 km.

The proposed project should be initiated as soon as possible. The final results and production distribution of the proposed desalination and power plants are presented in Table 2. The proposal presented in this study is planned to five years but production should be started at the end of the first year and be continued at the same level. It could be distributed as follows: two thirds to Gaza and one third to Egypt from both desalination and power plant projects. Details on how to finance the investment need to be sorted out later, but 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 the World Bank, SIDA and the European Union.

Table 2: Sample calculation for desalination and power plant proposal

Date	**Total Capacity**	**Within project**	**Capital Cost, $US**	**Gaza Strip**	**Egypt Sinai**
	m^3/d	**kW**	**million**	**m^3/d**	**m^3/d**
2010	0	0	0	0	0
2011	100000	100000	200	66667	33333
2012	200000	200000	200	133333	66667
2013	300000	300000	200	200000	100000
2014	400000	400000	200	266667	133333
2015	500000	500000	200	333333	166667
Finally	500000	500000	1000	333333	166667

The most important incentives and advantages to Egypt are listed below:

1. This project will increase water quality and quantities and electricity that will be available for the growing population of Sinai,
2. Egyptian natural gas can be used in the project adding value to the gas sales,
3. The plant will need staff. This gives employment opportunities for the people of Sinai,
4. Materials, chemicals and tools for repairing and maintenance of the desalination plant will also be provided from Egypt, which will increase the domestic M&U market.
5. Politically, this is an opportunity for Egypt to increase cooperation with Gaza. Already there is electricity cooperation in operation between Egypt and Gaza governments.

5 CONCLUSIONS

Clearly both the desalination and the power plant are vital in the Gaza Strip to supply water and electricity to the people. Desalination as a source of water supply has many advantages and few disadvantages. Climate and economic changes also impose significant costs on the Gaza water system. 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 people of Gaza lack infrastructure and rely on a clean water supply in order for their services to function normally. Although RO is a promising technology, highly professional people are required to operate the desalination plants. Supplies of chemicals required for desalination mean that continuous operation of a plant in Gaza may prove difficult and many existing small units have stopped production for this reason.

Why Egypt? Locating the desalination and power plant in Egypt on the Mediterranean coast is a good solution for both Egyptians and the people of Gaza. This proposal should improve agriculture as well as the economy and industry of both areas. The environmental issue must be studied in great detail before implementing the desalination plant project. The cost of water production will exceed the average for desalination plants in the Mediterranean basin. However costs may be reduced by the use of natural gas to produce energy in the same location. Finally, land availability is greater in the Sinai.

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