



Gaza Central Desalination Plant And Associated Works Program

Donor Information Handbook

**PWA and the Palestinian Water Sector are supported by the following
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Executive Summary

Gaza Central Desalination Plant & Associated Works Program (GCDP)

I. Background

Availability of fresh water in the Gaza Strip is amongst the lowest in the world. Currently two million Palestinians in Gaza rely almost exclusively on the coastal aquifer as a source of freshwater, but this is already inadequate to meet demand both from a quantitative and qualitative perspective. Only 3% of the water pumped from the aquifer complies with World Health Organization drinking water quality standards. To compound matters, domestic water demand is projected to increase from 103 million cubic meters (mcm) in 2015 to more than 140 mcm in 2035 based on an expected growth rate of 3.2% of the Gazan population.

To deal with this crisis, the Palestinian Water Authority (PWA) developed a rolling program of interventions to find alternative sources of potable water. Specifically, by 2020, PWA plans to implement the following measures:

- improving the water distribution system,
- improving agricultural water management,
- developing wastewater treatment and reuse and
- Increase supply of bulk water resources (**constructing of a central desalination plant**).

In this context, the construction of a large-scale desalination plant together with the appropriate supply and distribution infrastructure has been confirmed by all major stakeholders including the European Commission, the European Investment Bank, the Islamic Development Bank and the World Bank as the preferred option for Gaza to stabilize the aquifer and secure its water supply.

Expected impact:

- Providing safe & clean water for more than 2 million people
- Contributing to the regeneration of the coastal aquifer
- Reducing the pollution in the Eastern Mediterranean
- Enabling economic development & boosting jobs creation

II. Gaza Central Desalination Plant & Associated Works Program Components

The PWA, in partnership with international institutions including the European Commission, the European Investment Bank (EIB), the Union for the Mediterranean (UfM), the Islamic Development Bank and World Bank, prepared a comprehensive and integrated investment program and defined its components as follows:

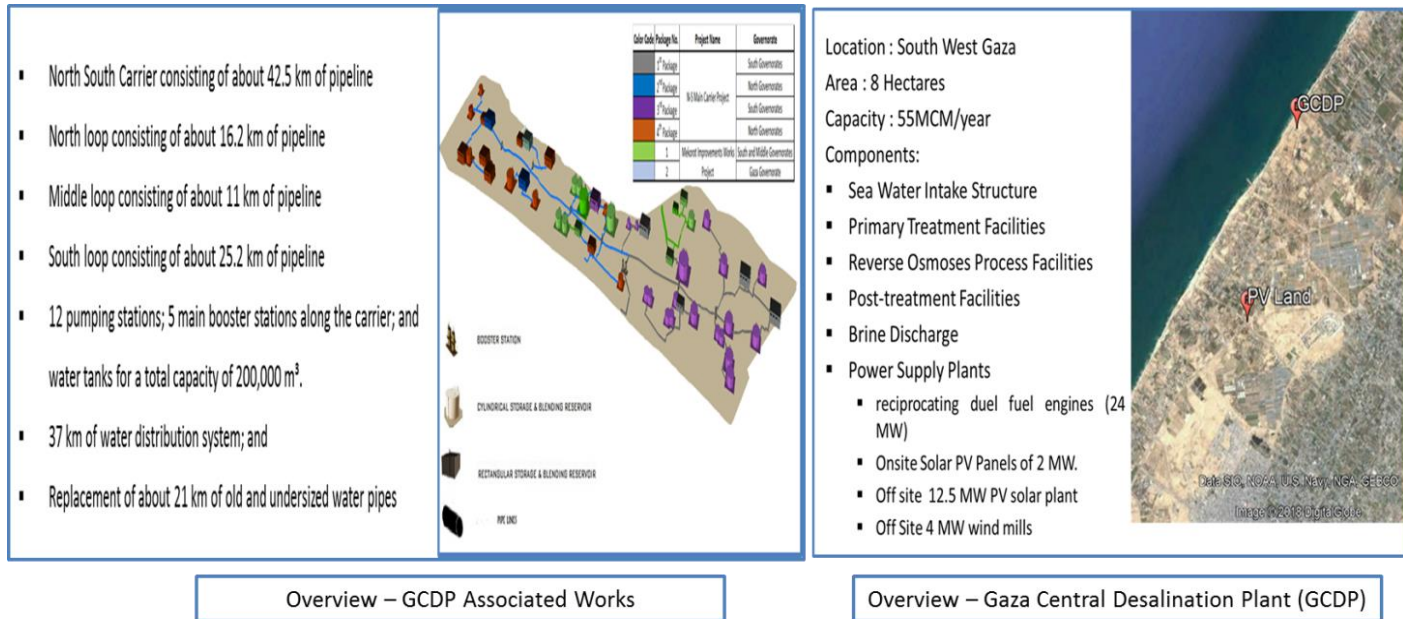
1. Gaza Central Desalination Plant:

- Construction and operation of a seawater reverse osmosis (SWRO) desalination plant of 55 MCM capacity;
- Installation of an On-site power plant fossil plant and a photovoltaic plant installed on the roofs of the SWRO buildings & Construction of an Off-site power plant consisting of a photovoltaic plant on ground structures and two wind turbines;

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2. Associated works:

- Construction of a north-south water carrier including storage reservoirs for transport of desalinated water, and for blending the desalinated water with water from other, primarily groundwater sources;
- A non-revenue water reduction plan, to reduce NRW to about 20% (in the year 2030) and to increase revenue collection efficiency from the current 38% to 80% and beyond;



Program Implementation

The EIB, EC, & PWA, have developed a Program Management Architecture (PMA) to ensure the smooth and successful implementation of the Program, whilst emphasizing transparency, good governance and supporting capacity building for the water sector in Palestine.

Power Supply

Due to the overall power crisis in Gaza, the EIB and PWA commissioned a power supply feasibility study, which identified and analysed various power supply options and their associated costs for the GCDP. The total power demand of the SWRO plant is in the range of 25 MWe, resulting in a total energy demand of 204 GWh per year. The following power supply option was selected:

The construction of an on-site fossil plant with reciprocating engines will enable 100% coverage. In addition, renewable energy facilities will be build both on and off-site with the potential to cover up to 15% the GCDP energy demand as an average per year:

- an on-site photovoltaic plant on the roof of the SWRO buildings with the capacity to cover 2.2% of the energy demand;
- an off-site photovoltaic plant with the capacity to cover 10.3% of the energy demand.
- two wind turbines with the capacity to cover 2.6% of the total energy demand.

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Power supply scenario (conservative)

Within the first two years of operation, the power supply will be covered by reciprocating engines fired with diesel fuel. From the second year of operation, onwards it is assumed that the complete power supply will be realized via a new grid connection from Israel via a 161-kV line from which a dedicated power line from El Matahen substation (within Gaza) to the project site. The reciprocating engine plant will serve as a back-up plant and will operate as back-up in case of any grid interruptions, whereas the renewable energy plants will be in operation to save operational costs. After two years of operation, it is assumed that the (back-up) reciprocating engines will be switched from diesel fuel to natural gas firing. In case the grid connection would not be available the plant could be fully powered by natural gas¹.

III. Program Cost – CAPEX & OPEX

Overall, the total cost for the Program is approximately **EUR 562.3 million** including an operational subsidy of EUR 46 million for the first five years of operation, project management and supervision cost as well as contingencies. This figure does not include the corresponding Trust Funds management costs.

Program Items	Cost (million EUR)
1. Desalination Facility	302.5
1. Desalination Plant (SWRO)	215
1. Power Plant	87.5
1. Reciprocating Dual Engines	40
1. PV Roof	6
1. PV on Ground Structure	27.5
1. Wind Turbines	8
1. Grid Connection	6
1. Associated Works	160
1. North - South Conveyor	130
1. Non-Revenue Water Reduction	30
1. Operation Subsidy for Five Years	46
1. Consultant for Supervision (Project implementation consultants (PIC 1 & PIC2))	15
1. Program Management Support Consultant Envisaged to be funded by EIB for Three Years	6.5
1. Program Management Team Envisaged to be funded by IsDB for Three Years	5.5
1. Contingences (5%)	26.8
1. TF Management Cost (not agreed upon yet)	-
Total Investment	562.3

¹ This will depend on progress of the Gas for Gaza (G4G) for which planning procedures have already begun on Israeli territory.

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The total OPEX of the full GCDP Program including associated works are expected to vary between EUR 65 and 110 million and will largely depend on energy supply options. This is translating into average water tariffs to cover supply costs of EUR 0.7 and 1.2 per cubic meter, with the difference substantially depending on availability of grid connection and natural gas. The above-mentioned EUR 46 million of operational subsidy will be used to reduce water bills for low-income households. The exact subsidy system still needs to be agreed with the donors.

Trust Fund Architecture

- The EIB will manage a Trust Fund relating the construction of the Desalination plant and its power supply a.
- The WB will manage a Trust Fund relating the construction of the Associated Works. The IsDB will manage an upper Fund (for handling cash flow to the two operational funds above) holding the financial contributions from the Arab Gulf Donors.

In addition, the Palestinian Water Authority will manage donor financing related to the Non-Revenue Water component through similar to existing bilateral mechanism.

Achieved Milestones

Significant progress has been made on all aspects of the programme, such as land acquisition, tendering procedures, programme management architecture, including the launching of the Palestinian Authority Steering Committee, energy supply and the financial mechanism for donor contributions, as well as Israel's agreement in principle on the regime to apply for entry of materials and important developments with the Gas for Gaza pipeline.

Next Step

Donors pledging conference scheduled for March 2018

- ✓ **Current Pledges: EUR 362.5 million**
- **Remaining Funds to be raised: approx. EUR 200 million**

For further information on all technical matters, please contact:

- Mr Sadi Ali , Project Management Unit Director, Palestinian Water Authority,
Sali@pwa-gpmu.org ,
- Mr Harald Schölzel, Lead Water Specialist, European Investment Bank,
h.schoelzel@eib.org.
- Mr Sari Sisalem, GCDP Program Coordinator and Advisor to Minister of Water,
sari.sisalem@gmail.com & / Or m.sisalem@eib.org
- Mr Almotaz Abadi, Senior Adviser, Union for the Mediterranean,
Almotaz.abadi@ufmsecretariat.org

For any further information regarding the program the Donors Conference, please contact:

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- NEAR-GCDP-BRUSSELSCONFERENCE@ec.europa.eu

1. Introduction

This Donor Information Handbook gives a presentation of the Gaza Central Desalination Program regarding its background and objectives, the components and the implementation structure, costs and financing.

In the annexes basic information that may be used to describe the current potable water crisis in Gaza, outlining the strategy of the Palestinian Water Authority (PWA) to address this challenge and document the need for the required infrastructure can be found. The annexes also describe in detail the costs of the proposed strategy and how donor grant financing may be managed and timed to support the strategy.

Many of the costs listed in this Handbook are based on best estimates as of February 2018, and it is expected that they will be updated from time-to-time as planned studies are completed and any bids are received.

2. Background

Availability of fresh water in the Gaza Strip is amongst the lowest in the world. Currently 2 million Palestinians in Gaza rely almost exclusively on the coastal aquifer as a source of freshwater, but this is already inadequate to meet demand. Numerous studies have confirmed the over-exploitation of the aquifer and warn that without decisive measures to drastically reduce its exploitation, it could be irreversibly damaged within this decade. Already, only about 3% of the water pumped from the aquifer complies with World Health Organization drinking water quality standards, with high levels of contamination and sea water intrusion posing a serious health risk to the area's inhabitants.

To compound matters, the population of the Gaza Strip is expected to grow by around 3.2% per annum over the coming years. Domestic water demand is projected to increase from 103 million cubic meters (mcm) in 2015 to more than 140 mcm in 2035. Today, most of the population depends on small private desalination units to convert brackish water (mixed salt/fresh water) into drinking water. These private brackish water desalination units produce water with a very low mineral content and vulnerable to contamination that has an adverse impact on public health. In addition to being of low quality, this water is expensive, with prices up to NIS 35 (EUR 8.25) per cubic meter.

To deal with this crisis, the Palestinian Water Authority (PWA) developed a rolling program of interventions to find alternative sources of potable water, based on a Comparative Study of Options (CSO), which was commissioned in 2011. Specifically, by 2020, PWA plans to implement the following measures, as identified in the CSO report: improving the water distribution system, improving agricultural water management, developing wastewater treatment, reuse, and increase supply of bulk water resources (mainly the **constructing of a central desalination plant**)

In this context, the construction of a large-scale desalination plant has been identified by all major stakeholders including the European Commission, the European Investment Bank, the Islamic Development Bank and the World Bank as the most realistic option for Gaza to stabilize the aquifer and secure its water supply.

3. The Gaza Central Desalination Program

At the 11th FEMIP Ministerial Meeting (Brussels, July 2011), and following the labelling of the project by the Senior Officials of the Union for the Mediterranean (UfM) as a priority project for the region, the EIB was formally requested by Palestine to support the Palestinian Water Authority (PWA) in the design and implementation of the Gaza Desalination Plant, building on its extensive experience in the financing of desalination plants in the region, notably in Israel. The EIB subsequently prepared a Project Information Memorandum which took stock of existing studies for the proposed Desalination Plant and identified additional studies required.

In November 2012, the EIB Management Committee approved a EUR 4m technical assistance, financed by the European Commission (EC) to finalize the conceptual design for the Desalination Plant and to prepare tender documents for the selection of the Engineering, Procurement and Construction (EPC) contractor and the Operation and Maintenance (O&M) contractor. The selected consortium composed of Fichtner (Germany) and Madar Consulting Engineers (Palestine) started its TA assignment in January 2014

In May 2015, the EIB FEMIP Trust Fund Assembly of Donors approved a EUR 600k technical assistance operation aiming for the procurement of on-and off-site power plants to supply the Gaza Central Desalination Plant with considerable amount of clean and sustainable energy.

A similar contract to develop the detail design and tendering documents for the Associated Works was competitively tendered by the World Bank in mid-2015. Funding was provided on a grant basis from a World Bank managed multi-donor trust fund. The bid was won by Joint Venture Lotti Ingegneria SpA & AI Engineering Srl, and which commenced work in February 2016. Its work, including the preparation of tender documents for the Associated Works, is expected to be completed in April 2018.

3.1 Program Components

Based on the initial set of studies and those that were either recently completed or are ongoing, the PWA has defined the main elements of a “The Gaza Central Desalination Program” (the Program). The four main components of the Program are:

- i. Construction and operation of a seawater reverse osmosis (SWRO) desalination plant of 55 MCM capacity;
- ii. Installation of an On-site power plant fossil plant and a PV plant installed on the roofs of the SWRO buildings & Construction of an Off-site power plant consisting of a PV plant on ground structures and two wind turbines;
- iii. Construction of a north-south water carrier including storage reservoirs for transport of desalinated water, and for blending the desalinated water with water from other, primarily groundwater, sources;
- iv. A non-revenue water reduction project, to reduce NRW to about 20% (in the year 2035) and to increase revenue collection efficiency from the current 38% to 80%;

Components i. and ii. are referred to as the “Central Desalination Plant” and components iii. and iv. are referred to as the “Associated Works”.

3.2 Central Desalination Plant

The SWRO plant with a nominal capacity of 55 MCM per year will consist of a seawater intake, cooling water system and brine discharge system, a pre-treatment system with dual media filtration, final cartridge filtration and advanced membrane filtration, a two stage reverse osmosis system with isobaric energy recovery and a post treatment system based on carbonation with CO₂ alkalization with limestone and disinfecting by sodium hypochlorite. The produced potable water will be pumped into the on-site product water supply tank. The potable water transfer pumps connected to this water supply tank are the supply limits for the later Contractor.



Figure 1: Illustration of similar SWRO plant

3.2.1 Central Desalination Plant Location

The Desalination Plant shall be constructed on a plot with an available area of about 7.3 ha close to Deir Al-Balah in the center of the Gaza Strip. The land plot is located on the seaside connected to the Mediterranean Sea it is directly located at the quayside Al Rasheed street and is therefore easily accessible.



Figure 2: Main project site



Figure 3: Picture of main project site (view from Al Rasheed Street)

3.2.2 Site Investigations

For the design of the Central Desalination Plant, the EIB Consultant, Fichtner, carried out certain site investigations with support of local subcontractors. The onsite power plant will be part of the GCDP works and follows the progress of works within the GCDP contract. The offsite PV panels are a separate lot of the contract.

Seawater quality measurements

The seawater measurements were carried out from April 2014 to December 2014. The results are summarized in the Tender Documents “Lot 1: Sea Water Reverse Osmosis Plant including Onsite Power Plant – Part B0 General specifications - Seawater Quality, submitted by Fichtner in November 2015 confirming that the quality is close to the Mediterranean composition.

Bathymetric survey

The data for the bathymetric survey were collected on 4 days within the period from June to October 2014. The final report with a detailed survey map showing the different water depths to define the seawater intake and brine discharge positions was submitted by Fichtner end of December 2014.

Topographic survey

UNICEF has already implemented a topographic survey in the year 2013. The implementation of the UNICEF STL V plant is ongoing. Only a small strip, currently being used as temporary site area for the STL V plant, is changed regarding the site levels as stated in the existing topographical survey report. It has been agreed between Fichtner and PWA, that there is no need to update this topographical survey report for the upcoming tender documents.

Marine survey

A visual survey was carried out in November 2014, which identified that the seabed formation within the investigation area consists mainly of sand layers with some area of clay. Some Algae beds have been observed. A few rocky areas are rich in sea mussels and some crabs have been noted. However, no critical environmentally sensitive areas could be identified. The marine measurements (current and wave measurements) needed for the brine dispersion study are finalized.

Soil investigation

The soil investigations report for the on- and off-shore area was finalized in February 2015. The soil profile at site is composed of partly thin clay layers overlying a deep gravely sand. The conditions concerning construction of the GCDP buildings are to be considered as normal, however later soil improvements or soil exchange will probably be necessary in area of clay layers.

Brine dispersion study

The simulations verified the proposed locations for the seawater intake head and the brine outfall diffusers and verified the environmental compliance with the allowable salinity increase in the near field area of the outfall.

3.3 Associated Works

The Associated Works (AW) consists of design and construction of main North-South carrier line of 42.5 km with in addition to North, Middle and Southern transmission mains for a total length of 110 km. This also includes 1 main pumping station, 5 main booster stations and blending tanks of total capacity 200,000 m³ and reconfiguration of water distribution system for all the 25 municipalities.

The overall objective of the Associated Works is to improve the water supply situation through efficient use of desalinated water and precious groundwater while ensuring technical as well as financial sustainability of its operation. The specific objectives are:

- Construct storage and blending reservoirs to comply with drinking water standards;
- To design and construct a transmission system (with sufficient hydraulic capacity);
- Sustainable O&M for the system; and technical assistance to the CMWU and Municipal Water Departments;
- To develop a NRW reduction plan & and quantify the socio-economic impacts and to coordinate with CMWU's in this regards;
- To develop an energy management plan; to plan the power supply system needed;
- To prepare the Tender Documents for the Contractors and follow up the Complete Tendering Process.



Figure 4: 3D view of Main Carrier, Transmission mains, Blending Reservoirs and Pumping/booster stations.



Figure 5: 3D representation of Main North and South Pumping Stations

4. Power Supply

Due to the overall power crisis in Gaza, the EIB and PWA commissioned and supervised a power supply feasibility study, which extensively analysed various power options and associated costs for the desalination plant. It considered a wide range of all options of power supply for the GCDP. The following options were identified and evaluated:

- Different grid connection alternatives, which could potentially supply the GCDP without the need of a dedicated power plant.
- Diesel and gas fired captive power plants on site
- Renewable energy options located at or outside the GCDP site in order to save fuel costs

Following several discussions with EIB/PWA the following power supply option was selected and shall be executed in two lots:

Lot 1:

Grid connection (to Israel) as favourite power supply (under preparatory stage)

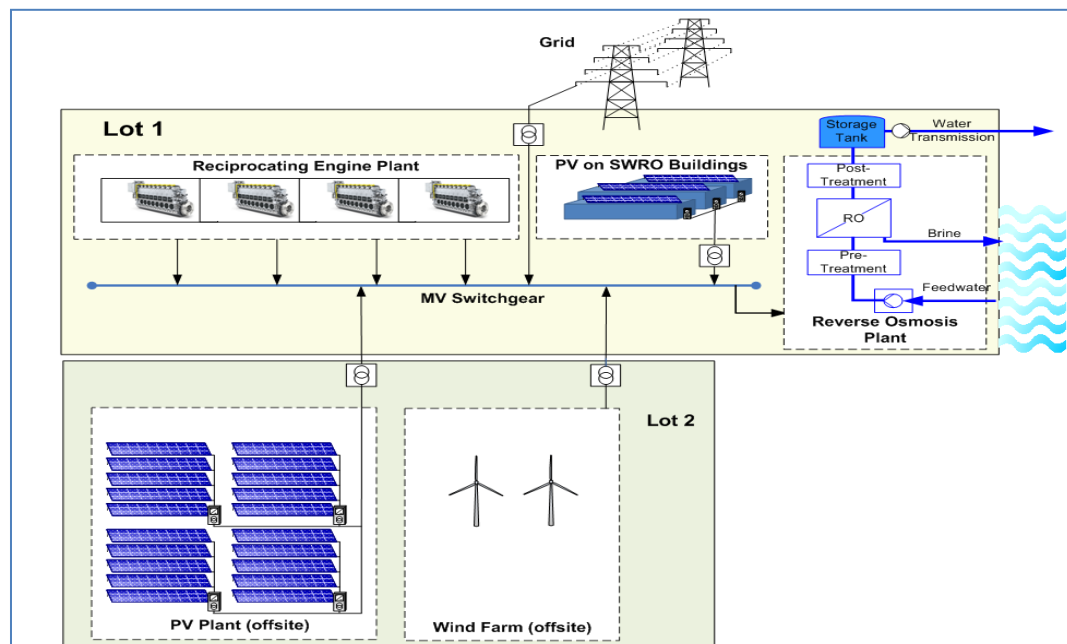
Full back-up power supply by an on-site fossil plant with reciprocating engines, which can be fired with diesel or natural gas

On-site photovoltaic (PV) plant being installed on the roofs of the SWRO buildings

Lot 2:

Off-site PV plant on a separate 10 ha area about 7.5 km away (linear distance) from the main project site

Off-site wind plant consisting of two turbines to be placed on the coast area in front of main project site



- **Figure Error! No text of specified style in document.-1: Overall plant configuration for Lot 1 and 2**

The final Power supply solution that was retained by PWA in concert with the EIB is as follows:

- The total power demand of the SWRO plant is in the range of 25 MWe, resulting in a total energy demand of 204 GWh per year.
- The construction of an on-site fossil plant with reciprocating engines with about 34 MWe will enable a 100% coverage also in case one engine would be out of operation.
- A PV plant on the roof of the SWRO buildings will have a total peak power output of about 2.8 MWe and will produce about 4.6 GWh per year, which corresponds to 2.2% of the total energy demand.
- The construction on an off-site PV plant will produce about 13 MWe (peak output) and 21 GWh per year, which corresponds to 10.3% of the total energy demand.
- In addition, the construction of two wind turbines with a capacity of 4 MW will produce about 5.4 GWh per year, which corresponds to 2.6% of the total energy demand.
- The total energy share of renewable sources is about 15% as an average per year.

For the future power supply, PWA developed the following conservative scenario:

- Within the first two years of operation, the power supply will be covered by reciprocating engines fired with diesel fuel. To reduce the high fuel costs the renewable energy sources (onsite-PV plant, off-site PV plant and wind turbines) will also be in operation and possibly GoP will exempt the diesel fuel from blue tax.
- From the second year of operation, onwards it is assumed that the complete power supply will be realized via a new grid connection from Israel. The grid connection shall be realized by a 161-kV line from which a dedicated power connection from El Matahen substation (within Gaza) to the project site. The reciprocating engine plant will serve as a back-up plant and will operate as back-up in case of any grid interruptions, whereas the renewable energy plants will be in operation to save operational costs.
- After two years of operation, it is assumed that the (back-up) reciprocating engines will be switched from diesel fuel to natural gas firing. In case the grid connection would not be available, the plant could be fully powered by natural gas².

5. Estimated Capital and Operating Costs

5.1 Evolution of costs since 2011

- The first cost estimate dates back to before the EIB started to support PWA. Back in June 2011 the cost estimate was in the range of USD 250m. However, this related to the desalination plant only. One of the changes the EIB introduced in 2011 was to design a conclusive program to address the water crisis in Gaza rather than trying to develop single projects in isolation. The approach, first proposed in the 2011/ 2012 Project Memorandum was unanimously accepted – despite the implication, particular on the contribution expected from the Islamic Development Bank that pledged to cover 50% of the cost.
- Since 2011 the cost estimate has been subject of various cost estimation exercises. The present estimate can be considered conservative as stated costs include already 20% contingency margin. However, the general situation surrounding the program in Gaza is difficult and “the market” may respond to these difficulties differently – meaning that high risk pricing approaches cannot be excluded.

² This would depend on progress of the Gas for Gaza (G4G) for which planning procedures have already begun on Israeli territory.

5.2 Amount of Capital Expenditure (CAPEX)

- Overall, the total cost for the Program is approximately **EUR 562.3 million** including an operational subsidy, project management and supervision cost as well as contingencies.
- The above total program cost include EUR 46 million to subsidize the operation of the desalination plant over the first 5 years.
- Also this figure includes EUR 12 million to cover Program Management Team cost for three years (EIB to provide EUR 6.5 million for the PMSC + IsDB to provide EUR 5.5 million for the Program Management Team). This figure does not include the corresponding Trust Funds managing costs

<u>Program Items</u>	<u>Cost (million EUR)</u>
1. <u>Desalination Facility</u>	302.5
1.1. Desalination Plant (SWRO)	215
1.2. Power Plant	87.5
1.2.1. Reciprocating Dual Engines	40
1.2.2. PV Roof	6
1.2.3. PV on Ground Structure	27.5
1.2.4. Wind Turbines	8
1.2.5. Grid Connection	6
2. <u>Associated Works</u>	160
2.1. North - South Conveyor	130
2.2. Non-Revenue Water Reduction	30
3. <u>Operation Subsidy for Five Years</u>	46
4. <u>Consultant for Supervision</u>	
5. (Project implementation consultants (PIC 1 & PIC2))	15
6. <u>Program Management Support Consultant</u>	
7. Envisaged to be funded by EIB for Three Years	6.5
8. <u>Program Management Team</u>	
9. Envisaged to be funded by IsDB for Three Years	5.5
10. <u>Contingences (5%)</u>	26.8
11. <u>TF Management Cost (not agreed upon yet)</u>	-
<u>Total Investment</u>	562.3

Table 1: Overview of GCDP CAPEX estimations

5.3 Amount of Operating Expenditure (OPEX)

a) OPEX for the Desalination Facility Component

- The annual OPEX for the Gaza Desalination Plant will largely depend on energy supply options and can range from **EUR 30 to 75 million**, assuming in all cases that on-site and off-site PV and wind plants will be in operation to save fuel costs (solar and wind energy supply 15% of the total power demand of 25 MWe). The above-mentioned EUR 46 million will be used to reduce water bills for low income households. The exact subsidy system still needs to be agreed with the donors.
- The higher level of OPEX corresponds to a scenario where there is no available connection to the electricity grid and reciprocating engines will be fired with diesel, whilst the lower level assumes that the plant is run with electricity from the grid and reciprocating engines are fired with natural gas.

b) OPEX for Associated Works Component

- The OPEX for the overall water supply system, comprising costs of water production from the other sources, transmission and distribution, pumping, storage and blending stations, overhead costs, is estimated at **EUR 35 million annually**.

c) The total OPEX of the full GCDP Program

- The total OPEX at the end of the project's implementation are expected to **vary between EUR 65 and 110 million**.
- This is translating into average water tariffs to cover supply costs of **EUR 0.7 and 1.2 per cubic meter**, with the difference substantially depending on availability of grid connection and natural gas.

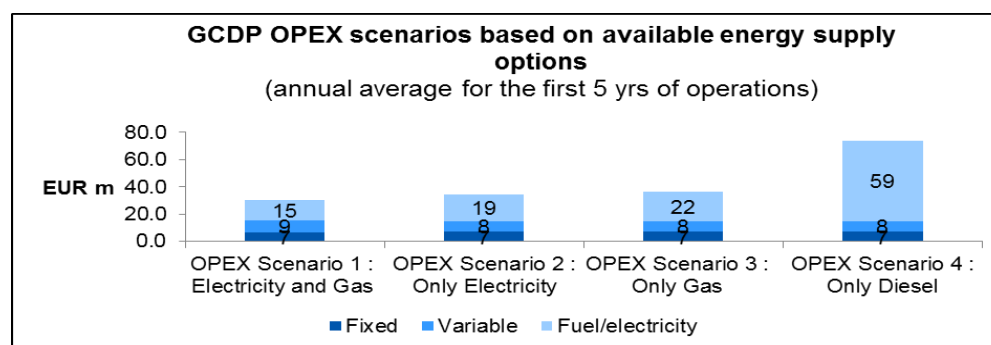


Figure 6: GCDP OPEX scenarios based on available energy supply options

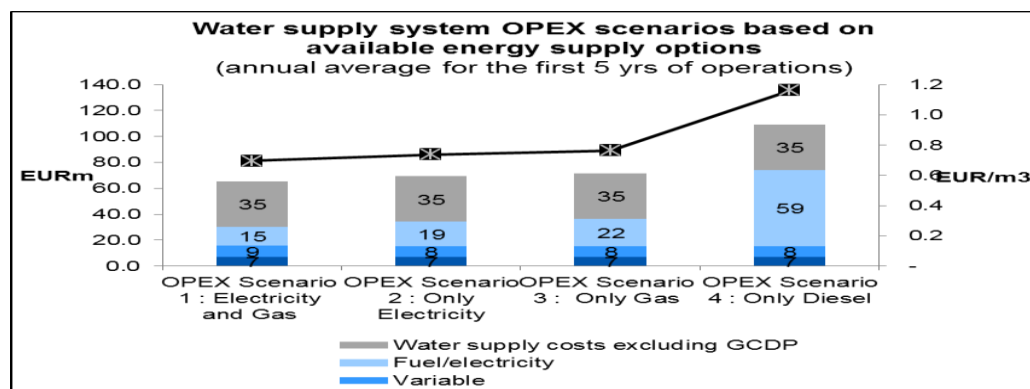


Figure 7: Water supply system OPEX scenarios based on available energy supply options

5.4 Amount for subsidies during Operations

- The Operations and Maintenance (O&M) subsidy is EUR 46 million
- The estimated level of subsidies would vary **between approximately EUR 11 and 18 20 million annually** depending on the available power supply options.
- Under this approach, the households' expenditure for water should range between EUR 140 and 240 annually, based on an average consumption of 106 l/ca/day. This is deemed acceptable if compared with an average household annual income of about EUR 5,810 in Gaza.
- A Cost-of-Service and Tariff Study is underway and will help define a sustainable and affordable tariffs structure, which must ensure that tariffs will remain affordable to the poorest households under any OPEX scenario.
- Considering an OPEX scenario where the onsite fossil power plant is operated with diesel in addition to the on-site and off-site PV and wind plants, the number of subsidies required amounts to approximately EUR 92 million during the first 5 years. If natural gas and a dedicated power supply from Israel become available to operate the GCDP after the second year of operation, subsidies in the order of EUR 70 million would be required. **As agreed between the partners, EUR 46 million is considered in the project budget to be funded by the donors and the rest will be funded by the government.**

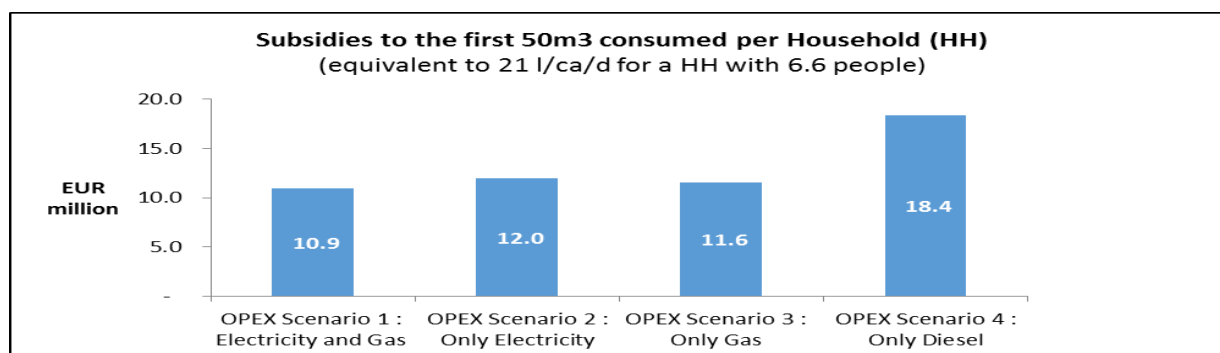


Figure8: Subsidies to the first 50m³ consumed per Household (HH)

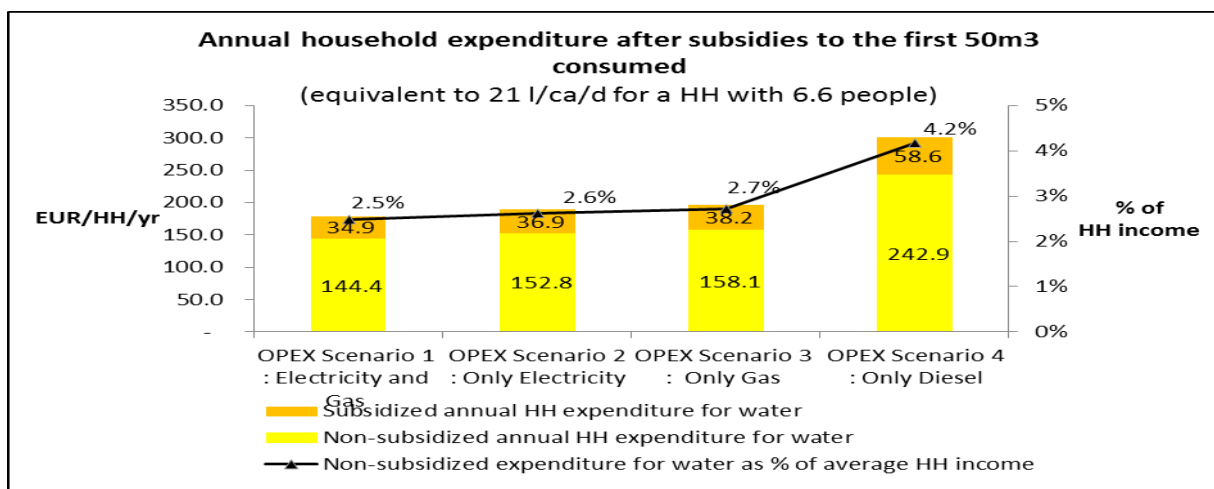


Figure 9: Subsidies to the first 50m³ consumed per Household (HH)

6. Trust Funds Arrangements and Financing Plan

6.1 Trust Fund Architecture

Given the possible involvement of many donors, a Trust Fund management is required to coordinate administration and the disbursement of funds. The funding mechanism was discussed at meetings organized by the UfM with the Government of Palestine, the European Commission the Islamic Development Bank, the European Investment Bank and the World Bank in Barcelona on 10 February 2016 and 7 October 2016. The proposed structure of the funding mechanism is presented below.

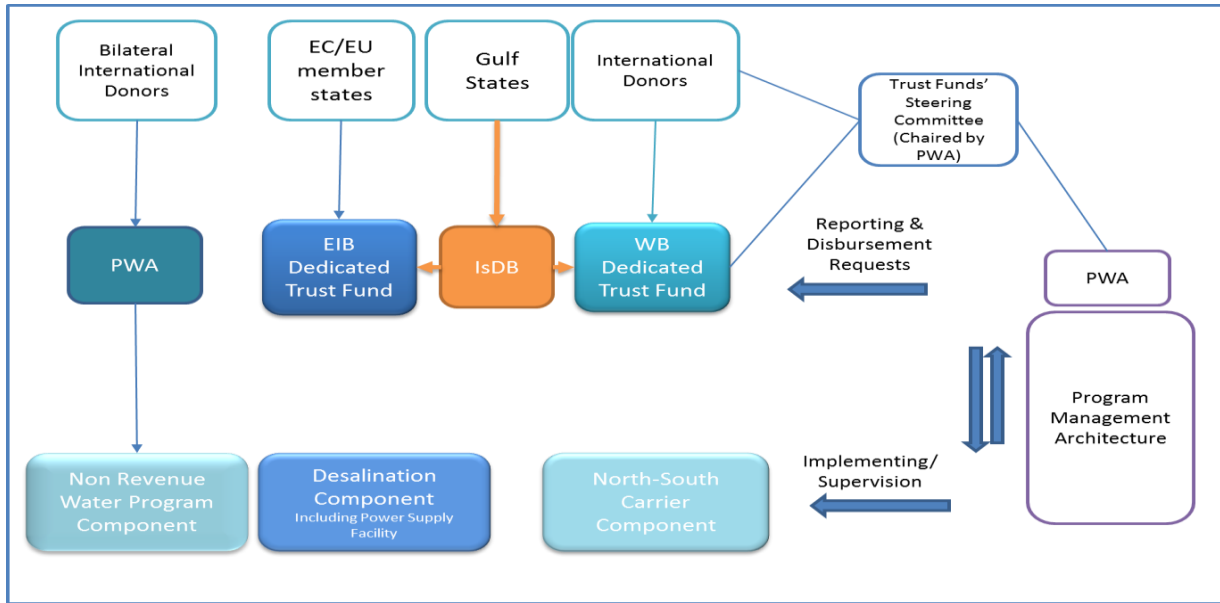


Figure10: Gaza Desalination Program: Funding Mechanism

As depicted, the IsDB will manage an upper Fund holding the financial contributions from the Gulf Donors. The EIB will manage the trust fund related to the construction of the Desalination plant and its power supply. The WB will manage the trust fund related to the construction of the North-South Carrier and Associated Works. In addition, the Palestinian Water Authority will manage the donor finance related Non-Revenue Water component through similar existing bilateral mechanism.

Trust Fund Managers

The managers of the Trust Funds (IsDB, EIB, and WB) will ensure that disbursement and financial reporting are carried out in line with international best practices. The role of the Trust Fund Managers begins by guiding donors through the process of contributing to the trust fund, including the preparation of donor contribution agreements and other required legal documentation. Thereafter, the Managers collect and disburse the funds from donors, starting with the call for funds to donors for their instalment payments and followed by the processing of cash and promissory note payments received.

Disbursement

The main stages of the disbursement process will be as follows:

- The Contractor, under the supervision of the Contracting Authority (PWA), will provide reports and submit invoices to the relevant Trust Fund Manager.
- The Trust Fund Manager will disburse the funds either to the Contracting Authority or directly to the Contractor (to be agreed upon).

6.2 Possible Donor Annual Contribution Schedule

In sum, the total amount needed from donors, shown by year of construction and then for the initial 5-years of operations, for the entire Gaza Desalination Program can be summarized in the following table:

	Est. Cost M Euros	2018	2019	2020	2021
Desalination Plant	302.5	30.0	82.8	122.8	66.9
Associated Works	160	16.1	34.0	67.9	42.0
Other Costs	99.8	10.4	20.0	42.3	27.1
Total by Year	562.3	56.5	136.8	233.0	136.0

7.

Table 2: Donor Funding Required by Year for CAPEX

program Description	Est. Cost M€	2022	2023	2024	2025	2026	2027
Desalination Plant (O&M) Support	46	15.0	12.4	8.8	6.3	3.5	0.0

Table 3: Donor Funding Required by Year for OPEX

8. Program Management and Coordination

8.1 Program Administration and Implementation Responsibilities

Table below presents an overview of the responsibilities of the key Program's stakeholders.

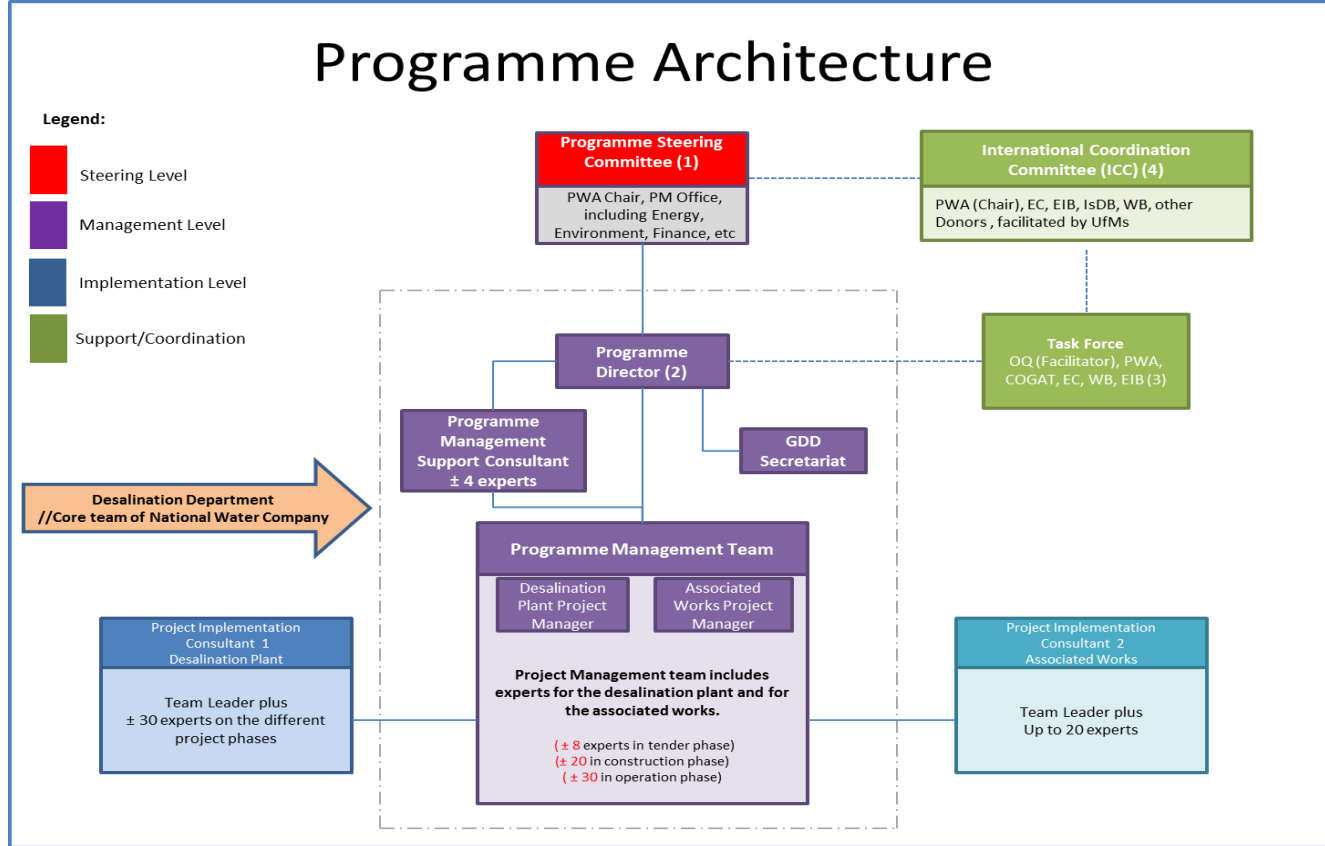


Figure 11: Program Management Architecture

As part of its advisory role to the program, the EIB has developed a Program Management Architecture (PMA), which was presented to the PWA, EC and EU Delegation in Jerusalem in July 2016 as the best possible practice to ensure the successful implementation of the program. This PMA was endorsed in Barcelona Coordination meeting in October 2016 with all the program partners.

The PMA consists of mainly four structures as follows:

- the Program Steering Committee, which is a governmental internal structure that ensures the ownership of the GoP for the program and to facilitate the needed inter-ministerial work,
- the International Coordination Committee, which provides a platform for all the international partners to oversight the work and development of the program
- the Task Force, which is responsible for the facilitation and coordination between the GoI, GoP, and the Program Management Body
- the Program Management Body, which consist of the Program Management Unit (PMU) and the Program Management Support Consultant (PMC), is responsible for the direct management of the

program from the tendering phase, to the construction and later on the operational management phase of the desalination plant.

- e- The overall Program management will fall under the responsibility of the National Water Company (NWC) after being fully established and functional. In the meanwhile, during the transitional phase toward the full establishment of the NWC, the PWA will be responsible for implementing the Program under the Project Management Architecture.

The Program architecture is designed as a comprehensive Program implementation structure aimed to ensure the smooth and successful implementation of the Desalination Program, whilst emphasizing transparency and appropriate checks and balances, good governance and support capacity building for the water sector in Palestine. The Program architecture is composed of the following bodies intervening at steering; either management or implementation levels, and with others performing a support and coordination function

The EC financed a consultancy firm to develop the PMA ToRs. In official communications, the EC and the PWA asked the EIB to support this PMA financially and technically. In response to the request of the EC, EUREP and PWA, the EIB reviewed the ToRs of the PMA and prepared budget estimation for the Program Management (i.e. the PMU and PMC). It was estimated the cost will be in the range of approximately EUR 4 million per year for the first 3 years. This budget is expected to cover both the PMU and PMSC costs.

On 21 and 22 November 2017, the EC arranged a meeting with all the Program Partners (i.e. the PWA, the EU Delegation in Jerusalem, the EIB, the World Bank, the Islamic Development Bank, the UfM, and the OQ). During that meeting it was agreed that both the EIB and the IsDB to financially support the Program Management Architecture by providing EUR 6.1 million from the EIB to recruit the PMSC and providing EUR 5.1 million from the IsDB to recruit the PWA PMU staff.

Steering level

The Program Steering Committee is an inter-ministerial committee chaired by the Minister of Water and Head of PWA, with membership of the Office of the Prime Minister, Minister of Finance, Ministry of Energy and Ministry of Environment. The Program Steering Committee will oversee deciding on the main strategic orientations of the Program

The Program Steering Committee based on professional experience and merit selects the Program Director. S/he should have a proven record of accomplishment of managing similar large and complex projects. The Director shall report to the Chair of the Steering Committee. All major decisions shall be taken by the Steering Committee, which authorizes the Director to act and implement.

Management & Implementation Level

A Gaza Desalination Department (GDD) in the PMU shall be established in PWA and will be dedicated to manage the desalination project in all stages (tendering, construction and O&M). A Director who will report to the PWA Head will head the Gaza Desalination Department in the PMU. The GDD shall coordinate all the dimensions of the desalination plant and the associated works. It shall have the authority to interface with all stakeholders in Palestine as well as the International Financial Institutions. After the transitional period ends, the staff hired by PWA will be transferred to the National Water Company.

The Program Director will be assisted by a Secretariat, which provides administrative and professional management support to the Program Director. The Director will also be supported by a Program Management Support Consultant who will give management support to the Director and to the Program Management Team. The Program Management Team will report to the GDD Director and will oversee implementing the Program. In principle, the proposed Program management team consists of ± 8 experts in the tender phase, ± 20 in the construction phase, ± 30 in the 5-year operation phase and onwards.

A Project Implementation Consultant 1 (PIC 1) will assist the Program Management Team for Desalination Plant with proposed staff comprised of a team leader ± 30 experts split over the three different phases of the project, and a Project Implementation Consultant 2 for Associated Works (PIC 2) with proposed staff up to ± 20 .

Support/Coordination

The International Coordination Committee will ensure coordination among international community to overcome any financial/ technical barrier and will meet on a bi-annual basis or as necessary. Participants include PWA (chair), UfM facilitator, EIB, IsDB, WB, EC, and any other donors.

The Task Force will oversee effective coordination with the Israeli Authorities on all aspects aimed to facilitate smooth construction and implementation on the ground regarding access to materials, goods, and personnel. The Task Force facilitated by the Office of the Quartet will meet monthly or as necessary and will liaise with the Program Director on a regular basis as well as with the International Coordination Committee (ICC). Participants include PWA, COGAT, EC, EIB and WB.

9. Procurement

9.1 Desalination Plant

For the Program components supervised by the EIB, EIB procurement rules will apply, including open international competition, non-discrimination of tenderers, fairness and transparency of the process, and selection of the most economically advantageous offer.

A comprehensive market survey carried out by Fichtner and concluded in February 2015 showed that 7 of 10 candidates indicated their interest in providing EPC as well as O&M services. On that basis, it was concluded that the combined EPC and O&M procurement will ensure the most competitive solution and would be more beneficial regarding interfaces, risk of gaps, training and knowledge transfer of plant specifics. The contract with the EPC and O&M contractors will be based on FIDIC conditions for “Design, Build and Operate Projects”.

9.1.1 Tender process

Since 2011, EIB has been managing a TA aiming to help PWA to tender and procure the EPC and O&M contractors. The concept design for the Desalination Plant and the Tender Documents to procure the GCDP under an EPC contract format were ready, however the tender process could not be launched started due to various (technical) reasons;

- A reliable process to import construction materials and chemicals necessary to build and operate the plant could so far not be established

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- Under the current tender scenario an approval (from Israel) of detailed list of material could only be sought AFTER the signature of the EPC contract.
- As it is currently impossible to assess the «approval criteria» there is a substantial risk of significant construction cost increases embedded in this process.

In response to and taking into consideration the above mentioned obstacles, several in depth discussions were held between the EIB, the PWA and EUREP to develop alternative options to tender the GCDP construction and operation contractors. The EIB prepared the possible alternative scenarios for the tendering and procurement process of the GCDP. On 21st and 22nd November 2017, the EC arranged a meeting with all the Program Partners (i.e. the PWA, the EU Delegation in Jerusalem, the EIB, the World Bank, the Islamic Development Bank, the UfM, and the OQ). During that meeting and after considering the advantages and disadvantages of all potential options, it was agreed to consider the Alliance Approach for tendering the Desalination Plant EPC contractor.

Alliance Approach

Two companies would be shortlisted with whom the PWA would develop their bid offer in close coordination with the Israeli authorities and supported by the project implementation unit located in the PWA. It provides the necessary flexibility to coordinate the entry of material and staff into Gaza with Israel as the selected two companies will engage early in the bidding process with the Israeli Authorities through the PWA. Tenderers to prepare a detailed engineering, a detailed bill of quantities and a tender period which will be discussed and agreed with the Israeli authorities in advance and can be implemented following an agreed monitoring and facilitation process (which is in compliance with the Israeli Authorities need to have a detailed a detailed list of material). The bidders to provide a strong commitment to participate in the tender process and to finally deliver a compliant proposal in form of a written Project Development Agreement

The Alliance Approach process can be summaries in the following steps:

- A more focused seawater desalination construction and operation prequalification process would target at the short listing of two bidders.
- Following the procurement notice, the Request for Qualification (RfQ) should be issued
- The RfQ to provide a clear description of the entire envisaged tender process
- The two bidders – after selection – will be asked to enter into a Project Development Contract which binds the bidder to provide a compliant proposal
- A pre-bid meeting with interested parties that have collected the tender documents to get feedback on the project and the envisaged tender process.
- The Bid have to be explicit on the coordination process with the employer (PWA), financier and with the relevant Israeli authorities
- The Bidders shall prepare a detailed design for the Project and deliver a detailed bill of quantities that is prepared in coordination with PWA
- The Bidders should be granted to undertake relevant investigations of the site in order to gain the information necessary for full proposal preparation
- The Bidders will get involved through PWA with the Israeli authorities that is responsible for granting approvals for the importation of dual-use items. This could be structured in the form of workshops, which will be conducted with each Bidder

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- It is expected that PWA will coordinate a first workshop to be conducted with the relevant Israeli authorities in order for the Bidder to explain its detailed design and the bill of quantities and the explanation by the GoI on their requirements and procedures to be followed by Bidders
- Following a review period, a second workshop shall be conducted with each Bidder that will serve the purpose to clarify the precise nature and use of some items that are not sufficiently clearly described by the Bidder.
- Upon clarification, the GoI shall provide to PWA an in-principle approval for each individual item and quantity of this item. Should some of the items be rejected, this needs to be brought forward to the bidder and the bidder shall consider which alternatives would be suitable.
- A third workshop between the bidder, PWA and GoI shall be conducted in order to discuss whether proposed alternatives would be acceptable and can be approved by GoI.
- Upon successful completion of this third workshop the bidder shall revise the bill of quantities accordingly and hand the detailed list of material generated from the Design and Bill of Quantities over to GoI for final approval which would then constitute the eligibility of the items for import into Gaza.

Fichtner as Employer's representative will support PWA during the tender process up to award of the Contract. This will include the coordination of all communications with the bidders, clarifications, evaluations and negotiations on close coordination with PWA. To review the tender documents and the proposals, PWA shall involve respective counterparts/experts for the different technical faculties to support the assessment and evaluation by Fichtner. This approach will furthermore build up the capacity within PWA. PWA representatives will be available for all meetings with the bidders and will be responsible for all consultations with local and Israeli authorities. A legal advisor will further support PWA staff to clarify all related issues during the contractual negotiations with the Tenderer.

Construction and commissioning period: Fichtner will support PWA during the design review of Contractor's documents, attendance during factory acceptance tests and site supervision. PWA is going to involve respective counterparts for the different technical faculties to support the works by Fichtner.

Operating Contract It is anticipated that an O&M contractor will be procured to operate the desalination plant. Indeed, due to the current lack of local O&M experience in the Gaza Strip for such plants, the award of an external O&M contractor would ensure the immediate availability and involvement of experienced staff and would ease the implementation of this challenging project. In any case, the expected initial tenure for the management contractor will be five years. To attract qualified firms to work in the challenging Gaza environment, the financing for the management contract should be confirmed up-front and visible to interested bidders. The core team, which will be working on the project during different phases, will be well experienced and well trained during O&M. This core team later will form the team of the desalination department within the NWC. Meanwhile, PWA completed the road map to establish NWC and a study focusing on strengthening West Bank water department has been also performed to ensure smooth and functional transfer to the National Water Utility.

Operation period: During the first five years of operation, the O&M Contractor will be responsible for the management, operation and maintenance of the Plant. The Contractor is thereby obliged to carry out intensive training for the Employer to build up the required capacity, which shall enable them to

successfully take over the future operation of the plant. Furthermore, it is the intention of PWA/NWC to take over part of the already experienced staff of the Contractor.

Management Contract Metrics It will be important that the management contract include a full suite of performance metrics to ensure at least plant safety, water quality, reliability, energy efficiency and plant maintenance. Given the expert nature of designing these metrics, a consultant will be hired to provide the required input.

9.2 Associated works

For the Program components supervised by the WB, WB procurement rules will apply, including: open international competition, non-discrimination of tenderers, fairness and transparency of the process, and selection of the most economically advantageous offer. The contract with the contractors will be based on FIDIC conditions for “Contracts for constructions” and shall also comply with the World Bank procurement policies and guidelines.

Construction Contract The associated works project will be divided in contract packages, which will be procured to international contractors due to the complexity of the system and to the lack of similar experiences among local contractors. Once completed and commissioned the system will be operated by the National Water Company, if functionally established, if not temporarily by CMWU until the functional establishment of NWC.

Tender process: the JV Lotti-AI (PIC) as Employer’s representative, in close coordination with PWA, will plan the construction activities and shall prepare the tender documents on contract packaging. The rationale to be applied will include coordinate different contractors works geographically, aim for single contract option were applicable, dissimilar nature are generally kept in separate contracts unless it can be easily subcontracted, etc.

Once finalized the Tender Documents, the Procurement Notice for the Prequalification of Contractors will be launched by PWA in accordance with World Bank Procurement Guidelines. The PIC shall perform, on behalf of PWA, the complete tendering process for each contract package, including pre-qualification, bidding, response and clarifications to bidders, organizing and conducting pre-bid meetings, bid evaluation, contract negotiations and finalization of the contracts. The PIC’s duty will consist in making comparable all the tenders in in accordance with the criteria proposed by PWA. It will be essential that the assignments will be implemented without obstacles and per the work plan. The evaluation process will start with the check of administrative docs and will include compliance with requirements, arithmetical correctness; respect of specifications, compliance with procedure for preparing BOQ, full tendering document etc. Once pre-awarded the contracts, the PIC will assist and advise PWA during contract negotiations with the prospective winner including:

If required, during the tendering period the PIC, with close coordination of PWA, will adjust time schedule during the contract negotiation. After a decision, has been reached on the award of the works contracts and on receipt of the written instruction by the Client, the PIC will prepare and issue “Work Orders” on behalf of PWA to the successful contractors. Preparation and issue of the “Work Orders” will be done in close consultation with the Client and will conform to normal PWA and Palestinian standards and procedures.

After contract signature, one originally signed document will be provided to PWA, MDTF, the Contractor and the PIC.

Construction and commissioning period: The Construction Supervision for all project components will be carried out by the PIC under guidance and supervision of, and in close co-ordination with PWA.

The most important activities under Construction Supervision can be summarized as follows:

- Administrative and Financial Project Management;
- Technical Project Management.

The different tasks are described in detail in the following sections. The main objectives of any construction supervision are to ensure:

- Contractors compliance with local requirements and contractual obligations
- Quality;
- Construction Schedule;
- Budget Control.

The PIC will support PWA during the whole Construction and during Defect Liability Period, attendance during factory acceptance tests and site supervision will be ensured by the PIC. The early involvement of PWA engineers within PWA office as well as on site will enable the best knowledge transfer during the whole execution phase and will familiarize them with the Associated Works until taking over after the operation service period by the Contractor.

10. Coordination and Management of Construction Materials Entry to Gaza Strip

The urgent need for construction materials to re-build Gaza prompted the United Nations to broker the Gaza Reconstruction Mechanism (GRM) in September 2014, a temporary agreement between the Government of Palestine and the Government of Israel that enables the entry of construction material into the Gaza Strip which is classified as ‘dual use’ by the Government of Israel.

The GRM relies on a central database within the PA’s Ministry of Civil Affairs (MoCA) to track the material required and delivered to the Gaza Strip. It has allowed the import at scale of material for both the entry of material for use by individuals in repairing their homes, as well as larger scale works, including larger scale infrastructure works those for the private sector and individuals.

The Office of the Special Coordinator for the Middle East Peace Process is the custodian of the GRM, while the United Nations Office of Project Services (UNOPS) supports the Materials Monitoring Unit (MMU) project which is responsible for carrying monitoring functions associated with the GRM in the Gaza Strip. This is facilitated using an online information management system (GRAMMS) and teams of engineers, quantity surveyors and stock monitors who collect the data, which serves as the basis for reporting that serves the Government of Palestine's information needs.

After bilateral meetings between the PWA and COGAT facilitated by the Office of the Quartet the parties have agreed that for the purposes of implementing the GCDP, the monitoring system will be separate from, but based upon the model of the GRM with adjustments as necessary in keeping with the scale and complexity of this project. To that end, the Government of Israel has not only recommitted on a number of occasions to this project, but has also issued a letter outlining the specific timelines for the approval of categories of dual use material.

- The GRM database system known as GRAMMS could be adapted to the project quite easily and be used in a similar way as in the GRM.
- Timelines (for example, for items being approved) must be defined and guaranteed, so expectations of deadlines for material to be arriving at the construction site could be defined up front and with a clear mechanism to follow up if they are not met.
- There are eight defined stages in the dual use import process: Identification, Clarification, Approval, Import Coordination, Crossing, Transportation, Storage and Usage. Each of the process flows should have to be designed in detail, defining clearly the parties accountable for each of the stages.
- Each time that something is not happening as expected, an ALERT should be raised to all the stakeholders. Depending on the nature of the alert, a specific process should be followed methodically to resolve it, to all parties' satisfaction.
- All dual use items should be classified into a small number of separate categories depending on risk. The monitoring requirements for each item should depend on its risk classification.
- For materials as chemicals, an effective mechanism must be implemented that can be applied beyond the timelines involved in the initial construction. For all chemicals that will require facilitation over many years, it is advisable to identify a precise list in advance and design a specific process for them. This process would ideally be more 'lightweight' given the regularity and predictability of the need. The security check phase of the standard item facilitation process should be removed, and a simple date-based coordination activity should become the norm.
- Heavy machinery can be facilitated for importation if areas of operation are defined in advance and GPS tracking devices fitted on them.

On the basis of that letter and subsequent discussions between the PWA and CoGAT (facilitated by the OQ), the operational model for the entry of material is now being developed.

Aside from the development of this new tool, given the Program's size and complexity, direct coordination between Israel's Coordination for Government Activities in the Territories (COGAT) and GOP line agencies will be essential. Recently PWA and COGAT have conducted important meetings to reactivate JWC and the draft agreement is under final discussions. PWA will work in the same spirit to enhance bilateral engagement and enhance the mechanism of materials access and monitoring for all the water sector projects, the big ones like GCDP and Associated Work Program..

11.Environment and Social Safeguards

The European Investment Bank and World Bank have agreed on a division of responsibility for the environment and social safeguards. Both IFIs will also coordinate closely with the Palestinian Environment Quality Authority, which will be responsible to issue the relevant permits and review the environmental and social assessment reports.

For the desalination plant, the plant site, the renewable energy sites and all Mediterranean Sea infrastructure and effects, the EIB ESIA guidelines has been applied. The ESIA was commissioned by

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the European Commission (EC), carried out by Acciona Ingenieria and completed to the satisfaction of the PWA, EC and EIB in October 2016. Total cost was 241,282 EUR.

The key environmental and social safeguard issues for the desalination plant site include:

- Land for the desalination plant, seawater intake pipes and brine discharge pipes and renewable energy infrastructure;
- Seawater intake methodology and infrastructure; and
- Sea brine disposal methodology and infrastructure.
- Impact on the marine environment (fauna and flora).
- Air and noise emissions
- Families displacement, habitat environment change, and work related issues
- Weak organizational and technical capacity

For the Associated Works, and all land-based parts of the overall Program (except the renewable energy sites) the World Bank ESIA guidelines has been applied and the assessment carried out by an independent and qualified firm (JV ECE & GV). The Assignment was concluded 31 December 2017 Total cost of this ESIA was about US\$70,000.

The key environmental issues for the Associated Works include:

- Impact on water supply and water quality;
- Risk of water pollution from storage, transmission, and or distribution;
- Impact on land use, including local agriculture activities;
- Impact on demand for wastewater treatment;
- Construction-related impact (noise, dust, debris, increased accidents);
- Impact on cultural physical resources;
- Impact to any natural (terrestrial only) habitat; and
- Disturbance of visual landscape, local infrastructure and local communities during construction phase

The main social impact to be investigated for the Associated Works will likely include:

- Safety hazards, especially on the workforce, children and the elderly;
- Social conflict due to short-term worker employment, as well as subsequent loss of employment for construction workers;
- Respect of local cultural norms and values by work force;
- Adverse sanitation and public health effects, as well as benefits anticipated; and
- Increased load on local services and supplies.