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Environmental and Social Impact Assessment (ESIA) & Environmental and Social Management Plan (ESMP)

For

Gaza Water Supply and Sewage Systems Improvement Project (WSSSIP) Phase 1 and Additional Financing (AF)

Final Report

September 23, 2014
AF revision prepared by PMU

Prepared By
Engineering and Management Consulting Center
EMCC

This Study prepared for the PWA/CMWU

CMWU Coastal Municipalities Water Utility

Funded By the World Bank

Environmental and Social Impact Assessment (ESIA)
&
Environmental and Social Management Plan (ESMP)

for
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List of Abbreviations

AF	Additional Financing
CAMP	Coastal Aquifer Management Project
CMWU	Coastal Municipalities Water Utility
EMCC	Engineering and Management Consulting Center
EA	Environmental Assessment
EMP	Environmental Management Plan
EQA	Environmental Quality Agency
LGU	Local Governing Unit
MOA	Ministry of Agriculture
MOH	Ministry of Health
MOL	Ministry of Labor
MOLG	Ministry of Local Government
MORA	Ministry of Religion Affairs
MOTA	Ministry of Tourism and Antiquates
PNA	Palestinian National Authority
PWA	Palestinian Water Authority
PMU	Project Management Unit
TOR	Terms of Reference
UNRWA	United Nations Relief and Works Agency
WSSSIP	Water Supply and Sewerage Systems Improvement Project
WHO	World Health Organization

Executive Summary

This Environmental and Social Impact Assessment and Management Plan was prepared for "Gaza Water Supply and Sewage Systems Improvement" to satisfy the World Bank Operational Policy 4.01 (January 1998). PWA as the owner of the project proposed the following components to be included in the project; rehabilitation and expansion of the water supply networks to support transmission of additional supply resources, and to improve the efficiency and operational management of the networks. The World Bank and Islamic Development Bank have cooperated and signed a principle agreement to finance the project components.

The project is categorized as a "B" project in accordance with the World Bank Operational Policy 4.01 (January 1998) and requires the preparation and implementation of an Environmental and Social Management Plan (ESMP). For category "B" projects, no major negative environmental impacts are envisaged since the project will invest in activities that support rehabilitation and improvements of the infrastructure.

The components studied are; (1) rehabilitation and expansion ofnetworks, (2) rehabilitation of water wells, (3) upgrading of DeirEl Balah desalination plant, (4) district meters replacement, (5) upgrading and maintenance of wastewater pumping stations, (6) construction of warehouse and workshop, & (7) technical and operational assistance for CMWU. Most of the project components are located in the middle and southern Governorates of the Gaza strip.

This ESIA/ESMF is being amended to include additional financing for WSSSIP, would help finance the cost associated with the scaling-up of project activities in response to circumstances arising during implementation. Specifically it would finance rehabilitating water and wastewater infrastructure damaged in Gaza as a result of bombardments and ground incursions by Israeli armed forces in the period of July 5 to August 26, 2014. The AF is requested by the Palestinian Water Authority (PWA) in consultation with the Gaza Coastal Municipal Water Authority (CMWU) to finance civil works, goods, consulting services, non-consulting services, training, operating costs and recurrent costs to: (i) conduct the most urgent repairs to damage water and wastewater systems in order to restore basic water and wastewater services; and (ii) restore and enhance the capacity of the CMWU to deliver these services. Overall damage to water and wastewater systems are assessed in the order of US$ 34 million, with the proposed operation covering approximately 40% percent of the required repairs.

The Assessment and Management Plan are prepared to ensure that the project is developed in a sound manner and does not cause negative impacts to the environmental resources and social issues. Also, to coordinate the policies, plans, programs and decisions of various parties involved in the project during implementation and monitoring. The assessment includes a survey of the local applicable regulatory standards and guidelines, description of the existing environment, potential impacts of the development, mitigation measures that needs to be implemented, required training program, schedule of implementation, and cost of implementing the recommendations.

The environmental resources and social issues that are of particular interest to the study are surveyed. Also, site visits to the project sites are selected to assist in describing, assessing the existing conditions, and summarizing the related potential impacts.

Different significance levels for the impacts are reported. Most of the reported impacts are either negligible or minor impacts. However, other impacts; moderate and major, are limited in nature and will be avoided by providing clear instructions and measures for the implementing and monitoring agencies.

The projects are highly welcomed by the community. In spite of some concerns and limited impacts for the community, the project includes several benefits. The benefits include improvement of living conditions, accessibility to infrastructure facilities and providing temporary and permanent job opportunities.

Potential impacts, mitigation measures, responsibility for execution, mitigation monitoring measures and methods, and monitoring and enforcement responsibility are presented.

In order to monitor the projects, coordinate the environmental training program and ensure that the activities are implemented in an environmentally sound manner, an environmental expertise will be established within PWA and CMWU. A permanent staff will be appointed, part time environmental advisor(s) contracted will support occasionally the CMWU staff through on-the-job training, and overseas programs will be conducted. The capacity building and training program focuses on the preparation and use of the appraisal/mitigation form, use of environmental guidelines, and implementation of the mitigation measures. Safety measures during construction and operation, proper waste disposal, and cleaning measures during construction are also included in the recommended training program.

The Management Plan includes hiring an environmental expert, capacity building and training programs, periodic environmental assessment for the project components.

In conclusion, the population of the Gaza Strip is increasing day by day, and as a result, the underground water resources

are getting worse and worse in terms of quality and quantity. In the light of this tragedy, rehabilitation and upgrading of the Gaza water resources are of utmost priority to the Palestinian community.

The Engineering and Management Consulting Center (EMCC) as a local consulting firm was commissioned to prepare the Environmental and Social Impact Assessment and Management Plan for the parent project, WSSSIP. All revisions pertinent to the AF have been done by the PMU.

الملخص التنفيذي

تم إعداد دراسة تقييم الأثر البيئي والاجتماعي وخطة الإدارة البيئية والاجتماعية لمشروع "إعادة تأهيل وتوسعة إمدادات المياه– غزة" وذلك لتلبية متطلبات سياسة العمل الخاصة بالبنك الدولي رقم (OP4.01 الصادرة في يناير 1998).

المشروع المقترح يشمل إعادة تأهيل وتوسعة شبكات إمداد المياه لدعم التزويد بمصادر إضافية، وتحسين كفاءة وإدارة عمل الشبكات. وقد تم توقيع اتفاقية مبادئ بين البنك الدولي والبنك الإسلامي للتنمية للتعاون في تمويل مكونات المشروع.

المشروع مصنف على القائمة "ب" حسب سياسة العمل الخاصة بالبنك الدولي رقم (OP4.01 و الصادرة في يناير 1998)، وهذا يتطلب إعداد وتنفيذ خطة إدارة بيئية واجتماعية (ESMP).حيث أن المشروع يستهدف الأنشطة التي تدعم إعادة تأهيل وتحسين البنية التحتية و من خلال الدراسة تبين أن مكونات المشروع لا يتوقع أن يصاحبها أي أثار بيئية سلبية.

مكونات المشروع التي سيتم دراسة تأثيرها البيئي و المجتمعي هي:

(1) إعادة تأهيل وتوسعة الشبكات، (2) إعادة تأهيل لآبار المياه، (3) تطوير محطة تحلية المياه في دير البلح مما يتيح إضافة كميات مياه جديدة للشبكة، (4) تبديل عدادات المياه المركزية، (5) تطوير وصيانة محطات ضخ مياه الصرف الصحي، (6) إنشاء مخزن وورشة صيانة لمعدات المياه و الصرف الصحي، و (7) مساعدة فنية وتشغيلية لمصلحة مياه بلديات الساحل لتمكينها من تقديم خدمة المياه و الصرف الصحي بأكمل وجه.

و تقع معظم مكونات المشروع في محافظات المنطقة الوسطى والجنوبية من قطاع غزة.

لقد تم تعديل الدراسه البيئيه و الإجتماعيه لمشروع WSSSIP "إعادة تأهيل وتوسعة إمدادات المياه– غزة" بناءاً على التوسع بأنشطه المشروع استجابه للظروف الناشئه أثناء تنفيذ المشروع. ويأتي التمويل الإضافي لتمويل اعاده تأهيل البنيه التحتيه للمياه و الصرف الصحي بغزه والتي تضررت أثناء القصف و التوغلات البريه الإسرائيليه من الفتره 5 يوليو الى 26 أغسطس 2014. كما أن الطلب التويل الإضافي جاء من خلال سلطه المياه الفلسطينيه بعد التشاور مع مصلحه مياه بلديات الساحل لتمويل أعمال اعاده البناء للمرافق المدمره، توريدات، أعمال استشاريه، أعمال غير استشاريه، تدريب، تكاليف تشغيل كما هو موضح بالبنود: (i) اجراء الإصلاحات الطارئه و المستعجله لمرافق المياه و الصرف الصحي من أجل استعاده خدمات المياه و الصرف الصحي الأساسيه; (ii) استعاده وتعزيز قدرات مصلحه مياه بلديات الساحل للقيام بخدمات المياه و الصرف الصحي. بينما تم تقييم الأضرار بقطاع المياه و الصرف الصحي بقطاع غزه بحوالي 34 مليون دولار امريكي مع تدخل طارئ من البنك الدولي بقيمه 40% من قيمه الأضرار .

تم إعداد و تنقيح التقييم وخطة الإدارة البيئية والاجتماعية لضمان تنفيذ المشروع بطريقة ملائمة بيئياً دون التسبب في أي آثار سلبية على المصادر البيئية والمجتمعية. كذلك تضمن الدراسة اتباع السياسات والخطط والبرامج والقرارات الخاصة بالمؤسسات المعنية بالمشروع خلال مرحلة التنفيذ والمتابعة. ويشمل التقييم و مراجعة السياسات والقوانين المحلية ووصف البيئة المحلية والآثار المتوقعة نتيجة تنفيذ المشاريع والإجراءات الوقائية اللازم تطبيقها أثناء التشغيل وبرامج التدريب المطلوبة لتشغيل المنشأت المائية و الصرف الصحي بدون التأثير على البيئة المحلية أخذين بعين الإعتبار كل المعايير البيئية لتنفيذ و تشغيل المنشأت المختلفة كما تتضمن الدراسة الجدول الزمني للتنفيذ بالإضافة إلى التكلفة المتعلقة بتطبيق توصيات التقييم والخطة و التي ستمول من محفظة مصلحة المياه.

تم دراسة الموارد البيئية والعناصر المجتمعية ذات الأهمية الخاصة بالنسبة للتقييم وخطة الإدارة البيئية من خلال خبرات المكتب الإستشاري و لقاء الناس المعنية

بالمشاريع المختلفة بناءاً على اللجنة التوجيهية للمشروع و هم:

سلطة المياه الفلسطينية، مصلحة مياه بلديات الساحل، سلطة جودة البيئة، وزارة الصحة، اللجان المجتمعية من مخاتير و ناس ذو علاقة بالمجتمع المحلي من خلال مؤسسة ذاكر كما إستأنست اللجنة التوجيهية بأراء الناس القريبين من المشاريع التي ستنفذ بجوارهم من خلال الزيارات الميدانية لفريق العمل و مصلحة المياه. وتم أيضا ترتيب زيارات ميدانية لمواقع المشاريع للمساعدة في وصف وتقييم الواقع الحالي وتحديد الآثار المحتملة.

معظم الآثار التي تم رصدها هي إما آثار ضئيلة أو طفيفة. ومع ذلك، يمكن تجنبها من خلال توفير تعليمات وتدابير واضحة للمؤسسات المنفذة والمراقبة لجزئيات المشروع إما أثناء التنفيذ أو التشغيل.

و على حسب الإستطلاع المجتمعي التي تم ميدانياً لإستقصاء أراء المجتمع المحلي و الناس القاطنين بالقرب من المشاريع المقترح إقامتها وجدنا ترحاب كبير بمكونات المشروع لما يعود على المواطن بالفائدة من خلال تنفيذ المشاريع المقترحة و خصوصاً تلك المتعلقة بتطوير محطات الصرف الصحي لما يعانوه من مشاكل أثناء الشتاء عندما لا تكون تلك المحطات قادرة على تصريف كمية المياه العادمة و مياه الأمطار مما يشكل خطراً على الناس القاطنين بجوار تلك المحطات و تعريضهم لخطر تسريب مياه المجاري للمنطقة المجاورة. كما إشتملت أراء اللجنة التوجيهية على أهمية تزويد السكان بمياه صالحة للشرب من خلال محطات تحلية أو من خلال زيادة عدد ساعات ضخ المياه بالشبكة لتصل للجميع أو من خلال حفر أبار جديدة لتدعيم منظومة توزيع المياه بطريقة عادلة. كما . يشمل المشروع على مجموعة من المنافع المجتمعية منها تحسين مستوى المعيشة، وتسهيل الانتفاع بمرافق البنية التحتية، وتوفير فرص عمل مؤقتة ودائمة من خلال تنفيذ المشاريع بالمقاولين المحليين.

كما وضحت الدراسة الآثار البيئية المتوقعة و كيفية تجنبها والإجراءات الوقائية اللازم إتخاذها من مالك المشروع مع تحديد عناصر المراقبة الدورية أثناء التنفيذ و التشغيل لاحقاً علماً بأن مسئولية المراقبة لتنفيذ الخطة قد تم تحديدها و تحديد الجهات المسئولة عن المراقبة للتأكد من تطبيق إجراءات السلامة و الوقاية لتجنب أي أخطار بيئية تنجم عن ذلك.

ولمتابعة المشروع وتنسيق البرنامج التدريبي وضمان تنفيذ المشروع بطريقة ملائمة بيئيا، يلزم بناء خبرة في مجال البيئة من خلال كوادر مصلحة مياه بلديات الساحل كمرشد بيئي لدعم طاقم إدارة المشروع حسب الحاجة و لإعتماد أسلوب التدريب الميداني أثناء العمل. كما يجب أن يشتمل برنامج التدريب على بناء القدرات اللازمة و التركيز على إعداد واستخدام نماذج تقييم الإجراءات الوقائية وإتباع الإرشادات البيئية وتطبيق الإجراءات الوقائية. كما يشكل هذا البرنامج احتياطات السلامة المهنية خلال مرحلة الإنشاء والتشغيل والطريقة السليمة للتخلص من النفايات وإجراءات النظافة خلال مرحلة الإنشاء.

وبصورة ملخصة فإن سكان قطاع غزة في تزايد مطرد يوما بعد يوم، ونتيجة لذلك تزيد كميات الطلب على المياه بإزدياد السكان حيث أن المصدر الوحيد للتزود بالمياه هو الخزان الجوفي و كنتيجة لعدم إتزان كميات السحب من الخزان الجوفي مع كميات الترشح فتولدت مشكلتان أولاهما إنخفاض منسوب المياه الجوفية لأكثر من 13 متر ببعض مناطق و الثانية هي زيادة ملوحة المياه نتيجة تداخل مياه البحر بجانب بعض الملوثات الأخرى كإرتفاع منسوب النترات ببعض المناطق نتيجة الإستخدام المفرط للمبيدات و الأسمدة الزراعية. فإصبحت مياه الخزان الجوفي بقطاع غزة لا تلبي الإحتياجات الأساسية لمياه الشرب إلا إذا تم عمل إدارة سليمة و مدروسة نحو النهوض بقطاع المياه من إيجاد مصادر بديلة عن الخزان الجوفي و عمل تطوير لبعض الابار بحيث تلبي إحتياجات الناس مع الإحتفاظ بنوعية مياه جيدة بالخزان الجوفي من خلال تقليل كميات سحب المياه و توزيع الابار جغرافياً لضمان وصول المياه للجميع. وفي ضوء هذه المأساة، فإن إعادة تأهيل وتطوير مصادر المياه في غزة هي أولوية قصوى للمجتمع الفلسطيني.

Water is Life

Over the World, safe drinking water is essential to humans and other life forms. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack accesses to adequate sanitation (MDG - UN, 2008).

The 2011 survey results showed that 1.8% of households in the Palestinian Territory live in housing units connected to a water network, an increase from 84.8% in 1999. This percentage varies according to locality type: 93.8% of urban households, 79.8% of rural households, and 97.7% in Camps. The monthly average household consumption of water in the Palestinian Territory was 23.8 cubic meters; 23.6 in the West Bank and 24.3 in the Gaza Strip, (PCBS, 2011).

1. INTRODUCTION

The Gaza Strip is located on the extreme western edge of a shallow coastal aquifer with a total area of 365 km^2 some 41 km in length and 7 to 12 km in width and a total population of about 1.71 million inhabitants (MOI, 2012).

Gaza Strip is one of the semi-arid areas where rainfall is falling in the winter season only, and the water resources in Gaza are limited. The coastal aquifer is considered the only source of fresh water for the Palestinian population in the Gaza Strip for all kind of human usage in the Gaza Strip (domestic, agricultural and industrial).This source has been faced a deterioration in both quality and quantity for many reasons, e.g. low rainfall, increase the urban areas which led to a decrease in the recharge quantity to the aquifer, also increasing the population will deplete the groundwater aquifer and led to seawater intrusion in some areas as a result in pressure differences between the groundwater elevation and sea water level. Gaza has a water crisis and faces serious challenges for future sustainability of water resources (CMWU, 2011).

Considering the amount of rainfall quantity is about 110MCM/year, where part of that is feeding the groundwater aquifer through natural recharging process. The recharge rate is varying in accordance to the soil porosity and the thickness of the unsaturated zone that overlaying the groundwater aquifer. Previous studies showed that the recharge rate is about 25% in the low porous area like the eastern part of the Gaza Strip, and about 75% in porous area where the sand dunes are still found in the north and south of the Gaza Strip. Also the rainfall intensity plays an important role in the recharge quantity to the aquifer. The long term average recharge is considered to be 40% of the whole rainfall quantity (PWA, 2005). In other words the recharge amount from rainfall to the groundwater aquifer is about 45 MCM / Year.

Water and wastewater services have suffered significantly during the recent twelve years during the Palestinian – Israeli Conflict. This has severely affected the lives of the people of Gaza and added to their suffering. Damages were incurred to a wide range of facilities and impacted almost all types of water and wastewater facilities. This includes damage to water and wastewater pipes and pump stations; water production wells and storage reservoirs; wastewater treatment plants; electrical control panels; electricity supplies; administrative and operation buildings and stores; and utility vehicle and trucks.

The Coastal Municipalities Water Utility (CMWU) is responsible for the delivery of water and wastewater services for the entire population of Gaza. The Gaza Emergency Water Project II (GEWP II) financed by the World Bank has played a

crucial role in enabling the CMWU to operate efficiently and effectively finance all emergency interventions to maintain services. More severe damages still require concerted efforts, resources, and time to bring the systems back to their original condition.

The total length of water distribution networks in the Gaza strip is about 800 kilometers with diameters vary from 2 to 20 inches according to the purpose used for. The water networks coverage in the Gaza Strip with reference to the number of beneficiaries has reached (98% of the Gaza Strip). The overall rate of water distribution in Gaza is between 70 to 85 liter per capita/ day. While the ratio of water distribution networks efficiency is about 63% including the illegal networks and leaks. The number of the water services subscribers is around 120 thousand subscribers distributed over the Gaza governorates. Over the previous years, the sanitation sector was, to some extent, neglected and this is due to the frequent closures of Gaza crossing in addition to the limited funding for sanitation sector. The wastewater network coverage of this sector has reached 70.7% distributed amongst the Gaza Strip governorates. In the Gaza Strip, there are three main treatment plants and one temporary plant (CMWU, 2011).

This project would provide financing to support the rehabilitation and expansion of basic water supply infrastructure in Gaza as well as capacity building and operational assistance to CMWU . The proposed changes in the AF which affect the ESIA/ESMP are: (i) additional of supplemental reconstruction activities, specifically restructuring of Component 1 (Improving Water Supply and Wastewater Facilities) to include additional activities for restoring damaged water and wastewater systems; as well as (ii) an extension of the closing date by 18 months from June 30, 2016 to December 31, 2017.

1.1. Source of Funding

The proposed project appeals to a main pillar in the Palestinian Authority's National Development Plan 2011-2013, designating more than US$500 million for reconstruction and rehabilitation of infrastructure (including water and wastewater) in Gaza. The World Bank's assistance program to the West Bank and Gaza for 2011-2012 amounts to US$75 million. The discussions between the World Bank and Islamic Development Bank (IsDB) have resulted in a principle agreement to cooperate in financing these projects, a start of a strategic partnership and cooperation for the reconstruction of Gaza.

Where the upgrading in Deir El Balah Desalination Plant is not part of the parallel finance between the World Bank and IsDB but it is being included in this study because the desalinated water will be used for distribution through water tank which will be financed through the parallel finance between the World Bank and

IsDB. On the other hand a large project for regional desalination will be financed by UNICEF and EU, which they will study the environmental impacts and monitoring plan associated. Taking into account the proposed regional desalination plant and the existing Deir El Balah desalination plant since they are within the same vicinity and they will share the brine rejection pipe after a re-design is considered (at least 500m in the sea). The proposed AF will be financed by World Bank managed trust funds currently composed of contributions by the Swedish International Development Cooperation Agency (SIDA), the Representative Offices of the Denmark, Finland, Palestinian Authority, the Agence Française de Développement (AFD), with the Netherlands and Norwegian Representative Offices considering contributions. As all AF co-financing will be channeled through the existing multi-donor trust fund, the World Bank will continue to supervise all safeguards aspects of the AF, including compliance, monitoring, and reporting, according to World Bank safeguards guidelines. IsDB as a parallel financier to WSSSIP is not active in the AF.

1.2. The ESIA and ESMP, including AF Aspects

The PMU-PWA commissioned the Engineering and Management Consulting Center (EMCC) to prepare the Environmental and Social Impacts Assessment (ESIA) and its Environmental and Social Management Plan (ESMP) for the "Gaza Water Supply and Sewage Systems Improvement" to satisfy Palestinian Environmental Law and World Bank safeguards policies; the World Bank Operational Policy 4.01 (January 1998). Given the above justification, this project is categorized as a "B" project in accordance with the World Bank Operational Policy 4.01 (January 1998) and requires the preparation and implementation of an Environmental and Social Management Plan (ESMP).

No major negative environmental and social impacts are envisaged since the project will invest in activities that support rehabilitation and improvements of infrastructure and service delivery and provide an improvement and systematic operational and maintenance systems.

Construction-related impacts include both rehabilitation of existing water infrastructure as well as restoration of previously-new infrastructure inthe form of reservoirs, water booster stations, pumping stations, water mains, transmission lines, and water wells. Replacement of asbestos pipes will be either by UPVC and/or Steel pipes, where the asbestos pipes will be abandoned and stay in the ground since it is very hard to remove those pipes from the ground. The proposed infrastructure, i.e., rehabilitation and re-allocation of the water wells are expected to have an overall positive impact on the localwater balance, including groundwater. Potential negative impacts that are localized and limited in nature will be avoided by providing instructions in the contract document which

specifically address environmental issues in a manner acceptable to the World Bank Manuals, as well as following Good Management Practices during construction and service delivery.

Construction debris removal, now ongoing and largely guided by UN agencies, is expected to have been completed at each site prior to WSSSIP interventions Some backfilling of buried pipes might require gravel, but this will be new materials according to technical specifications, as verified by the supervising engineers of the CMWU.

Similarly, UN Mine Action Service (UNMAS) as well as other humanitarian agencies, are responsible for the safe removal of unexploded ordnances (UXO) and other explosive materials. Written documentation demonstrating completion of UXO clearance will be required as part of sub-project pre-construction screening processes prior to commencement of civil works, as will be amended in relevant sections of the Operations Manual

2. PROJECT DESCRIPTION

This project would provide financing to support the rehabilitation and expansion of basic water supply infrastructure in the Gaza Strip as well as capacity building and operational assistance to Coastal Municipalities Water Utility (CMWU).

2.1. Project Objectives

The network investments financed by the Project will achieve the following objectives:

i. Rehabilitate and expand capacity of the water supply networks to support transmission of additional supply resources,

ii. Restore operations of the networks to acceptable quality standards, and,

iii. Improve the efficiency and operational management of the networks while operating under stressed water supply conditions.

The proposed Project is very important to the Gaza Strip despite its modest size when compared to the enormous investment needs required to improve water supply. The Project is critical to improving the deteriorated water supply networks and facilities, to boost the level of service efficiency, while expanding its capacity to allow for the transfer of any additional supply resources that may become available to the Gaza Strip.

2.2. Project Components

The project to be implemented will include the following components1.3:

Component (1): Rehabilitation and Expansion of Water Supply and Sanitation facilities	**Subcomponent 1 (1.1.1): Networks Rehabilitation, Expansion, and Reconfiguration.**
(1) Construction of two groundwater reservoirs of 1500m^3 capacity each, complete with water booster stations to serve both Khoza'a and Abassan Al Kabira areas in Khan Younis governorate in order to replace the damaged reservoirs .Also, the items shall include for structural rehabilitation and repairs of partially damaged ground water reservoirs in Al Musader (350m^3) ,Wadi Al Salqa (350m^3), and Al Moghrakah (3000m^3) located in the Middle Governorate and electromechanical rehabilitation and repair of partially damaged Al Rahma water booster station located in existing Rahma 5000m^3 ground water reservoir in Khan Younis The reservoirs will be connected to the major well fields supplying the middle and southern governorates, will be used to blend the water supply from the wells and desalination plants to improve the water quality, and will improve the performance of the networks and help the utility cope with demand and improve the quality of service .	

Component (1): Rehabilitation and Expansion of Water Supply and Sanitation facilities	Subcomponent 1 (1.1.1): Networks Rehabilitation, Expansion, and Reconfiguration.

(2) Replacement of all damaged carrier water lines including all connections, valves and plumbing fixtures requirements and upgrading of water networks with all associated household connections .This will cover UPVC piping and ductile pipes wherever applicable, including 4 km of 14" diameter pipes, 5 km of 12" diameter pipes, 8 km of 10" diameter ,16 km of 8" ,6",4",2" diameters. Also, the works and supplies shall include for procurement of two leakage detection vehicles to establish leakage detection campaigns required to reduce the leakage.

Component (1): Rehabilitation and Expansion of Water Supply and Sanitation facilities	Subcomponent 2 (1.1.2): Rehabilitation of Water Wells.

The component includes the upgrading of 39water wells, reconstruction of 2 totally damaged wells in Deir El Balah due to IDF operation and the re-allocation of 5 additional wells in the middle and southern governorates to improve yield, reduce specific energy demands and unit production cost, and reduce stress to the aquifer, as well as enable operation and maintenance of the new 5 wells location. .
This subcomponent will be finance through World Bank and IsDB as detailed in procurement plan of the project

Component (1): Rehabilitation and Expansion of Water Supply and Sanitation facilities	Subcomponent 3 (1.1.3): Restoration of DeirElBalah Desalination Plant.

Drilling and construction of two wells to replace completely damaged Abu Hamam and Abu Naser wells, each of 60m3/hr production capacity in Deir Al Balah area .Also, 8 partially damaged wells shall be repaired and rehabilitated including civil and electromechanical works. The works shall cover also electromechanical rehabilitation of Al Salam Brackish water desalination plant of 50m3/hour production capacity in Rafah which was partially damaged

Component (A): Rehabilitation and Expansion of Water Supply and Sanitation facilities	Subcomponent 4 (1.1.4): Environmental mitigation measures and monitoring

This will enhance CMWU environmental monitoring programs established by CMWU for both water and wastewater services, where additional laboratory equipment and kits should be procured to enhance the CMWU laboratory capacity .Also, several additional activities and mitigation measures should be carried out to maintain both safe dumping of sludge generated from wastewater treatment plants and safe effluent wastewater to the sea outfalls which were partially damaged during war . Also, water quality monitoring program shall be established at customers household points where actual blending is taking place along with the water distribution networks.

Component (1): Rehabilitation and Expansion of Water Supply and Sanitation facilities	Subcomponent 5 (1.1.5): Upgrading and maintenance of wastewater pumping stations.

Carry out comprehensive cleaning and desludging of 6 anaerobic wastewater lagoons located at 3 treatment plants in North, Rafah and Khan Younis plants. This will improve the performance of the plants by increasing the detention time for anaerobic lagoons. Also, the works shall include electromechanical rehabilitation of mechanical surface aerators located in Khan Younis and North WWTP and rotary arm for bio tower in Rafah, WWTP including effluent water pumping stations with all associated electrical and mechanical installations requirements.

Component (1): Rehabilitation and Expansion of Water Supply and Sanitation facilities	Subcomponent 5 (1.1.5): Upgrading and maintenance of wastewater pumping stations.
Replacement and upgrading of various wastewater gravity pipelines of different sizes with all associated manholes requirements which are damaged during the war periods. Also, it will include electromechanical rehabilitation and repairs of 10 wastewater pumping stations including the replacement of damaged electrical switchboards, generators, pressure manifolds and its associates, pumps.	

Component (2)Utility Capacity Building and Operational Support	Subcomponent 2 (2.2.1): Rehabilitate the administration and operational buildings of the CMWU
Procurement of 30 PCs ,10 printers ,5 photocopiers, scanners and other IT equipment which are partially damaged at different CMWU regional offices.	

Component (2): Utility Capacity Building and Operational Support	Subcomponent 2 (2.2.2): Purchase chlorine (extra demand to disinfect the entire water networks) and chemicals , and fuel
Additional requirements of chlorine disinfection solution required to chlorinate the targeted reservoirs again ,water supply tanks, water networks and bring them safely again to the services mode .Also, additional chemicals for desalination plants are required to secure the operation of 9 brackish water desalination plants each of 50m3/hr production capacity and one sea water desalination plant of 115 m3/hour .Diesel fuel quantities of at least 250 000 liters has to be made available to cover the deficits required for standby generators operated for more than 12 hours a day after the complete damage of Gaza electricity generation plant .	

Component (2): Utility Capacity Building and Operational Support	Subcomponent 3 (2.2.3): Rehabilitate the administration and operational buildings of the CMWU; purchase vehicles and heavy machinery, including loaders, excavators, and maintenance vehicles.
Structural and civil works repairs requirements for CMWU Headquarters, regional and operational offices. Also, procurement of two loaders, two backhoes, one excavator, two trucks and five equipped maintenance vehicles. Comprehensive repair of 10 partially damaged service water and wastewater vehicles with all associated spare parts.	

The WSSSIP project, including the AF, includes more than 66 subprojects. Figure 1 shows the distribution of the project components.

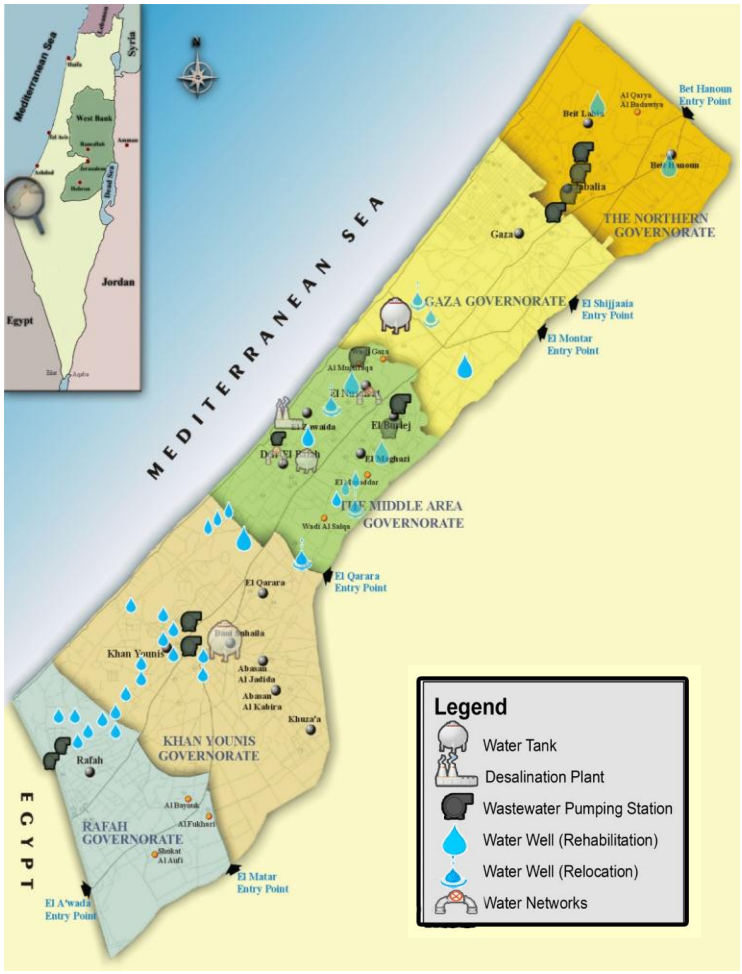

Figure 1: The Distribution of the Project Components in the Gaza Strip (Gaza Water Supply and Sewage Systems Improvement)

2.3. Project Phases and Processes

The project consists of design, construction and operation phases. Understanding of these phases and detailed activities is necessary.

Design: The project is now under conceptual design stage. The design process does not include any activity that could endanger the environment but the design should consider the measures required to mitigate the negative impacts of activities during other phases; construction and operation.

Construction: The construction phase includes the construction of the new networks, rehabilitation of water wells, and supplying the equipment and tools. The construction phase also includes some buildings for the different facilities, such as operating rooms for wells and pumping stations, and new building for the desalination plant.

Operation: The operation phase includes all the processes of operation and maintenance of the targeted facilities.

3. ESIA &ESMP PROCESS AND METHODOLOGY

The project is categorized as a “B” project in accordance with the World Bank Operational Policy 4.01 (January 1998) and requires the preparation and implementation of an Environmental Management Plan (EMP). According the specific components of the project, an Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) are required. For category “B” projects, no major negative environmental impacts are envisaged since the project will invest in activities that support rehabilitation and improvements of infrastructure. Potential negative impacts that are localized and limited in nature will be avoided by providing instructions in the contract document which specifically address environmental issues according to the World Bank Manuals. For the Additional Financing activities, they are technically and geographically similar in scope to the parent project such that the ESIA needs no additional work.

3.1. Objectives and Features of the ESIA

Prior to project appraisal, an Environment and Social Impact Assessment (ESIA) will be conducted in order to:

- Ascertain the possible environmental and social impacts of the infrastructural subcomponents;
- Enhance the social aspects of the proposed project.
- Detail the possible environmental and social impacts of the water meter installation, subsequent bill collection, and system efficiency;
- Construct an environmental and social management plan (ESMP) to manage, mitigate, and monitor any possible negative impacts during the construction and operational phases of the project;
- Assess the capacity of the implementing party to implement the ESMP;
- Provide information for decision-making on the environmental consequences of proposed actions; and
- Promote environmentally sound and sustainable development through the identification of appropriate enhancement and mitigation measures,and

- Suggest any capacity building needs necessary to fill gaps.

3.2. Scope of the Environmental Assessment

The ESMP consists of the following components:

- Task 1: Description of the Proposed Project,
- Task 2: Description of the Environment,
- Task 3: Presentation of Legislative and Regulatory Considerations,
- Task 4: Determination of the Potential Environmental Impacts of the Proposed Project,
- Task 5: Determination of the Potential Social Impacts of the Proposed Project,
- Task 6: Development of an Environmental and Social Management Plan (ESMP),
- Task 7: Conduct Stakeholder Consultations.

3.3. Data Collection

The study team reviewed the available relevant documents including environmental studies, design reports, quality tests as well as state standards, policies and regulations.

In the planning stage, only the existing reports have been reviewed. The general considerations on the future situation have been made concerning population projections, water demand projections, wastewater treatment capacities, and required measures. Thus, conclusions reached in this report will need to be reviewed on a regular basis, in order to ensure that any new project components or revisions of the present planning are assessed in a similar manner.

Among the available resources the following documents were collected:

- In close coordination with the PWA, CMWU and municipal representatives, site visits were arranged to the proposed project sites. The site visits were very essential in order to draw a comprehensive overview about the project site and its surrounding environment.
- Collected and reviewed existing studies conducted on the environmental situation in the Gaza Strip specifically the environmental profile, the

Environmental Strategy and Action Plan, other environmental assessment studies and environmental management plans.

- Data on aquifer conditions, pumping wells, rainfall data, losses from utility pipelines, existing water quality.
- Data on best practices, potential impacts and mitigation measures in neighborhood countries.
- Reviewing the environmental laws, strategies and actions plan that were adopted by the Environmental Quality Authority (EQA).
- Information on the environmental attributes of the study area. Infrastructure, transportation links, and utilities are documented from available reports produced by local relevant institutions.
- Photos were taken to different locations.
- Public participation
- A brief ecological survey was also conducted to update data on the flora, fauna, and habitats of the area.

3.4. Consultation

The study team conducted consultation with different groups and entities in order to collect the necessary information and complete the projects description and their impacts; facilitate consideration of alternatives, mitigation measures and tradeoffs; reduce conflict through the early identification of contentious issues; provide an opportunity for the public to influence project design in a positive manner (thereby creating a sense of ownership of the proposal); improve transparency and accountability of decision-making; and increase public confidence in the EIA process. The consultation activities included:

i. Interactive exchange between the EMCC team , the PWA and CMWU staff encompassing shared analysis and agenda setting and the development of understood and agreed positions on the proposal and its components and impacts. Two main meetings were carried out, one for PWA members and the other for CMWU concerned staff. In both meetings there were representatives from other institution (i.e. in PWA meeting, some of CMWU staff were available in the meeting and vise versa). The total number involved were 8 members from PWA and 8 other members from CMWU.

ii. Meetings with mayors ,municipalities' local engineers and municipal staff to arrange site visits to project locations and understand the local environment

and community behavior. Three mayors were involved (Rafah, Khan Younis and Deir El Balah), while another seven members of the municipal staff were engaged in the stakeholder meetings as it will be detailed in chapter 6.

iii. Individual interviews with the local people residing around the project components to get a sense of their experience being exposed to such facilities and take notes of their suggestions and solutions. Group discussion and semi-focus groups with local community members at project locations were carried out, where more than 30 members were met in those different groups. Table 7A shows the stakeholder groups summary for the impact of the project findings as well as Annex V shows a sample of those questions raised for nearby residents around the wells re-allocation and waste water pumping stations rehabilitation. Also chapter 6 shows the Environmental and Social findings.

iv. Individuals stakeholders have been selected to represents all the community expertise, some of them are teachers (different level of education" elementary, secondary and universities teachers"), others are engineers and others are normal people with a special focus on women's at home, others are workers and to gather all those multi-experience people, Zakher Association for improving women capabilities help the consultant to invite those peoples as will explained in chapter 5 (section 5.3).

v. Meetings and discussion with water/wastewater experts, lap technicians, infrastructure engineers, and other experts to solicit data about specific issues from all institutional (i.e. PWA, CMWU, EQA and MOH).

vi. Meetings and correspondences with governmental entities and stakeholders (PWA, EQA, MOH, ...etc) to collect their opinions and comments about the project components, and potential impacts.

3.5. Baseline and Impact Assessment

Assemble, evaluate and present relevant baseline data on the environmental and social characteristics of the study area to cover the following.

- *Physical environment:* For the water metering sub-component, the physical environment to be treated is the entire service area. For the water wells sub-component, the physical environment to be treated is the well site and neighboring affected catchment area. For the other areas, the physical environments to be treated are the current sites, expansion sites, as well as those adjoining sites to be affected by adverse and/or beneficial effects, both on land and in water. With regards to sand, seawater, and living marine

species sampling specific to the desalination plant, the consultant will collect sand samples settled close to the desalination egress. Similarly, seawater is to be collected and tested. Any freshly-caught living marine species caught near the site are to be tested.

- *Biological environment:* terrestrial communities in areas affected by construction, facility sitting, land application or disposal; aquatic, estuarine or marine communities in affected waters; rare or endangered species; sensitive habitats, including parks or reserves, significant natural habitats; species of commercial importance in land application sites. This description section is particularly relevant with respect to the expansion of the desalination plant.

- *Social environment:* Present and projected populations; present land use and ownership; public health issues specific to water supply and water quality; willingness to pay for water; cultural heritage sites on or near proposed infrastructure interventions.

This Study, ESMP, evaluated the environmental impacts of the project during all development stages; Design, Construction and Operation Stages. The potential impacts of each project are described and evaluated for the construction and post-construction stages of the project in order to identify the mitigation measures which should be stated in the project contract documents and must be enforced by the responsible authorities.

3.6. Development of the Environmental and Social Management Plan (ESMP)

Based on the collected data, preliminary design, reports, site visits, interviews with involved staff and consultant's experience, an Environmental and Social Management Plan (ESMP) was developed for the project, which includes feasible and cost effective measures to minimize or mitigate negative impacts and the actions to be adopted during the different phases of the project. Also, the ESMP is prepared to integrate environmental concerns into the design and implementation of the proposed projects. The ESMP includes three basic components: institutional component, environmental mitigation, and environmental monitoring.

The cumulative potential adverse environmental effects without these projects, however, can be substantial, particularly as they relate to water quality, the ecology, and impact on the regional socioeconomic and socio-cultural framework.

The projects implementation and operation should mitigate the risks to humans, the impacts on ecology and natural resources. All potential environmental effects and measures to mitigate these effects must be adequately identified in a

comprehensive environmental Management Plan as outlined in the subsequent sections.

3.7. Legislations and Standards

A detailed survey about the organizational Structures, the relevant draft or adopted laws, standards and policies is given in Annex (II). Following the Autonomy Agreement between the Palestinian Liberation Organization (PLO) and Israel in 1994, the Palestinian Water Authority (PWA) wasestablished in January 1996. Until November 1996 the governmental organization basically consists of two levels: central and local levels. In November 1996 a new intermediate level was introduced as Governorate, thus three levels were established: central, regional and local governments. Now, in the Gaza Strip, there are five Governorates: Northern, Gaza, Middle, Khan Younis, and Rafah. All ministries were announced in 1994 and, since that time, a major effort has been made to consolidate these ministries and to develop administrative capacity.

The planned project targeted mainly the middle and southern governorates. The current institutional framework has been reviewed concerning related ministries, governmental and non-governmental organizations. The organizations concerned with the planned project have been consulted and their regulations, standards, and requirements were thoroughly studied. Also the future plans for water management in the Gaza Strip through Coastal Management Water Utility were considered.

The following are the main standards and laws that have been considered for the study:

- The environmental assessment of the project was conducted according to the World Bank Operational Policy OP 4.01.
- Environmental laws, strategies and actions plan that were adopted by the Environmental Quality Authority (EQA).
- Environmental Quality Authority (EQA), Environmental Assessment Policy, Gaza, 2000.
- Environmental Quality Authority (EQA), Environmental Law, Gaza, 1999.

4. ENVIRONMENTAL ISSUES AND BASELINE INFORMATION

This section assembles, evaluates and presents relevant baseline data on the environmental characteristicsof the study area. The project includes several components distributed in the Gaza Strip and mainly in the middle and southern areas. Most of the environmental issues and resources in the Gaza Strip are similar and there are no major variations. For this project which includes more than 60 activities, the ESIA presents the baseline environment for the whole Gaza Strip environment. The specific issues are discussed in more details.

4.1. Location and Topography

The Gaza Strip is a narrow coastal strip along the Mediterranean Sea, in southern part of Palestine at Coordinates (31°25′N 34°20′E). Figure 2 shows the location of Gaza Strip in the world.

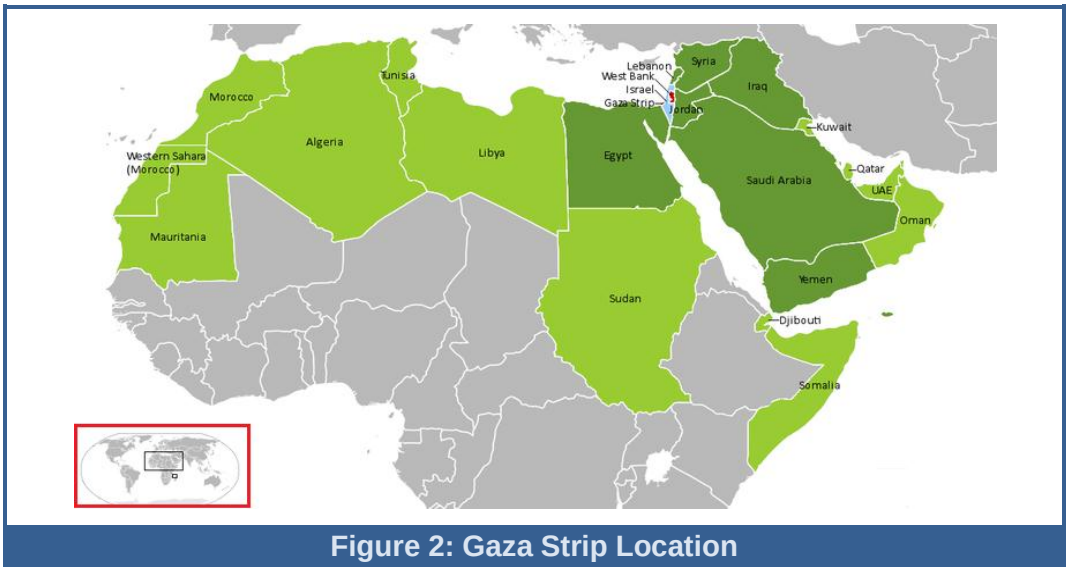

Figure 2: Gaza Strip Location

The total area of Gaza Strip is about 365 km^2. It has a 51 kilometers border with Israel, and an 11 km border with Egypt. The Gaza Strip includes five Governorates: Northern, Gaza, Middle, Khan Younis, and Rafah. The following Figure shows map of Gaza Strip and Governorate boundaries.

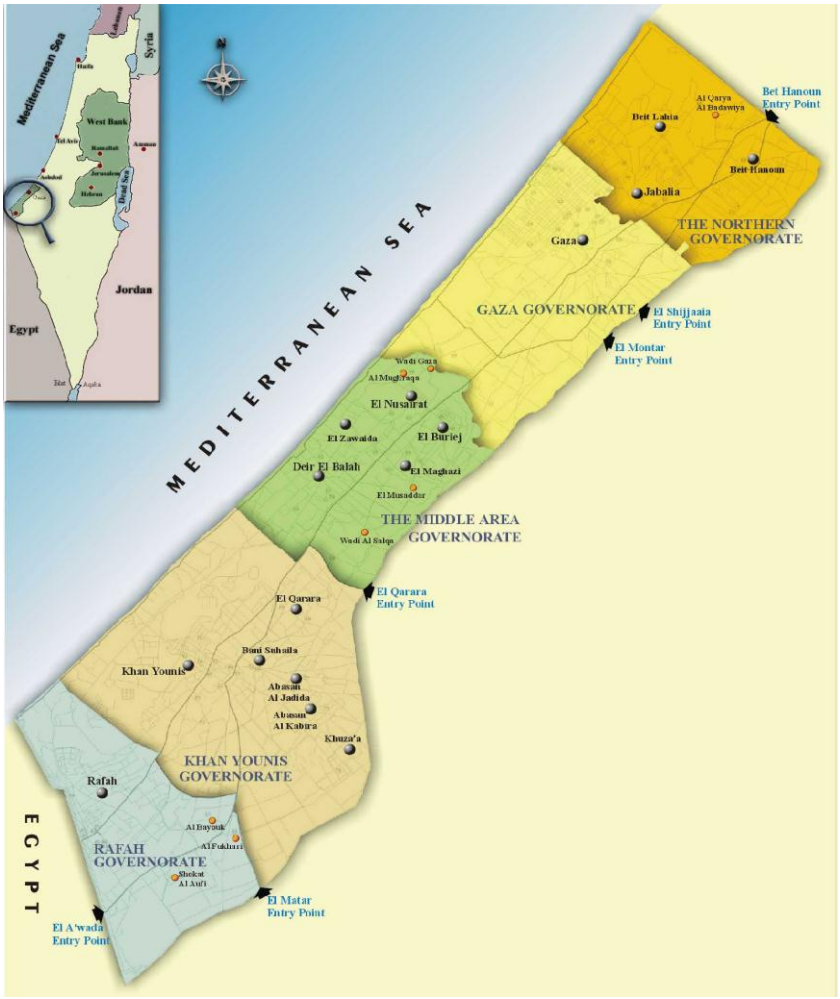

Figure 3: Gaza Strip Governorates

Gaza is located on the coast of the Mediterranean Sea, north of the Sinai Peninsula and southwest of Jerusalem, on a road that links Egypt with central Israel. Gaza Strip forms part of the coastal foreshore plain bordering the Hebron Mountains in the north-east, the Northern Negev desert in the south-east, and the Northern Sinai desert in the south. It is situated in the shadow of the Nile Delta and Northern Sinai. The curve in the coastal starting from El Arish towards north of Gaza. The topography of the coastal plain is determined by the exposure of Kurkar ridges. The age of these ridges increases from the coastline eastwards. In the north of the Gaza Strip there are four ridges: the coastal ridge (20m MSL), the Gaza ridge (up to 50 m MSL), the El Muntar ridge (80m MSL), and the Beit Hanoun ridge (90 m MSL). The ridges are separated by deep depression (20-40m MSL) with alluvial deposits. There is evidence that there are at least three to four younger Kurkar ridges on the continental shelf, parallel to the present coastal line and several kilometers offshore.

Kurkar ridges of calcareous sandstone appear all along the coast positioned in a south-west-northerly direction parallel to the coast. The influence of these Kurkar

ridges on sedimentation and erosion processes is however limited to local disruption of waves and currents. Figure 4 presents the Gaza strip topography.

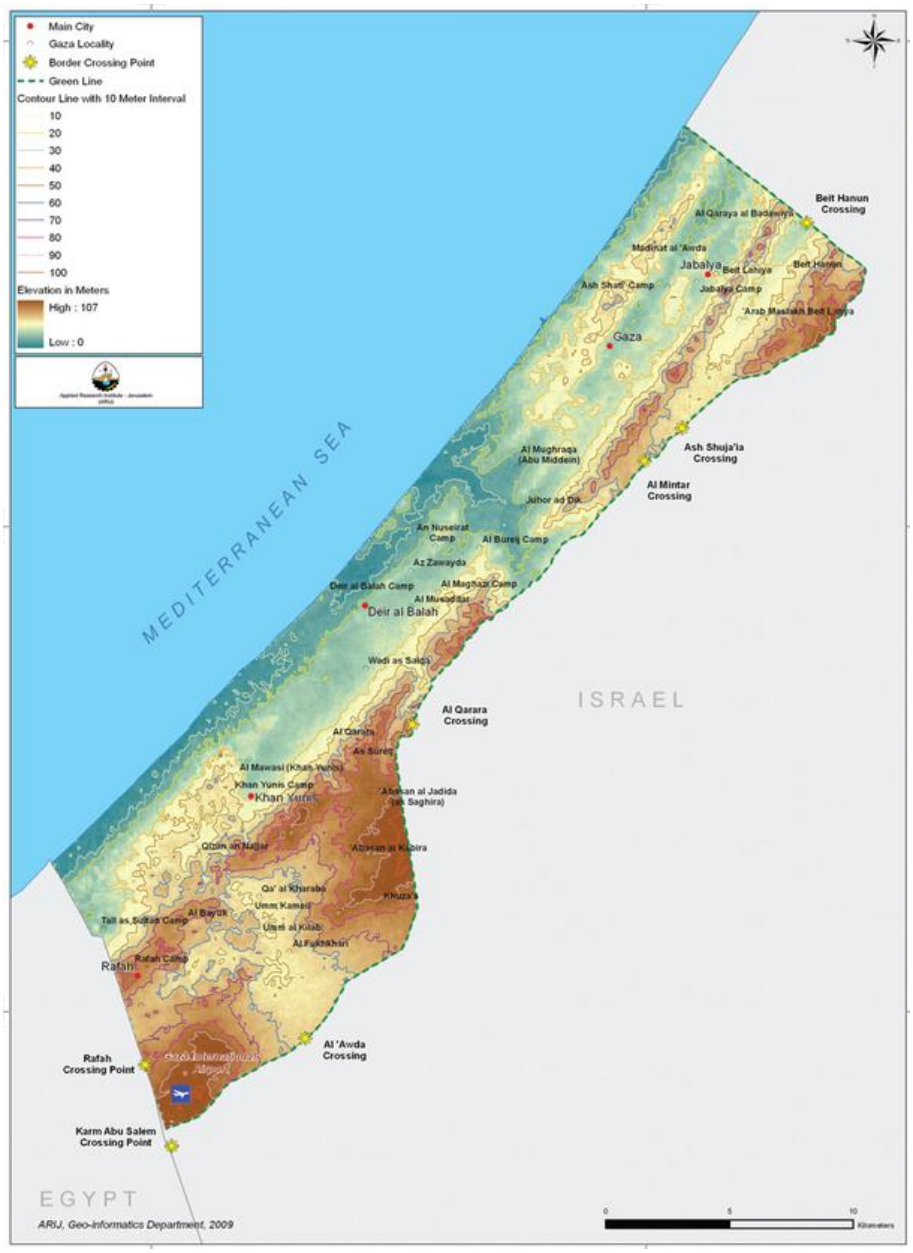

Figure 4 : Gaza Strip Digital Elevations
Source: ARIJ, 2009

4.2. Climate

The Gaza Strip is located in the transitional zone between the arid desert climate of the Sinai Peninsula and the semi humid Mediterranean climate along the coast. The following is a climatological summary in the project area for the period.

- Temperature: The average daily mean temperature in the Gaza Strip ranges between 25.8 ^{0}C in summer to 13.4 ^{0}C in winter. The hottest month is August with an average temperature of 25 to 28 ^{0}C and the coldest month is January with average temperature of 12 to 14 ^{0}C.
- Humidity: The relative humidity fluctuates between 60% and 85%.
- Wind: In summer, sea breeze blow all day and land breeze blows at night. Wind speed reaches its maximum value at noon period and decrease during night. During the winter, most of the wind blow from the Southwest and the average wind speed is 4.2 m/s. In summer, strong winds blow regularly at certain hours, and the daily average wind speed is 3.9 m/s and come from the Northwest direction. Storms have been observed in winter with maximum hourly wind speed of 18 m/s.
- Rainfall: The winter is the rainy season, which stretches from October up to March. Rainfall is the main source of recharge for groundwater. The rate of rainfall is varying in the Gaza Strip and ranges between 160mm/year in the south to about 400mm/year in the north, while the long term average rainfall rate in all over the Gaza Strip is about 317mm/year (CMWU, 2011). For the last ten years, between 2001 and 2011, the average annual rainfall of Gaza strip ranged between 220mm/year to 520 mm/year (MOA, 2011).

Annex IV-A Presents the main elements of the Gaza Strip climatological conditions.

4.3. Land use

Land use: The general land use of the Gaza Strip is divided to agricultural areas, built-up areas, and governmental areas. The following table presents the land use classification in the Five Governorates of the Gaza Strip.

Table 1: Gaza Strip, Land use (km^2)

Governorate	Total Area	Agriculture (Citrus, permanent crops, vegetables)	Built-up areas and roads	Empty private areas	Governmental, sandy dunes / jungles	Others
Total Area	**365**	**184**	**41**	**8**	**117**	**15**
Total %	**100.0**	**50.4%**	**11.2%**	**2.2%**	**32.1%**	**4.1%**

Source: (1) PCBS, 2010. Statistical Abstract of Palestine, No.11. Ramallah – Palestine. (2) Analysis of Urban Trends and Land use Changes in the Gaza Strip between 2001 and 2005, ARIJ, 2006.
Note: according to PCBS (2010) the total agricultural lands are 109.9 km^2 only.

The physical components of the proposed project will occupy limited areas. Those areas are governmental, and already allocated to the project activities, no resettlement is expected (See Annex VIII). In general, the aesthetic view of the cultivated areas of the Gaza Strip is pleasant and relaxing, this is available at the eastern boundary, some areas at the coastal line and some agricultural areas. The nearby buildings and facilities disturb the feature. Most of the project locations are located inside the built-up areas.

The geographical location of the Gaza Strip has contributed to its notable and diverse history and heritage. The beaches along the 40 km of coast of the Gaza Strip are the main source of recreation for Gaza population. The project locations and the surrounding areas are in general in urban-built-up areas, and only limited locations of water wells are occupied by grapes orchards or seasonal crops. One of the targeted water well (relocation activity) is located near a creational site of Al-Nour resort (in the vicinity of ex-settlement of Netzarim).However the re-location activities of the water well are limited and will not disturb the features.

Transportation: The road network in the Gaza Strip consists of a poorly developed and deteriorated road system. Regional (north-south) transportation is limited to Salah El-Dean Road, Al-Rasheed Coastal road and Road #4 at some areas. The available classification of road system in the Gaza Strip is presented in the following table:

Table 2: Classification of Roads in the Gaza Strip

Governorate	Classification of Roads				
	Regional (km)	Main (km)	Minor (km)	Unpaved (km)	Total (km)
North Gaza	28	45	130.0	156	359
Gaza	35	66	173	292	566
Middle area	25	70.5	156.5	131	383
Khan Younis	35	66.5	120.2	194.4	416.1
Rafah	32	41	76	136	285
Total of the Gaza Strip (km)	**155**	**289**	**655.7**	**909.4**	**2,009.1**

The transportation network in the Gaza Strip includes Gaza International Airport (GIA), inaugurated in 1998. GIA has been largely closed since October 2000 and its runway was destroyed by the Israeli Defense Forces in December 2001.

It was planned to construct the Gaza Port. During the existing conflict, the construction of the port postponed indefinitely. However, the area of the port will be served by the existing coastal road. This road is in poor condition and is not capable of serving the growth of heavy freight traffic when the port is opened. Recently, development of the coastal road has been started.

4.4. Water Resources and Quality

The Gaza Strip is located on the extreme western edge of a shallow coastal aquifer. The water resources in Gaza are limited. The coastal aquifer is considered the only source of fresh water for the Palestinian population in the Gaza Strip. Gaza has a water crisis and faces serious challenges for future sustainability of water resources.

The Coastal Aquifer in the Gaza Strip is the only natural source of water supply for all activities (domestic, irrigation and industrial supply). The groundwater is being pumped through more than 4,600 wells all over the Gaza Strip. The latest published values for groundwater abstraction was around 164 MCM for year 2007 (CMWU report), 162.25 MCM for year 2008 (PWA report) and 166.7 MCM for year 2009 (CMWU report). More than 50% of the abstracted groundwater was for domestic water supply. The natural groundwater recharge from different components are around an average of 100 – 110 MCM yearly (recharge from rainfall, agricultural return flow, water and waste water network losses, and recharge basins in different places all over the Gaza Strip)(HWE report, 2010)[1].

In year 2009, the recorded water abstracted from groundwater was around 86.7MCM, while agricultural water abstraction is assumed to be around 80MCM.Yearly average groundwater deficit is ranged from 40 to 60 MCM(CMWU report, 2010).

The calculated future water volume required based on two important factors, which are the improvement of the water distribution system and fairness distribution all over the Gaza Strip to reach 150L/C/D by year 2035. Those factors were calculated based on the current situation and expected future development to reach 80% water distribution efficiency by year 2035. Based on PWA records over the past eight years, the municipal water abstraction has been

[1]House of Water and Environment, final report, Setting-up Groundwater Protection Plan of the Coastal Aquifer of Gaza Strip,2010 .

increasing based on the population growth as well as the increasing in water demand become bigger.

Since year 2000, the agricultural activities have been shrinking due to Israeli Military activities along the eastern border of the Gaza Strip, which consequently decrease the agricultural demand. But since year 2006/2007, a jump in the total irrigated area was observed as a result of the induced efforts of NGO's to replant the uprooted lands of citrus and olives, but unfortunately, most of the new shrubs were uprooted again especially in the buffer zones and border lands.

The groundwater quality is monitored through all municipal wells and some agricultural wells distributed all over the Gaza Strip. The chloride ion concentration varies from less than 250mg/L in the sand dune areas as the northern and southwestern area of the Gaza Strip to about more than 10,000mg/L where the seawater intrusion has occurred. The chloride concentration is used as a reflection of water salinity which can be tasted when drinking. The nitrate ion concentration reaches a very high range in different areas of the Gaza Strip, while the WHO standard recommended nitrate concentration less than 50mg/L.

The area in the north, Khan Younis and Rafah are the most affected areas with highly nitrate concentration since year 2000/2001 and that is also referred to agricultural activities and waste water collection basins in the north of the Gaza Strip, while leakage from existing sewage septic tanks in Khan Younis and Rafah are the reformation of highly nitrate concentration added to that the agricultural activities in Shoka and Israeli ex-settlement areas in Khan Younis and Rafah areas.

Annex IV-B presents more details for the water resources and quality in the Gaza Strip.

4.4.1. New Water Resources (Desalination Plants)

Gaza Strip demand exceeds the available fresh groundwater, which an over exploitation of groundwater led to deterioration in its quality and quantity. Hence PWA has approached an international consultant (Phillips Robinson & Associates) to carry out Component 1 of the comparative study of options for an additional supply of water for the Gaza Strip (CSO-G), which has been submitted in July 2011. This study concludes that Gaza Aquifer is not any more productive and a new water resource shall be in pipelines by year 2016 where the large desalination plant shall be constructed to by then. And as an emergency short term solution to the current water resource situation in Gaza Strip a proposal for small scale desalination plant has been approved to supply the middle and southern part of the Gaza Strip by fresh water after blending the desalinated

water with brackish water abstracted from the aquifer as first phase, while existing desalination plant (Deir El Balah) shall be upgraded step by step until reaching a capacity as 5,000m^3/d, then blended with brackish water before distributing the water to the networks, which will be as a supporting quantity for the regional desalination plant quantities.

UNICEF has approached EU to fund the first stage of the regional desalination as 6,000m^3/d which will supply the southern part of the Gaza Strip[2], while the land has been granted in southern of Deir El Balah Governorate, which is close to the existing desalination plant. In the future, those two plants will share the brine rejection pipe to the sea which will be implemented through the UNICEF-EU project. Added to that UNICEF is now in the process to issue an Expression of Interest (EoI) for consultancy services to carry out a feasibility study andan Environmental and Social Study for the proposed project.

IsDB will finance an upgrading of the existing desalination plant facility located in Deir El Balah city to increase the plant capacity from 600 to 2,600m^3/d of water with TDS < 100 mg/L and specific unit production cost of not more than US$0.8/$m^3$ (equivalent to 3NIS per cubic meter of desalinated water) and using the RO system technology will reduce the current energy consumption.

The plant seawater intake is from an existing beach wells drilled along the shoreline. The depth of each well is about 45m with a maximum capacity of 75m^3/h each. The raw seawater is delivered through a pressure pipe (DN 200) to the raw water tank which has a capacity of 150m^3 and is installed at the plant site.

While the existing brine pipe has been designed to dispose the brine production for 5,000m^3/d inflow with 40% desalination plant efficiency (existing brine pipe diameter is 18 inch).The brine from the desalination plant will be pumped to a reservoir (200 m^3 capacity) near the seaside, and the outfall diffuser will be installed at the end of brine rejection pipe in the sea (150 meters from the shoreline). Figure 5 represents the propose layout for the brine rejection pipe to be followed in the IsDB project of upgrading the existing desalination plant,

The desalination plant upgrading agreement with IsDB states that Environmental Safeguards, Monitoring and Mitigation measures are left to the country who receives the fund to practice its own environmental regulations, where PWA has included this component as part of this environmental study to be adapted with the World Bank Policy.

[2]UNICEF-EU project is under preparation, where a TOR for Feasibility Study and ESIA is still under preparation

Consequently and as part of the parallel program, the produced desalinated water shall be pumped to the proposed 4,000m^3 water reservoir in Al Aqsa area of Deir El Balah in which the desalinated water shall be blended with water from wells (S/69 and J/146) to achieve better water quality of TDS <1,000 mg/L and chloride concentration <400mg/L complying with PWA standard for drinking water quality requirements. This improvement will encourage the customers to pay their bills and increase the collection efficiency essentially required to feed back the system with cost recovery to secure sustainable operation and maintenance costs. Meanwhile, the blending water costs scenario provided as per table 3 between desalinated water and wells water will be liable to the people of the Middle Governorate:

Table 3:Water Cost for desalinated water blending scenario

No.	Water Source	Quantity	TDS	Cl	NO_3	specific Unit Production cost	
		m^3	mg/l	mg/l	mg/l	US$/$m^3$	NIS/m^3
1	Desalinated water	2,600	100	30	10	0.8	3.04
2	Well S/69 (Ab Marwan)	1,500	1,612	589.8	89.3	0.13	0.494
3	Well J/146(Ab Naser)	1,000	1,971	689	69	0.13	0.494
Blended water		5,100	911.57	323.86	44.89	0.47	1.79

The electric power supply of the existing desalination plant is provided by the Electrical Company and another two generators with sound proofing boxes will be provided to the plant. These electric generators are started and operated in case of a power failure by manually switching gear. One generator will be able to operate the RO-plant alone.

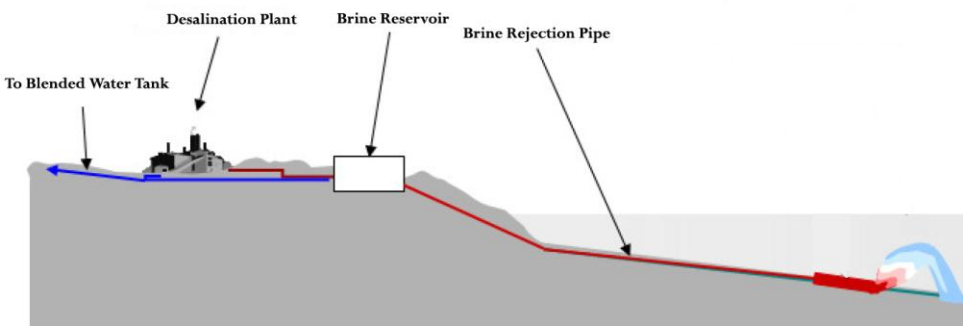

Figure 5: Propose Brine Rejection Pipe Layout

4.4.2. Wastewater Services

Recent reports indicate that 60 percent of the population now lives in areas served with sewage networks, while the other 40% use septic tanks and cesspits (Ashour et al., 2009). The three existing wastewater treatment plants function

intermittently (in addition to Khan Younis temporary treatment plant). Little sewage is treated and most is returned to lagoons, wadis and the sea. Along the Gaza Strip, 16 outfalls discharge directly into the sea, including Wadi Gaza, which discharges up to 70,000-80,000 cubic meters per day.

4.5. Soils and vegetation

Sand dunes are the main soil type along the coastal part of the Gaza Strip. Sandy loess soils, loessial sandy soils, and loess soils prevail in the eastern part of the Strip. Vegetation, which is dominant in and around the project sites, includes the following categories: Wild and fruit trees, wild weeds and agricultural crops. These categories are available in limited quantities as the project sites are small and limited. No forests or jungles were seen in the area.

Undisturbed vegetation hardly exists in the entire the Gaza Strip due to the fact that most of the land uses is dominated by urban and agricultural use. The overpopulation has resulted in intense development and pollution pressures and in the over-exploitation of Gaza's natural resources. The types of vegetation vary slightly between the various habitats, although many similarities exist throughout the entire Gaza Strip. The coastal dunes have somewhat higher species richness than other areas.

Gaza Strip is considered as an area is of high diversity of important food crops and wild plant species. Intensive agriculture implies intensive pesticide use to combat the diverse pests infesting crops such as insects, weeds, rodents and fungi in addition to bacterial and viral diseases.

4.6. Biological Habitat and Species

4.6.1. Wild Mammals

Wild Mammals (Class Mammalia): Data on mammals indicated the presence of about 120 species inhabiting Palestine. Most of these species have Palearctic affinities and a few have affinities to the Ethiopian and Oriental realms. More focus was paid on the eastern parts of the Gaza Strip due to its richness by mammalian fauna that many species of them have been hunted there for different purposes. As a result, the populations of some mammalian species such as Hedgehogs, Hares and carnivores were known to diminish in eastern Gaza Strip due to poaching, hunting and habitat modifications.

As told by the locals living in the eastern areas of the Gaza Strip, the targeted mammalian species that has been hunted by locals for meat is the Cape Hare (*Lepus capensis*). The two Hedgehog species namely the Long-eared Hedgehog

(*Hemiechinus auritus*) (Figure 6) and the Ethiopian Hedgehog (*Paraechinus aethiopicus*) are known to be sometimes eaten by some locals, especially the Bedouin families, living in the margins. Thus, the two species are falling under an actual threat. They are caught using ground mist nets or easily by hands.

Many mammals have been hunted for the supply of Gaza zoos. Examples are the Golden Jackal (*Canis aureus*) and the Jungle Cat (*Felis chaus*). The Egyptian Mongoose (*Herpestes ichneumon*), Egyptian Fruit Bat (*Rousettus aegyptiacus*), Palestine Mole-rat (*Spalax leucodon ehrenbergi*), House Mouse (*Mus musculus*), and the Commensal Rats (*Rattus spp.*) are by far considered as pests and they are usually combated by the local community; especially farmers using different control means.

Figure 6: The Long-eared Hedgehog Hemiechinus auritus

4.6.2. Birds

Birds (Class Aves): Palestine is located on major migration routes in the Palearctic region. Despite its small area, more than 500 of the 9600 bird species worldwide are known to occupy all habitats of Palestine. Urbanization, habitat destruction and modification including the draining of wetlands, the wide spread use of pesticides and poaching and hunting impose real threats to bird life in Palestine and hence the Gaza Strip. Previous and current surveys of bird fauna in the areas of the proposed projects in the Gaza Strip pointed out the occurrence of a considerable number of both resident and migratory bird species. In autumn, scores of fine nets are erected each year along the Gaza coastline to illegally catch migratory birds such as the Common Quail *Coturnix coturnix* and many other species. Additionally, hunting of passerines and non-passerines including raptor species is a common practice in eastern Gaza; an area which is characterized by the presence of poultry husbandry and intensive agriculture, where almonds, palms, citrus, olives and vegetables are cultivated there. In areas occupying inside urban and residential centers, the occurrence of wildlife seems to diminish due to absence of natural spots and the dominance of both people and traffic.

The presence of solid waste landfills in eastern Gaza Strip; particularly that of Deir ElBalah promotes the presence of many raptor species as well as Cattle Egret, Hooded Crow, and many passerine species. The Black Kite (Milvus migrans) is usually counted in hundreds (Figure 7). They are usually found roosting at the ground or flying in the sky of the vicinity of the Deir ElBalah landfill.

Chukar (Alectoris chukar) is a very distinctive bird occurring throughout the year in different localities and habitats of the Gaza Strip; particularly in the eastern belt (Figure 8). The bird is commonly seen flocks in the citrus, almond, olive, fig and grape fields and other agricultural areas in both sites of Wadi Gaza. The bird is threatened by intensive hunting because of its delicious meat.

Figure 7: The Black Kite Milvus migrans is usually counted in hundreds in eastern Gaza Strip where the major solid waste landfills are located

Figure 8: The Chukar Alectoris chukar in one of the most hunted birds in the Gaza Strip

4.6.3. Reptiles

Reptiles (Class Reptilia): Palestine, and hence the Gaza Strip, is a home to a variety of reptiles which comprise such principal categories like snakes, lizards and turtles. The reptile's dry, thickened and cornified skin is suitable for harsh climates and habitats and protects the animals from shocks and risks of dehydration. The existing reptilian fauna are all resident and mostly found throughout the year. Some may cause harm to locals especially vipers.

The Palestine Viper (Vipera palaestinae), which is known locally as "Haya Za'ara", is the only endemic snake species in Palestine (Figure 9), where it represents one of the most poisonous and dangerous viper species in Palestine and the adjacent countries. Most snake bites in the Gaza Strip were attributed to this species. The Desert Monitor (Varanus griseus) is the largest lizard species living in the Gaza Strip. It is highly endangered due to poaching and killing by farmers.

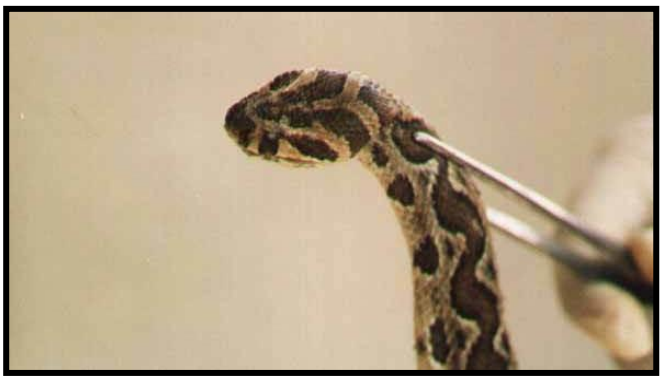

Figure 9: The Palestine Viper Vipera palaestinae is the most poisonous viper species in Palestine

4.6.4. Amphibians

Amphibians (Class Amphibia): Amphibians are usually tied to moist places because of their skin. They usually seek water, wetlands and sometimes moist soils for egg deposition. The Common or Green Toad (*Bufo viridis*) is common and found year round in or near the wet habitats of the Gaza Strip (Figure 10).

Figure10: The Common Toad Bufo viridis is a common anuran in the Gaza Strip

4.6.5. Marine Life and Environment

No scientific surveys of Ichthyofauna (fishes) of the Gaza Strip were done. According to the Gaza Coastal and Marine Environmental Protection and Management Action Plan report, an arbitrary number of 201 fish species has been recorded in the Mediterranean of the Gaza Strip. The majority of the species are bony fishes consisting (81%) of the fish population. Cartilaginous fishes (sharks, rays and other forms) constitute the rest percentage (19%). The most important habitat for bony fishes of Gaza Strip is the rocky substrate, while the majority of the cartilaginous fishes use the soft bottoms, muddy and sandy substrates. Many species of macro-benthos have been identified in the coastal zone of Gaza Strip with no further details. The higher taxa include Molluscs, Crustaceans and Polychaeta.

Specific information or literature on marine flora of the Gaza Strip appears to be very scarce. Again, according to the Gaza Coastal and Marine Environmental Protection and Management Action Plan report, Sea grass species are not present in the Mediterranean of the Gaza Strip, because the sea bed of this area is not sheltered and the rocks of the sea bed are covered by the sand at least during Winter where the water current appears to be strong enough to prevent the weed's growth, despite the nature of the sea bed is suitable for their growth.

Different types of pressures have been exerted on the marine environment of Gaza Strip. They are listed as follows:

i. Increasing fishing efforts and deterioration of fish populations and habitats, i.e. habitats for spawning, nursery and feeding.

ii. Wastewater discharge which affects marine life, including phytoplankton, zooplankton, crustaceans, macro-algae and juvenile fishes.

iii. Removal of rocks for construction which destroys fish habitat, shelter, and marine flora and increases erosion rate.

iv. Solid waste dumping.

v. Unlicensed fishing Catch of fish including small fish, without control and regulations.

vi. Agriculture (run-off and discharge of pesticides and fertilizers).

vii. Oil spills coming from the open sea.

viii. Sand mining.

4.6.6. Flora

Despite its small size, Palestine is host to about 2,700 species of wild plants. What makes this floral diversity is the fact that Palestine is located where the Mediterranean, Irano-Turanian, Sudanian and Saharo-Arabian plant geographic zones intermingle in an area of varying climates and soil types. The Gaza Strip harbors a diversity of wild vascular plant species (Subkingdom Tracheobionta) belonging to the Divisions: Coniferophyta (conifers) and Magnoliophyta (flowering plants), and including trees, shrubs and herbs. The vegetation cover of the Gaza Strip is so important to wildlife. It provides food, shelter, protection, breeding, nesting and resting sites for most Palestinian wildlife species.

The Common Reed (Phragmites australis), which is a large perennial rhizomatous plant, is very common in fresh and brackish water marshes and wetlands in the Gaza Strip (Figure 11). The Acacia (Acacia cyanophylla) is a about 5-meter high shrub growing in the sand dune ecosystem characterizing the western belt of the Gaza Strip. The plant is often used as windbreaks, sand soil fixation and for grazing. The shrubs were considered as a vital resource to the Palestinian community in the last few decades due to its exploitation as a fuel material.

Figure 11: The Common Reed Phragmites australis grows in different localities of the Gaza Strip including the vicinity of the Sea Water Desalination Plant in Deir ElBalah

The Sycamore Fig (Ficus sycamorus) is one of the old and historic plant species in the Palestine coastal valley (Figure 12). The Sycamore Fig trees carry their fruits nearly year long and these fruits are usually eaten fresh by locals. The species is under actual threat due to over-cutting and agricultural and residential creep. The River Red-gum Tree (Eucalyptus camaldulensis) is a huge evergreen plant species found in the whole Gaza Strip and hence the proposed Gaza supply rehabilitation and expansion projects. The species was favored by people because of its elegance, shade provision and, especially, rapid growth. Moreover, the green belts of this plant species are good windbreaks to protect agricultural crops from the negative impacts of strong storms and winds. The nectar of the plant is usually imbibed by the honeybee for the production of honey as was admitted by many local people (Figure 13).

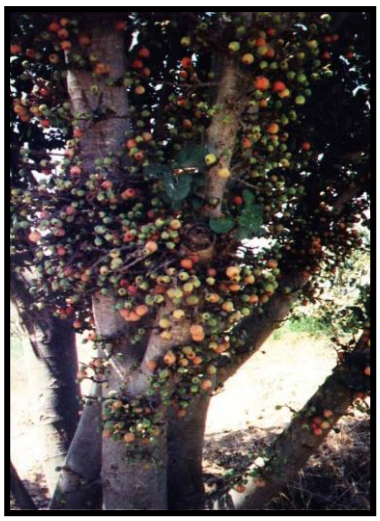

Figure 12: The Sycamore Fig Ficus sycamorus is a common tree in the Gaza Strip

Figure 13: The River Red-gum Tree Eucalyptus camaldulensis, which is common in the Gaza Strip, has multi-uses.

However, samples of sand, sea water, and crabs have been taken from the site of existing brine discharge to the Mediterranean sea.

Figure 14: Deir El Balah desalination plant: The entry (Right) and the RO filter membranes (Left)

The results show the current impact of Deir El Balah desalination plant on some marine parameters which are indicated in Table 4.

Depending on Table 4, most of the results gained are good in the sense that they lie within the normal range. The exceptions are the results of fecal coliforms which show high values in both seawater and sand samples. The results of fecal coliforms indicate the impact of the sewage pipeline that is very close to the

exiting brine outlet pipeline (Figure 14). The two pipelines discharge their content at the same place on the coastal line of the Mediterranean. A fecal coliform is a facultative-anaerobic, rod-shaped, gram-negative, non-sporulating bacterium. Its presence in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other animals. Annex (III) details the allowable standards.

Table 4: Analysis of seawater, sand and crab samples taken from the site of existing brine discharge on the coastal line – Deir ElBalah (Middle Gaza Strip).

Test		Water #1 5m distance	Water #2 10m distance	Sand	Species Crabs
Turbidity (NTU)		5.5	4.0	–	–
Salinity%		4.0	4.0	–	–
Temperature ^{o}C		15	15	–	–
pH		7.96	7.94	7.71	–
DO(mg/l)		6.2	5.9	–	–
BOD as O_2(mg/l)		24	24	130mg/kg	–
Total Phosphorous(mg/l)		0.8	0.6	–	–
TKN(mg/l)		0	0	–	–
NO^-_3(mg/l)		0.35	0.30	–	–
NO^-_2(mg/l)		0	0	–	–
NH^+_4(mg/l)		0	0	–	–
Boron (B)(mg/l)		4.8	4.8	–	–
Chlorophyll *a.*(µg/l)		6.5	4.5	–	–
Residual Chlorine(mg/l)		0.06	0.02	–	–
Fecal Coliform, (CFU/100ml)		350	70	2000 CFU/100g	–
Heavy Metals	Cadmium (Cd) (µg/l)	BDL*	BDL	–	BDL
	Chromium (Cr) (µg/l)	BDL	BDL	–	13.9mg/kg
	Nickel (Ni) (µg/l)	BDL	BDL	–	8mg/kg
	zinc (Zn) (µg/l)	41	97	–	130mg/kg
	Cupper (Cu) (µg/l)	BDL	BDL	–	BDL

* BDL = Below Detection Limit

Figure 15: The existing Brine Outlet of the Deir ElBalah Desalination Plant

The Biological Oxygen Demand (BOD) refers to the amount of oxygen microorganisms must consume in order to oxidize (that is, break down) all the organic compounds in a liter of wastewater. Although the BOD values of the seawater samples seem to be good (24 mg/l), they are high (130 mg/l) in case of sand samples. This may indicate the precipitation of organic material coming through the sewage on beach sands and the impact of sea currents the organic material as well.

All other parameters are within the normal ranges except for the total phosphorous, BOD, and fecal coliforms due to the existing of sewage pump station overflow pipe. The wastewater adds some dilution to the concentrated brine and has the attraction of some species due to the presence of nutrients.

High levels of Zn concentration indicate that the metal was taken up by the crabs through food (algae, Zooplankton, water, and sediment). Industrial waste water is one of the main sources of zinc from galvanic industries, battery production, etc. Moreover, car tires containing zinc and motor oil from zinc tanks release zinc compounds on the adjacent road, and consequently end up in water. Background concentrations of zinc seldom exceed 40µg/L in water 200mg/kg in soils and sediment, or 0.5µg/m^3 in air. Environments heavily contaminated by anthropogenic activities may contain up to 99mg Zn/L in water, 118g/kg in sediments.

5. SOCIAL ISSUES AND BASELINE INFORMATION

Gaza's 1.71 million people are enduring a serious humanitarian crisis brought on by more than five years of blockade. Gaza's civilians are facing dire shortages of food, water, cooking gas, fuel and medical care due to insecurity and the enforced closure on all of Gaza's borders. Electricity is sharply down, and in some places open sewage is spilling into the streets. Children, who make up 56 percent of Gaza's residents, are especially vulnerable.

The water, sewage and electricity infrastructure - already severely depleted by the blockade - is now stretched to a breaking point. The World Bank and the World Health Organization have warned of the dire consequences of epidemics from the discontinuation of vaccinations, lack of garbage collection and contaminated water.

This chapter will show the social impact assessment objectives, methodology followed to achieve the objectives, resettlement versus project components, population and housing, economic situation and a stakeholder formation and structure. While stakeholders inputs and concerns will be discussed in details in chapter 6 “General Findings and Impacts”.

Objectives of Social Impact Assessment:

I. Outline the main issues of the social baseline.

II. Describe the current impacts of the project components on the baseline.

III. List the positive and negative (if found) impacts in carrying out the project components.

IV. Provide recommendations where necessary to mitigate potential negative impacts.

Methodology

I. The project and subcomponent documents were collected from PWA and CMWU, necessary data were identified.

II. A desk review was carried out to the project documents.

III. Field visits were carried out to observe and monitor the project component and the surrounding social and economic environment.

IV. Stakeholder meetings which were carried out on an individual basis with PWA, CMWU, MOH, EQA and Community representatives. Added to that an Individual interviews with the local people residing around the project components to get a sense of their experience being exposed to such facilities and take notes of their suggestions and solutions.

Project Components and Resettlement

Involuntary resettlement means taking of land which will resulted a relocation of livelihoods in the project implementation location, and not only that but loss of shelter, loss of assets or access to assets or loss of income sources are also considered as resettlement by the Bank's Policy OP 4.12.

Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out. In order to ensure compliance to guidelines, the World Bank developed the Operational Policy (OP 4.12) - Involuntary Resettlement. During project identification, the task team has the responsibility to identify any potential involuntary resettlement under the project components. Table 5 presents the project components and the corresponding status of taking land and/or resettlement.

In conclusion, all project activities related to networks rehabilitation will be implemented underneath the sidewalks of the streets within the right of way area, and all new water wells will be constructed on Governmental lands specified for public facilities. In other words, no new land is required for these components. In addition, all upgrading, maintenance, and rehabilitation works of wastewater pumping stations will be implemented in the existing sites of these facilities where no new land is necessary and no resettlement is expected.

In addition, all new water tanks and booster stations will be constructed on Governmental and/or leased Waqf lands[3]. These lands were specified by the concerned municipalities to be used explicitly by PWA/CMWU for the construction and operation of these projects. Usually, Waqf lands is been granted to be used for the municipalities public services and it is well known to be allocated and/or leased for 99 years unless it is still in use.

For the upgrading and expansion of Deir El Balah seawater desalination plant, the required area for upgrading is available within the boundaries of the existing facility and already preserved, as planned, for this purpose.

[3] Waqf land is known in Islamic Countries where land is defined as a property dedicated to charitable purposes and can not be sold and usually administrated by Ministry of Religion Affairs .MORA either allocate or lease such properties for public services and/or private use.

All lands met through Waqf and/or Governmental lease have been obtained with the necessary legal documentation in place. Those documents can be found in Annex VIII.

Table 5: Project Components and Resettlement

Component	Subcomponent	Taking of Land / Resettlement
Component (1): Rehabilitation and Expansion of Water Supply and Sanitation facilities	1.1.1: Networks Rehabilitation, Expansion, and Reconfiguration.	- All activities will be implemented at the boundaries of the roads(within the right of way area). - No new land is necessary and no resettlement is expected.
	1.1.2: Rehabilitation of Water Wells.	- All rehabilitation activities will be performed at the existing locations of wells. - Some activities include construction activities at new locations, these locations are either governmental lands allocated to such facilities, or located at the right of way ofexisting roads (at the boundaries of other public facilities). - The necessary new lands are allocated for these public facilities and taking will not alter the people. - No resettlement is expected.
	1.1.3: Restoration of Deir El Balah Desalination Plant.	- No resettlement is expected since the restoration will take place at the existing plant.
	1.1.4: Service connections and district meters replacement.	- The activities will be conducted at specific locations in very limited boundaries. - Discussion of land taking and resettlement is not applicable for this issue.
	1.1.5: Upgrading and maintenance of wastewater pumping stations.	- The activities are at the existing sites. - No new land is necessary and no resettlement is expected.
Component (2): Utility Capacity Building and Operational Support	2.2.1: Warehouse and Workshop	- The necessary land for expansion is already allocated. - No resettlement is expected.
	2.2.2: Technical Assistance for CMWU.	- Discussion of land taking and resettlement is not applicable for this issue.
	2.2.3: Operational Assistance for PWA/CMWU.	- Discussion of land taking and resettlement is not applicable for this issue.

In summary, all project components does not trigger the Bank's Policy OP 4.12 because there is not involuntary taking of land resulting in relocation, loss of shelter, loss of assets or access to assets or loss of income sources or means of livelihoods.

5.1. Population and Houses

The Palestinian Ministry of Interior Affairs has estimated the population of the Gaza Strip by the end of September 2011 to 1,713,505 persons living in 365 Km^2 and distributed over the five main governorates as follows:

Table 6: Population of the Gaza Strip

Governorates	Area (Km2)	Population	males	Females
North governorate	61	278,497	141,520	136,977
Gaza	74	650,522	330,191	320,331
Middle governorate	58	240,146	120,931	119,215
Khan Younis	108	331,906	168,508	163,398
Rafah	64	212,434	106,364	106,070
Total	365	1,713,505	867,514	845,991

The local community of the Gaza Strip is considered to be relatively young with a number of youths under 14 years old of 666,613 persons while those between 14-29 years old are 569,866 persons and the people between 30 – 44 years old 262,705 persons and the over 45 years old are 214,321.

In addition, the fertility rate amongst the Palestinians is relatively high in comparison to the surrounding countries. The high fertility rate is attributed to the tendency of early marriage among young females, and the local customs and traditions-oriented trends of reproduction rates. Nonetheless, such numbers have seen a drop according to the Palestinian Central Bureau of Statistics (PCBS) that showed that the number of newborns has dropped from 609 in 1997 to 409 in 2010 (PCBS, 2011).

The Palestinian Territories, and the Gaza Strip in particular, are considered a very densely populated area. The population density in the Palestinian Territories has reached 672 capita/km^2 in 2010. However, this number exponentially increases in the Gaza Strip to reach 4629capita/km^2 making the Strip one of the most densely populated areas in the world.

The number of households possessing a residence (ownership) in the Palestinian Territories is 83.6% in 2010. The ratio is an average for the West Bank (81.8%) and the Gaza Strip (86.9%). The number of households paying rents has declined in the Palestinian Territories from 11.5% in 2006 to 8.7% in 2010 (5.5% in the Gaza Strip).

The statistics show that 14.1% of the households in the Palestinian Territories live at houses of an area less than 80m and 8.8% live in houses of an area more than 200m (12.2% in the Gaza Strip).

The Habitat Baseline survey in the Palestinian Territories (2008) showed that88.2% of the households live in houses with available public water network (97% in the Gaza Strip) and 99.9% in the Gaza Strip have access to public electricity grid. However, 53.7% of households use underground cesspits for wastewater discharge (68.6% in the West Bank and 24.7% in the Gaza Strip). The rest (45.5% in the Palestinian Territories) have access to the wastewater discharge system (30.2% in the West Bank and 75.1% in the Gaza Strip).

The results indicate an incremental increase in the number of population, particularly in the Gaza Strip. Such increase requires an action plan from the Palestinian Authority, NGOs, and INGOs in providing health, educational, housing, and infrastructure services. Therefore, this project comes in consistent to development agenda that the Gaza Strip strives to via providing the Strip with its needs of sufficient and safe drinking water throughout rehabilitating some wells. Thus, the wells will effectively continue to provide local residents with water for drinking and agricultural and other purposes. Gaza Strip, in general, is in pressing need of water and this project highly contributes to saving priceless natural resource. The rehabilitation of wastewater discharge plants comes in the same context as they secure safe and health disposal of wastewater in the light of poor wastewater collection and drainage conditions.

5.2. Economic Situation (Employment and income)

The total labor force participate rate is one of the main indicators of a successful and active labor market. The labor force survey showed that participation rate has declined to 41.4% of the total labor force (over 15 years old) in 2010 in comparison to 41.6% in 2009. Approximately 66.8 percent of the males and 14.7 percent of the females of the Gaza Strip are considered to be within the labor force.Unemployment in the Gaza Strip has been persistently high. The PCBS (2011) estimated the average unemployment rate in the Gaza Strip to 23.7% (almost one-quarter of the labor force). The unemployment rate in the Gaza Strip between the females in the labor force reached 23.8% whereas the same ratio between the males is 25.7%.

The unemployment rate in Khan Younis was the highest in the Gaza Strip with a 46.7% followed by the North governorate 39.0% while Gaza governorate managed to score the least with 29.8% according to the PCBS, 2009.

The average monthly house expenditure in the Palestinian Territories is 886.9 Jordanian Dinar (JD) in 2010 (680.7 JD in the Gaza Strip to an average 6.6 members-family. In addition, the poverty rate amongst the Palestinians according to the patterns of consumption reached 25.7% (38%) in the Gaza Strip whereas

14.1% in the Palestinian Territories (23% in the Gaza Strip) experience extreme poverty.

The Palestinian economy tightly linked to the political changes in the area. The World Bank (2011) reported a severe recession of the Palestinian economy accompanied the political changed in 2007 resulted in boosting the poverty rate to 50% that not shortly after, fell to 33.7 in 2009. This recession followed other deflations in the market by 20%in 2006 and 8% in 2007 and 6% in 2008.

The economic variations in the Gaza Strip reflect tragic scenarios in poverty, unemployment rates and income levels. Therefore, it is fair to assume that people will tend to look for the least expensive services to the commodities of their life such as clean water. However, paying water bill for the municipality might not be always possible in light of the prevalence of extreme poverty which might lead to rearranging payment priorities and neglect paying the bills.

Thereby, carrying out this project will slightly contribute to enhance the situation by providing job opportunities to the project labor in addition to the secondary beneficiaries such as tools and equipment suppliers. Specific to Additional Financing, restoring basic water and wastewater services will meet urgent humanitarian needs as well as support the re-establishment of private sector development and employment generation through civil works and goods contracts to local contractors and suppliers

5.3. Stakeholder Meetings

Stakeholder meetings were the driven forces towards any success of any raised projects, hence stakeholder groups have been formed from the affected institutions and people around the proposed project components, and after a long discussion with PWA and CMWU; a stakeholder structure was as follows:

- Palestinian Water Authority.
- Coastal Municipalities Water Utility "CMWU".
- Environmental Quality Agency "EQA".
- Ministry of Health "MOH".
- Mayor of Municipalities (Rafah, Khan Younis and Deir El Balah).
- Municipal Staff.
- Community Representative.

- Public Consultation (during field visits).

The meetings with the stakeholders were carried out on an individual basis due to difficulties found to gather all the concerned parties in one meeting, the

5.3.1. Palestinian Water Authority

One large meeting was held at PWA conference meeting with PWA team in Gaza as;

Eng. Rebhi Shiekh (PWA chairman deputy)

Eng. Ahmad Yaqubi (General Director of Water Resource Directorate)

Eng. Ahmad Kulab (Operation Department)

Eng. Mahmoud Ismael (Planning Department)

Eng. Mahmoud Abdel Latif (Information Department)

Eng. Jehad Disht (Water Resource Department)

Eng. Sawsan El Masri (Administrative Department)

Eng. Jamal Al Dadah (Planning Department)

The consultant explained to the PWA members a brief description of the project components with the assistant of both Eng. Shiekh and Eng. Yaqubi.

5.3.2. Coastal Municipalities Water Utility "CMWU"

Another large meeting was held at CMWU conference room with the attendance of all related staff as described below, added to that Eng. Yaqubi (PWA member) was attending this meeting as well, the attended CMWU and PWA members in this meeting were;

Eng. Ahmad Yaqubi (PWA)

Eng. Maher Al Najjar (CMWU, Deputy General Director)

Eng. Ashraf Mushtaha (Planning Department)

Eng. Omar Shatat (O & M Directorate)

Eng. Farid Ashour (WW Department)

Eng. Zidan Dhman (Customer Services Department)

Eng. Ramdan Naem (Supervision Department)

Eng. Ahmed Shaker (Design Department)

Mr. Mamdouh Ghazali (Financial Directorate)

Eng. Al Najjar gave an introduction to the project components, where the meetings dialogue and discussion will be discussed in chapter 6 “General Findings and Impacts”.

5.3.3. Environmental Quality Agency "EQA"

A small meeting with Environmental Quality Assurance Institution was held at EQA office, with an existence of;

Eng. Bahaa’ Agha (Water Resource Director)

Eng. Atia Borsh (Water Quality Department)

Eng. Zaki Zoraab (Planning Director)

The consultant explained to EQA group with the project components in details in order to avoid any future conflict with their strategic plans. The meeting was smoothly and they were open minded while project description took place. EQA inputs and concerns will be discussed later in chapter 6.

5.3.4. Ministry of Health "MOH"

The consultant visited Ministry of Health to discuss the project components in the presence of CMWU. The meeting took place in MOH – Water Quality Directorate (Mr. Ahmed Tibbi), while another two members from MOH also attended the meeting (Mr. Yassin and Ms. Maha).

CMWU explained to MOH group a descriptive of the project components and questions that maybe interest to MOH, as well as a friendly dialogue and discussion have took place while describing the project components. While MOH concerns and inputs will be discussed in chapter 6.

5.3.5. Mayor of Municipalities (Rafah, Khan Younis and Deir El Balah)

Three meetings were held, where each mayor had been visited separately. The consultant, PWA and CMWU had met the mayors and their water and wastewater department staff discussing the different project components, where the mayors feedback and concerns has been noted and will be discussed in chapter 6.

5.3.6. Municipal Staff

Municipal staff have been considered to play an important role in stakeholder opinions because they are fully aware of their district area problems especially in water supply system and disposal of waste water into its final destination. Hence

meetings with water and wastewater department staff have been carried out to get their feedback and advices.

Two meetings were carried out with those staff, the first meeting when carrying out the mayors' meetings where the water and wastewater department heads were available in the meetings, and the second meeting was directly with them separately.

The municipals staff concern will be discussed in chapter 6.

5.3.7. Community Representative

The main key players in stakeholders' structure are the community itself and their opinions as well their major problems and solutions prospective. The community representatives have been chosen to be through an NGO named Zakher Association for improving women capabilities, where Zakher NGO was responsible to gather all related people within the area to discuss the project components and what they think about the different projects, where a collection of more than 30 people have attended the different meetings held atZakher Association and in the field.

The consultant and one of CMWU staff have attended this workshop, where the consultant started to give an idea about the proposed projects and in some cases get into details of technical issues when answering the people concerns and clarifications. The meeting outcomes will be incorporated in chapter 6.

5.3.8. Public Consultation

Field visits have been carried out to the proposed project components' location, where one of the field visit objectives were to speak directly to the people who will be directly affected by the project implementation and living in the nearby areas of the project components to listen to their problems, concerns and opinions about the project implementation. More than thirty people have been met during the field visit, while in some areas it was so difficult to find anyone living in that area either because it is close to the Eastern Gaza border (where could not be visited due to security reasons), or due to virgin area where no one is living there (i.e. Mograga and Ex-setllements).

During the field visit and people meetings, the consultant start giving them a descriptive of the specific project components separately to take the people concerns, feedback and approval for such an implementation, while chapter 6 will describe their opinions.

In August 27 and 28, 2014, while revising the ESIA/ESMP report to include AF1 activities, teams of PMU /CMWU have visited some of the damaged sites, where all their inputs to re-connect houses with safe and drinkable water and to remove the random wastewater spots located in some of the streets due to broken wastewater networks or damaged wastewater pumping stations by lifting the wastewater from low to higher points until reaching the final destination. More details in section 6.1.

6. GENERAL FINDINGS AND IMPACTS

During the operation phase through the assessment process of the project, it is expected that significant benefits would occur to the benefited groups. On the other hand direct, indirect or cumulative impacts may be produced during both construction and operations phases. These impacts either minor impacts with minimal effects or require monitoring and mitigation measures to minimize their effects.

The following sections shows the details of the project impacts considering two different scenarios. The first is to reveal the impacts of keeping the project components as is (without the Project), while the second is to investigate the potential impacts of carrying out the project components as proposed. All scenarios has been given below are from stakeholders feedback with the consultant experts.

The consultant with assistant with PWA and CMWU have formed a stakeholder structure to include all of;

- Palestinian Water Authority "PWA".
- Coastal Municipalities Water Utility "CMWU".
- Environmental Quality Agency "EQA.
- Ministry of Health "MOH".
- Mayor of Municipalities (Rafah, Khan Younis and Deir El Balah), and another 7 members from the municipalities staff
- Community Representative by Zakher Association for improving Women Capabilities, where more than 30 members have attend the different meetings.
- Public Consultation has been carried out nearby each facility (wells re-allocation, wastewater pumping station rehabilitation and reservoirs construction).

The meetings with the stakeholders were carried out on an individual basis due to difficulties found to gather all the concerned parties in one meeting. Their input and concerns have been elaborated in the below findings separately for each component of the project, While Annex V shows a sample ofthe public consultation field survey.

Section 6.1 shows the stakeholders input, feedback and concerns for the different project components, while section 6.2 will present the consultant vision after taking into account the stakeholder inputs into consideration for Environment and Social Impact without and with implementation of the project components respectively. While the rest of this chapter will talk about the benefits and negative impact of the project components from Environmental and Social prospective;

6.1. Stakeholders Input, Feedback and Concerns

This project has seven main components which will be financed through the parallel finance between World Bank and IsDB, those components have been described in chapter 2. This section will summarize the stakeholders inputs, feedback and concerns per each component of the project.

The stakeholders' meetings start with a description of the project components to the audience while a brief descriptive of the groundwater status has been carried out either by PWA and/or CMWU members to give a full picture of the current water and wastewater situation in the Gaza Strip. The presentations at PWA, CMWU and Zakher Association have took a form of power point presentations because of large audience existence, while the other small meetings took a form of discussion on rounded table (EQA and MOH). The public consultation took place at people houses and in the streets where an oral descriptive have been given to them; afterwards a discussion dialogue had took place in a form of questions which were prepared earlier by the consultant with an assistance of CMWU and PWA, other raised questions have also been asked from different stakeholders based on their concerns and understanding to the situation. All questions and answers will be summarized in Table 7A, while the below divisions describe some of the dialogue discussion from different stakeholder meetings, the conversational style and the wording of the consultation has been kept as in the transcripts, so as to reflect the content as accurately as possible

6.1.1. Network Rehabilitation, Expansion and Reconfiguration

A description of the current status of the water supply system as an intermittent water supply in the Gaza Strip and introducing the different stakeholders to the main problems found through the operation of such system. Also, a descriptive of this component have been elaborated to show the stakeholders why water reservoirs have been chosen in those locations and to whom water will be transmitted. Added to that, a descriptive of water networks status and why networks needs to be replaced especially the asbestos and old pipes.

Eng. Ismael (PWA) shared with a story saying that before almost 2 years the water barely received where he is living (West of Deir El Balah) and after network reconfiguration and rehabilitation carried out by CMWU 2 years ago, it started to be improved, he added also, it becomes better than before but needs to be at least on daily basis not as recently every other day.

Eng. Yaqubi (PWA) states that water resource becomes depleted due to over exploitation of the groundwater and a good management of the aquifer abstraction needs to be applied, where all illegal connections along the main network should be cut off to enable water to reach the end point of the network. He also mentioned that a better management of water distribution shall be followed and instead of directly pumping the water from the wells towards the domestic networks, it should be collected to reservoirs and then to be pumped to the network.

Eng. Dadah (PWA) says that the farmers are always looking for profit and because there is almost no agricultural monitoring to the farmers, they connected to the domestic network to take water for irrigation purposes, and by doing this the water will not reach the other people for drinking, where LAW must be effective and strong in this issue which is not the case.

Eng. Shatat (CMWU) says that the better operation scheme is to have a water reservoir instead of considering the water well as a reservoir, in which it will enable rehabilitation for any well without disconnecting water to the customers where they will keep having water from the water reservoirs (other sources).

Eng. Dhman (CMWU) states that the illegal connections shall be controlled and metered to know their consumed quantity which they have to pay for it.

Eng. Shaker (CMWU) says that all the required design and drawings for this component has been prepared where all land acquisitions for water reservoirs have been granted from municipalities and/or land authority (see Annex VIII), where water network upgrading and/or rehabilitation work will be in the streets.

Mr. Tibbi (MOH) states that all asbestos networks shall not be used for water distribution due to their health hazardous, and also would be better if removed away from the ground to any disposal to be environmentally disposed. Mr. Tibbi added that water is being received only every 3 days, where it should be on a daily basis and mentioned that if the water reservoirs will improve the situation he will start looking for an area (to buy a house) near water reservoir to ensure a continuity of water supply. Where Eng. Mahmoud (PWA) reply saying that the asbestos pipes remain in the ground and never been extracted from the ground.

Eng. Agha (EQA) states that it is one of the best practices to use water reservoirs instead of water well direct supply, he also adds that all illegal connections in the main water networks shall be closed and who connects an illegal connections shall be punished by the LAW, which is not strong enough at this particular point.

Eng. Zoraab (EQA) says that PWA has put water distribution master plan in year 2005 by Finland project and before that they already have a master plan for major water carrier along Gaza Strip (Gaza Carrier) which was stopped due to political reasons. All those master plans are talking about installing water reservoirs along the Gaza Strip to enhance the distribution, why it is not implemented yet, he asked CMWU?

CMWU answers EQA concern and states that CMWU is following the PWA master Plan and more than 5 new water reservoirs have been implemented in Rafah, Khan Younis, Jabalia and Deir El Balah areas. CMWU also states that the problem is not in water distribution system only but also it is a problem of water quantity abstracted from the aquifer which becomes less and less due to water quality deterioration, where another source of water shall be considered such as sea water desalination.

Mayors states that they are doing their best towards improving the water networks and that's why they are reaching PWA and CMWU for assistance to find solutions to their major problem in distribution and by water reservoirs the distribution will improve but still the quality is an issue. PWA states that by mixing process (brackish water with fresh water) in the water reservoirs will keep the water drinkable and within the PWA standards. CMWU agreed on that.

Mayors states that they will push more towards having a clear LAW statement to punish those people who connect illegally to their agricultural land area. Also, they say that CMWU shall look for identifing those illegal connections to identify the Un Accounted for Water (UFW) to make those people pay for that consumed water quantity.

Hajj Abo Mohammed is around 50 years old from the Community Representative and another 2 members say that we use water tankers for drinking water where we live (mid of Nussirate area, east Deir El Balah and east of Khan Younis), do you expect us to accept the water delivered to my house from tab water?, CMWU states that in case of Nussirate we are hoping to do so because Mograga well will be rehabilitated in this project as well, and in case of eastern area we can say yes it will be improved and that because the water reservoir will collect water from fresh wells (located in Mograga) and pump it towards the eastern elevated area where they were previously having their water from nearby wells (brackish water).

Om Yehia is around 40 years old from the Community Representative says that I wish I have brackish water delivered to my home rather than having no water for 4 days where I am living (Bani Suhila). CMWU says that the water wells for Bani Suhila are located in western part of Khan Younis and they are being pumped more than 10km to reach your house and the water in the network is believed to be stolen along the way because it passes through agricultural areas.

Eng. Asad worked in Ministry of Public Works and live nearby the propose Bani Suhila water reservoir (Community Representative) mentioned that the water reservoirs are very good for water distribution but (he says) I am concern about the construction phase where in some cases retaining wall is important to avoid any soil corrosion and/or failure of nearby roads, and would advice PWA to take this idea while they construct the reservoir, added to that the roads may closed during the excavation time due to heavy vehicles movements. PWA thanks Eng. Asad for his concern and says that the design of those reservoirs is already completed and there would be no deep foundation for the reservoirs after carrying out the soil testing and sampling, whileonly Bani Suhila reservoir will need a retaining wall to support the road from collapsing at time of excavation, and it is already stated in the Bill of Quantity of the project. Where the closed roads due to excavation purposes will be coordinated with the Police department to create a diversion road till the excavation is completed.

At the end of each stakeholders meeting, two last questions have been raised by the consultant whether do you agree to implement this project component and what are your concerns to be taken while the implementation and/or operation process?. The second question was if you disagree of carrying out this component why and what are the possible alternative solution?. These two questions have been raised at the end of each project component discussions and for each stakeholder meetings. The answer and concerns are as follow per each stakeholder;

PWA: Fully agree to implement this component because it will increase an employment opportunity by construction of water reservoirs and by upgrading the existing water distribution system. But concern about the noise that may be created due to large truck movement during the project implementation.

CMWU: Totally agree to the project component since it will enhance the current water distribution and will minimize the water loses in the old networks.

EQA: Agreed to the project component with a concern to have more rules and guidelines towards eliminating the illegal connections and enforcement of LAW in this regard.

MOH: Agreed to the project component but a special care shall be taken when washing up and cleaning of the new network where the network shall be tested against any fecal and/or total coliform to ensure a clean network before pumping water in it to the domestic use.

Community Representatives and Public Consultation: Agreed to the project component but special concerns from people around the water reservoirs especially in construction phase a retaining wall shall be constructed to avoid any soil failure in the area which may affect the nearby houses. During a field visit conducted on 27 August 2014 in Khozaa' (one of the destructed areas), CMWU met some of the people there, Hajja Om Ahmed Najjar said "Now we came back to my home but I do not have an access to water due to damaged water reservoir in the area". Another old women said When I came back I did not know where is my home due to massive destruction in the area and when she found it she said there is no home any more, so she was asking what shall I do?" During the site visits (27 and 28 August 2014) all the interviewed people were stated that they need safe and drinkable water because the water networks have been damaged during the hostilities.

Also, a special concern was expressed that, when implementing the water networks upgrading, to try not to close the street to enable the residents of the area to practicing their lives without any obstacles.

6.1.2. Rehabilitation of Water Wells

Eng. Yaqubi (PWA) says that the wells close to the Gaza eastern border have been chosen since a long time ago and they become almost unreachable for operation due to security reasons.

Hajj Abo Ismael is around 60 years old from the Community Representative says that I am used to go to my agricultural land located in eastern part of Burij ten years ago but sine year 2002, I could not reach my land and wondering if this well is currently operated. CWWU reply saying that the eastern wells are being operated but the problem is when the electricity cut off and when the well needs rehabilitation, chemicals and fuel; we have to coordinate with Israeli side to guarantee reaching the well safe to do the work and it usually takes 2 to 3 weeks to get it done and people cannot wait that long without water where in some cases we distribute water to those people by CMWU water tankers.

Ibrahim Hamdan is 35 years old (farmer in Wadi Salqa area) from the Community Representative says that Wadi Salqa is an agricultural area and only 3000 inhabitants are living there without a continuous water supply because the main water supply well is located almost along the eastern border of the Gaza Strip, and we are all depend on our agricultural wells for drinking water. Hence we will

be grateful to PWA if re-allocation of the well carried out to minimize our diesel consumption to abstract more water from our agricultural wells.

Mr. Yassin (MOH) says that the distributed water without chlorination is harmful for the people health and it may cause some diseases especially in rural areas where they still depend on to their agricultural wells for water supply.

Other public consultations for wells re-allocation is shown in section 6.2.2 especially for Al Farouq well and Mograga wells.

At the end the two questions have been asked and the answers came as;

PWA: Agreed to drill new five wells as a replacement of existing wells due to their un-suitable locations for operation and maintenance issues But their concern was to make sure that the existing wells are closed properly to avoid any pollution to those wells.

CMWU: Agreed to have new water wells that can be operated on a daily basis.

EQA: Agreed to drill new water wells but a special concern shall be taken to avoid any deterioration of groundwater quality.

MOH: Agreed to the project component with a concern that the water abstracted from the new wells shall meet the PNA standard for drinking purposes.

Community Representatives and Public Consultation: Strongly agreed to drill new five wells as a replacement of existing ones due to their unsuitable locations especially the two wells located close to the Gaza eastern borders and the one located in the cemetery. Their concerns was to have a drinkable water distributed to the people.

6.1.3. Restoration of Existing Deir El Balah Desalination Plant

In this section a very long debates have been occurred, some of them realistic and others shows the anger of normal people towards the government role in this regard, some of them is showed below;

Eng. Mushtaha (CMWU) states that PWA has completed a comparative study for new water resources and it concludes to have an URGENT needs for new water resources added to the water supply system to ensure safe drinking water supplied to the customers and to relief the groundwater aquifer from the stresses of abstraction. He also added that CMWU create a 3D hydrogeological groundwater model for the Gaza aquifer to show the current situation and future status if keeping the same scenario of fully depending on groundwater for domestic and agricultural needs, and conclude that the aquifer will not sustain

producing freshwater at year 2016, and a new water resources shall be introduced to the system.

Eng. Yaqubi (PWA) says that regional desalination plant is a MUST for the Gaza people and that because the groundwater aquifer can not give more with its current status (bad quality and low quantity).

Eng. Sheikh (PWA) says that PWA is looking for donation from Arab and EU countries toward financing a large desalination plant which will cost around 400 million Euros including the Gaza Carrier as well. BUT till the fund is secured which may take some time, Gaza needs water and that will be through upgrading the existing desalination facility in Deir El Balah which will be financed through IsDB to be 2,600m^3/d. The desalinated water will be blended in water reservoir with other two brackish water wells. This will be a short term solution to the nearby area around the existing desalination plant (Zawaida and Deir El Balah city). While the cost of distributed water will be reasonable (1.8NIS/m^3) after blended, in which the people can pay for it.

Mr. Shakour (Community representative) says that we do not care from where water is coming but we are in need to have healthy drinking water at our houses.

Ms. Inaam and Mr. Saber (Community representatives) states that the government should look for donation and/or fund to have fresh water to the people since they are the responsible body toward us because we pay our taxes and nothing coming back to us from the government.

Mr. Awad is from khan Younis (40 years old) says that our tooth become yellow from drinking brackish water and I blame the government because they know about the water without any solution proposed yet.

Mr. Hossni (teacher of Aqsa elemntary school) says that I can pay for having freshwater coming to my house but at the same time there are other people especially the un-employed people wo can not pay for this water since it could be at high prices, so I suggest to have a compensation program carried out by the government to lower the prices of desalinated water and they pay the difference to the operator.

Mr. Tibbi (MOH) says that a comprehensive program shall be carried out from the government and PWA towards ensuring healthy and safe water produced due to chemicals involved in the desalination plant process.

Eng. Agha (EQA) says that since year 2004, the regional desalination project is suppose to be in operation but due to political issues the project has been stopped and it would be great benefit to the people to have it back on track and we hope that it is not too late for aquifer healing.

At the end the two questions have been asked and the answers came as;

PWA: PWA says this component will help distributing healthy and safe water to the people living in Zawaida and Deir El Balah city.

CMWU: This project is financed by the IsDB and looking forward for PWA large project (regional desalination plant).

EQA: We are looking forward to see the desalination project on ground and as a supporting quantity added to the system we agree to upgrade the existing desalination plant. Also we would like to be part of the large desalination plant environmental study.

MOH: Monitoring program is needed to ensure healthy and safe drinking water distributed to the people and agreed to implement this component.

Community Representatives and Public Consultation: We are looking forward to receive a drinkable water to our houses.

6.1.4. Service connections and district meters replacement

The following paragraphs show some of the discussion dialogue from different meetings between the stakeholders, where a summary of questions and their consequence answers from each stakeholder group is summarized in table 6A.

Eng. Yosef Haj Yosef (Municipal staff – Khan Younis) states that district meter is very essential to the water supply system because it show us where the water being consumed and where the water is being stolen based on supply/demand distribution system. While Eng. Farid (Municipal staff – Rafah) says that we are facing problems with the people who do not have water meters and/or their meters are damaged or broken by assuming their consumptions based on the people living in the house. Mr. Shanti (Municipal staff – Middle area) states that we have a bulk water transferred to agricultural area and the farmers are willing to pay the consumed water but we are facing problems in absence of water meters since 5 years now.

Mr. Awad is from khan Younis (40 years old) says that we have a backyard land and we asked for a separated water connection with a meter but the municipality says that you have to buy the meter and the municipal employee will install it, where those meters are not always available in the market and when found they are expensive. Hence the municipalities have to provide this facility to the customers. CMWU comments on this saying that in the past 5 years there were very limited budget to buy water meters and also there is a restriction from Israeli side towards importing those meters (Why!!), but we will try pushing this component forward.

Mr. Mousa Ashqar (teacher in elementary school) says that we teach students towards reserve the water and keep safe drinking water for our kids after we pass away, and every time we raise this topic in the classes, the students start giving us bad practices in their daily basis of using the water. This occurs due to very cheap water and also because there is no control in using the water (i.e if the water quantity is recorded and its price is higher, then the end customers will feel about its importance). We try in the school to teach the students that water is life and we should not waste it away.

At the end the two questions have been asked and the answers came as;

PWA: PWA considers this component as a priority to water resource to know where water goes and who consumes it. PWA agreed without any concern towards an implementation of this project component.

CMWU: Agreed to the project component without any concern.

EQA: Agreed and looking forward for PWA/CMWU to pinpoint the areas of illegal connections and towards improving the water supply system.

MOH: Agreed and hopefully by the end of the project component there will be no stolen water from the networks.

Community Representatives and Public Consultation: We are looking forward to have a drinkable water received to our houses and we have no problem to install new meters to know exactly how much each family is consuming and it will be better than the assumption theory that they follow for the people who do not have meters and/or have damaged meters.

6.1.5. Upgrading and maintenance of wastewater pumping stations

This component took a very long discussion dialogue between the community representatives especially those who are living nearby the existing waste water facilities.

Hajja Intesar Abo Kash living in Nussirate camp (public consultation) says that we suffer from wastewater flooding to the house from the bathroom during the day and night especially in winter seasons and she described an event occured to her during one of the nights (see section 6.2.2). Also during the field visit to the same area we spoke to a young lady (refuse to say her name) says that they suffer from the wastewater flooding to the house when the waste water pumping station turned off for any reason, she also says that the station is very old and the government shall replace its equipment for better services.

Mr. Ibrahim Jouda (Community Representatives) living in Deir El Balah working in secondary school, stated that the problem with those stations are their level, where the level of the station is higher than the surrounding area, and that's why the waste water being flooded around the station when it is shut off.

Mr. Medhat barood (public consultation) living in Deir El Balah area agreed with what has been discussed by Mr. Jouda but also mentioned that those stations are very old and needs maintenance from time to time. He also reported that lack of municipal planning led to level difference between Deir El Balah waste water pumping station and nearby houses, where an adjustment has to take place or to increase the station capacity to avoid an increase in waste water flow to the station.

Ms. Amna Layal living in the middle area and working as a teacher in the university says that in case of upgrading those stations, will we have a network in my district?, CMWU replies saying that the waste water pumping stations will be re-deign to consider all the future expansion of the waste water network collection system and for sure you will have the sewage networks once fund availability is granted towards an improvement of treatment plant and waste water stations.

Mr. Jaber living in Mawasi area says that we are in low land area and the municipality build a waste water collection basins nearby our land and at the beginning the wastewater flooded our land, is it also handled in this project?, CMWU replied saying that this is not part of this project but ICRC is carrying out an upgrading of the temporary waste water treatment plant in Mawasi area in coordination with PWA/CMWU and EQA, and this plant will be removed once the regional treatment plant is constructed at the eastern of Fukhari area where all the design drawings have been completed and waiting for an implementation within the few coming months. Added to that there were a recommendation from PWA to dewater the recharged waste water from the low land area by building two wells and those wells succeeded in dewatering and protect Mawasi area from any possible infiltrated waste water by creating a protective groundwater zone, added to that a rehabilitation is carried out at this time to prevent any leaks from the bottom collection basins.

Mrs. Sohair Bayomi (community representatives) says that PWA and the government shall find a solution towards improving the waste water collection system and also shall carry out an education program by TV educating the people about the water value and how to keep our houses safe from any accidental flooding.

Mayors, municipal staff, CMWU and PWA question answers are being elaborated in table 7A

At the end the two questions have been asked and the answers came as;

PWA: Agreed without any concern.

CMWU: Agreed.

EQA: Agreed and PWA/CMWU shall look for more funding to re-designing all waste water pumping stations to receive the future expected flow and also to build up the regional waste water treatment plant.

MOH: Agreed with one concern about the working teams in the stations, that they shall be fully protected from any field hazardous since they will be exposed directly to waste water.

Community Representatives and Public Consultation: Agreed and if PWA/CMWU needs any facilitation in the area, we will be happy to provide it to the working teams since it will keep our houses and families safe from waste water flooding. Only one concern, if possible to lower the existing level of Deir El Balah waste water pumping station to avoid waste water flowing out of the station.

6.1.6. Warehouse and Workshop

Eng. Shatat (CMWU) and Eng. Kulab (PWA) state that most of the current maintenance carried out by CMWU are done through service contracts, where these services can be carried out in house by providing an equipped workshops to do all the required maintenance for the different equipments.

Eng. Shiekh (PWA) says that if this component is carried out and the workshop is equipped, then the money spent in service contracts will become minor which will affect the operation cost for tariff purposes.

Eng. Agha (EQA) says that it is good to be self dependent towards daily maintenance schedule which will lower the water cost in the future.

Mayors and municipal staff says that the maintenance is taking place in daily basis for water and waste water facilities and equipments, hence having in house maintenance workshop would be excellent.

Community representative says that we only care about the service level and suitable drinking water and if this item will improve the services, we will be happy.

At the end the two questions have been asked and the answers came as;

PWA: Agreed without any concerns.

CMWU: Agreed and looking forward self sustainability towards equipment maintenance.

EQA: We have no problems and/or concerns to implement this component.

MOH: No comments and we have no problem in implementing this component.

Community Representatives and Public Consultation: What we are looking for is to receive good services and especially in waste water and if this component will participate in improving the services we are with the implementation of this component.

6.1.7. Technical assistance

This component has been discussed with the community representatives based on the impact that may occur as an increase of tariff system of the water and waste water services,

Mrs. Sohair Bayomi (community representatives) says that the government shall compensate for the difference between the operation and maintenance cost and the water tariff due to our political and economical situation. While Ms. Amna Layal says that a comprehensive study shall be carried out to the economical situation of the people before any increase of the water tariff. Mr. Mousa Ashqar says that there should be no increase in the water tariff unless new water resource is engaged to the system such as desalination plant, where Mr. Awad says that the people are willing to pay for good services and drinkable water.

Mr. Najjar (CMWU) says that PWA and CMWU will study the willingness to pay against the political and economical situation of the Gaza Strip, and any increase in water tariff will be based on strong and comprehensive study.

At the end the two questions have been asked and the answers came as;

PWA: Agreed to enhance the current services provided.

CMWU: Agreed.

EQA: Agreed.

MOH: No component, agreed.

Community Representatives and Public Consultation: We can accept an increase in tariff structure of the water and waste water services in case it took all the political and economical situation of the Gaza people into account and we would like to be part of any future survey for this component.

6.1.8. Operational assistance

The discussion dialogue in this component went toward providing chemical, regents, fuel and other assistance that could be necessary to operate the different facilities in proper and safe way.

Eng. Atia (EQA) says that desalination plant without the chemical especially in RO System will not be functioning well since it is a chemical treatment process.

Mr. Tibbi (MOH) says that without chemical and reagents provided to the CMWU-Lab, they will be useless since we are looking forward for future cooperation between our lab in MOH and CMWU lab for double check samples and lab quality control. Also, added that chlorine injected to the water supply system has the most significant health value because it kills all bacteria in the system that could leak into the networks.

Eng. Shatat (CMWU) says that CMWU has achieved more than 99% of water disinfection and without chemical provided we would not achieve this record and we will not allow any drop of water to flow in the network system without any chlorine injection.

Mr. Sadallah (35 years old) says that sometimes I feel chlorine in our tap water, is it healthy to drink it and why sometimes I feel that? CMWU states that chlorine is a very important to the water supply system, but maybe you are living very close to the well facility and we will look in specific for your location and find out why this happen.

At the end the two questions have been asked and the answers came as;

PWA: Totally agree.

CMWU: It is essential for keeping the services running without any health impact.

EQA: Agreed.

MOH: Agreed.

Community Representatives and Public Consultation: for the sake of keeping our families and kids safe, we agree.

Table 7A illustrates the different questions raised during each stakeholder meeting and a summary is being showed;

Table 7A: Summary of Stakeholders Opinions:

Project Components	Brief Description	Questions	Stakeholders Opinions					
			PWA and CMWU	EQA	MOH	Mayors and municipal technical staff	Community Representative	Public Consultations
1.1.1: Networks Rehabilitation, Expansion, and Reconfiguration	(1) Construction and installation of five water reservoirs with associated pumping booster stations, and transmission lines to connect to the supply distribution networks. The reservoirs will be connected to the major well fields supplying the middle and southern governorates, will be used to blend the water supply from the wells and desalination plants to improve the water quality, and will improve the performance of the networks and help the utility cope with demand and improve the quality of service .Two of the water reservoirs will be a replacement of totally damaged one's from the IDF 0 operation. (2) Rehabilitation of four water reservoirs in Musader (350m3), Wadi Salqa (350m^3), Mograga (3000m^3) and Rahma (5000m^3), the work includes civil and electromechanical rehabilitations of the water reservoirs and associated booster pumps due to the IDF operation . (3) Replacement of old and damaged (from IDF operation) transmission lines in the north, Gaza ,middle and southern governorates of different sizes, especially asbestos lines, to reduce losses and improve service quality. The work will include all transmission lines accessories as valves and fittings	Q1: What do you think of the current water distribution system	Actually the current water distribution is in a bad situation because of insufficient water resources, illegal connections to the networks. Also the old network is an issue in this regard because of the water leaks from the network which makes the pressure in the network to be insufficient to reach the customers	The situation in all Gaza Strip is very bad due to lack of water resources and the aquifer becomes deteriorated in quantity and quality, added to that the water network efficiency is relatively low due to Un-accounted for water (illegal connections).	We are not an expert in water but the water reach my home every 3 days and I have to store water to cover my demand for the next two days. while it should be every day water available in the network.	Rafah: We try to do our best to drill more wells in the area but the demand becomes higher to be covered, while in some districts in Rafah the water reach the end customers every 3 to 4 days for only 8 hours due to many reasons. Khan Younis: In the last three years we drilled more than 5 new wells to cover the current demand and with the assistant of CMWU we are trying to change the old network to improve the water supply system. Deir El Balah: With assistant of donors and CMWU, we could enhance the water distribution system in my area but still we need to fight the illegal connections and replace the old water meters.	I think the problem can be from two main parts: the first one as no new water resource is available in Gaza Strip to cover the required demand, and the second part as the culture of people should be changed where some people try to irrigate and drink from illegal connections which make others to suffer from low pressure in their network and insufficient water	All the met people state that they are not satisfying with the current water distribution system where some of them receive water every two days and other each 4 days for short time 8 to 10 hours each time. Also they state that the government and/or the responsible people should look for new water resources because the water become salty.
		Q2: What is the main problem in distribution system?	1. Old networks 2. Illegal connections 3. damaged water meters 4. Clear rules and laws 5. No enough pressure	1. Laws are not sufficient to punish the people who connect through the networks without a permissions. 2. old networks.	1. insufficient water resources. 2. old networks.	1. Damaged water meters 2. Old networks. 3.Lack of finance 4. problem in material entry to Gaza 5. illegal connections	1. No enough water 2. Old networks 3. Public educations	1. No water is available 2. bad quality.
		Q3: How do you think the water distribution system will improve?	1. Added new water resource to the system 2. replace old networks 3. putting Laws and Rules to be carried out for people who makes illegal connections' 4. Replace old meters	1. Law must be on ground 2. replace old networks 3. add desalinated water to the distribution system	1. New water must be added 2. replace old network will enhance the distribution system and reduce risk of pollution	1. replace old meters to enable knowing the UFW 2. Replace old network with new to minimize leakage 3. Law must be effective	1.Old network must be replaced with new 2. Educate the people with the water value	1. New drinkable water must be added to the system 2. Replace the old network with new one.
		Q4: Do you think construction of the water reservoirs will improve the distribution system?	Yes because it will improve the pressure in the network as well as it will maintain water in the network in case of wells (water resource) rehabilitation take place. Also the distribution will be enhanced especially in the far areas	Based on PWA master plans, water tanks are a key in enhancing water distribution system because they cover at least two days of water distribution in case of any damages or faults occurred in the wells.	Yes	Of course it will enhance the water distribution	Yes	Yes
		Q5: Do you think replacement of old network will improve the water supply system?	Yes and it will minimize the leakage in the network as well	Yes	Yes	Yes	Yes	Yes
		Q6: Do you agree to replace asbestos pipe lines with UPVC and/or steel pipe. Does it matter?	Yes since the asbestos network is very old and they leak all the time. The problem with the asbestos is its safe disposal where the old pipes (asbestos pipes) will remain in the ground since it is very difficult to get out from the ground	Yes and it will be good to be replaced because of health and environmental aspects.	Yes to avoid health risk to expose to the asbestos	Yes	Yes	Yes

Project Components		Brief Description	Questions	Stakeholders Opinions					
				PWA and CMWU	EQA	MOH	Mayors and municipal technical staff	Community Representative	Public Consultations
1.1.2: Rehabilitation of Water Wells.	General	The component includes the upgrading of 39water wells and the re-allocation of 7additional wells in the middle and southern governorates to improve yield, reduce specific energy demands and unit production cost, and reduce stress to the aquifer, as well as enable operation and maintenance of the new 7 wells location. Two of the new wells will be replacement of totally damaged wells in Deir El Balah due to IDF operation.	What do you think of the 30 wells upgrading, please elaborate.	The only water resource in Gaza Strip depends on the groundwater which is being abstracted by the wells. Those wells need to be upgraded from time to time to meet the required demand and to suite the energy and electricity required to abstract the water. In the past 5 years and due to Gaza Siege those wells have been maintained from local market which show a lower well efficiency and they consume higher energy than required which an upgrading of those pumps should take place. Yes we are in urgent needs to upgrade those wells to lower the electricity consumptions and replace damaged parts.	Not only the 30 wells mentioned in this project should be upgraded but all the Gaza wells should be studied against its energy consumption and that because we have a problem in electricity availability. Hence all wells should be upgraded to lower their energy consumption. We know that those 30 wells have local materials which consume more energy but also other wells should be investigated	Upgrading of wells make them produce more water with lower energy.	Yes those wells should be upgraded to match the shortage in energy.	Yes this may help producing more water with lower cost to the people	No comments
	Al Farouq Well		Are you satisfy with the well location and Why?	This well is located at Nussirate Cemetery. of course we are not happy with the well location but due to cemetery expansion, the well becomes in it, which could make its water contaminated by death decompose	It is better to change the well location because its location in cemetery is not suitable for drinking which may increase the nitrate concentration in the well	We are Not satisfying with the well location in cemetery. and the well must be changed due to high salinity and nitrate in the well	It is better to change its location because the people start to complain about the well location and well bad quality as well	It is not adequate to drink from well inside the cemetery and it is better to change its location. Also the well has high salinity concentration	All the met people agreed to move the well from the cemetery because of its bad quality and because of its location inside the cemetery and they were afraid that they could drink death water
	F/191 well F/192 well		Are you satisfy with the well location and Why?	Well (F/191) is located in Al Azhar University as their new dedicated land and it will become very difficult to operate the well within a private land property. Also Well F/192 is located within the new street in Mograga area. Those two wells are major wells for the middle governorate where the abstracted ground water quality is within the WHO standards	Those wells are essential to the people in the middle governorate where their quality is very good compared to other wells in the middle governorate. Hence and because of the wells become in private land (F/191) and in the street (F/192), the wells should be replaced but within the same area due to quality constrains.	Those wells have a very good groundwater quality and if can operate from its current location, we prefer to keep their location UNLESS it will be very difficult to operate them with their current location. In case of changing their location we recommend to have the same quality.	Thos wells have a very good water quality but its current location with a private property and within the street border will make it very difficult for operation and maintenance team to access the well.	The water quality is very good in those wells and in case of changing their location we need to guarantee the same quality supplied to the people.	The wells have good water quality and it will not be harmful to us in changing the well location since they will have the same quality.

Project Components		Brief Description	Questions	Stakeholders Opinions					
				PWA and CMWU	EQA	MOH	Mayors and municipal technical staff	Community Representative	Public Consultations
	Wadi Al Salqa well		Are you satisfy with the well location and Why?	This well is located 300m away from the eastern border of the Gaza Strip (buffer zone) and it is very difficult to the operation and maintenance team to do their regular work in this well. Added to that the well is far away from the center supplied area (city)	This well should be changed to be closer to the current network and to be accessible to the maintenance and operation team	This well has a chloride and nitrate concentration in an increasing trend added to that the accessibility to reach the well is very difficult for MOH monitoring team to take water samples from the well itself and not from the network as we do these time. Added to that the shortage in water may lead the people to depend on their agricultural wells for drinking water which may expose the people to health hazards due to water disinfection by chlorine.	We spend more than 2 weeks to coordinate visiting the well to provide it with some fuel and to change the generators oil filters. and some times we distribute the water by vehicle tankers to supply the demand with water in cases where the well has fault and stop to operate.	Wadi Salqa Village suffers a lot from the shortage of water due to in accessibility to the well to be reached for operation. Also some people start using their agricultural wells for drinking purpose which is not good for their health and the well should be changed to keep the water disinfected and clean	We can not reach the well location due to security reasons. But been informed that there are no people living around the well
	Abu Hamam well(T/46)		Are you satisfy with the well location and Why?	This well is very close to the eastern Gaza Strip border which make it very difficult and some times impossible to reach the well for any operation and maintenance purposes				In the time of well stopped due to faults, the people start suffering because of water shortage and it is better to change its location to maintain water accessible to the people	
1.1.3: Upgrading of Existing Deir El Balah Desalination Plant.		Existing plant is an old module with production capacity of 600 m^3/day, currently being upgraded to reduce energy requirements. Upgrade the plant to produce another 2,000m^3/day, connect the plant with the proposed reservoir for blending the desalinated water with other water supply (brackish water wells) to bring the water quality to an acceptable drinking water. The plant will serve the communities of DeirEl Balah and Al-Zawaida municipalities in the middle	Q1: Do we need a new water resource?	It is a MUST to have a new water resource to the Gaza current resources and that can be ONLY by seawater desalination plant. At least to provide the people with fresh and healthy water for drinking purposes and to release the stresses in the groundwater and to stop its deterioration.	New water resource is needed to keep the aquifer recharge and recover for the next decades	We hope to have fresh water from our home tape	Yes it is needed badly. and we asked for such project since years but the problem is political and fund allocation	What we need is fresh water regardless of its origin (groundwater or desalinated seawater)	
			Q2: Do you agree to pay for the desalinated water cost?	All of the staff meet say YES they will pay for the desalinated cost if they receive it. Some of them states that we already buy water for drinking purposes.	Yes without any remarks	Yes	Yes we will pay for that	We already pay for water from the distributed tankers, while if we recieve it from tape water, Yes we will pay for that	
			Q3: How do you think the role of government is this regard?	The government shall find a donation for such plant and in some stages, the government shall also look for water tariff compensation (i.e. they can pay for the first 3 years operation and maintenance and afterwards it should sustain itself)	There should be a role for the government because it is large facility and needs large investment to be implemented and no one can do it unless the government has a role in it.	The government shall keep a very close eye to the monitoring program due to chemical treatment occurs in the desalination plant. Hence an hourly monitoring program for health aspects shall be carried out in the regional desalination plants	In deed the governmental shall be responsible for operation and maintenance as well as monitoring to ensure freshwater is being produced	The government shall pay for us at least the first five years to compensate drinking brackish water since more than 10 years (?). The government shall also look for providing fresh and drinkable water to all Gaza people (this is the government role!!)	

Project Components	Brief Description	Questions	Stakeholders Opinions					
			PWA and CMWU	EQA	MOH	Mayors and municipal technical staff	Community Representative	Public Consultations
1.1.4: Service connections and district meters replacement	This subcomponent will finance the supply and installation of 20,000 water meters, in addition to bulk meters and pressure gauges on selected areas in the network, added to that a supply of two leak detection vehicles with equipped devices.. This component will be designed with proper targeting to improve utility billing, reduce network losses, and improve collection	Q1: Do we need water meters and Why?	Yes we are in bad need for those meters and even more than this quantity. During the last 6 years we were not able to purchase water meters due to Gaza Siege and limited budget available.	Yes the customers needs those meters to enable the utility measures the consumptions in which the billing value will be charged.	From healthy point view, it does not matter whether there is water meter or not and what it does to have a suitable drinking water for the customers, but we are not against knowing the quantity of water used for each customer.	The only way to know the customers consumptions is by having water meters in which it will reflect their billing value. Added to that we were not able to change the old water meters and even the new connected customers do not have meters due to fund availability.	Yes it is required to know the consumed water for each family and that will be a good indication for educating the people on the water value.	Not consulted for this specific item because it has been covered in large number of customer in the Community Representative column
		Q2: Do you think that meters enhance the utility billing?	Yes, the utility backbone is the billing values and to achieve a correct water consumption and water losses can be identified in the meter readings based on supply/demand equation.	Yes, with water meters the utility will be able to calculate the water value which could achieve a self dependent towards operation and maintenance cost.	Yes	In deed the new water meters will enhance the utility billing and as a consequence will enhance the provided services where money will be available in case of services breakdown.	Yes it will enhance the utility billing BUT we are asking in any case of tariff structure, we should be involved because the economical situation of peoples should be considered	
		Q3: Do you think this item in Urgent needs?	It is a priority need for this item since it can be as an indicator for services improvement and a pin point towards UFW and illegal connections	We may consider it as a requirement but not as an urgent because there is more urgent toward having good water quality for customers.	Could be an urgent to know where the water is being stolen from the network, but PWA can determine its urgent level.	Yes it is an urgent requirement towards keeping the services of water supply running and sustainable added to that the UFW can be determined in which location.	We do not know whether it is on top priority or not but the people in charge (government) know better in this regards	
		Q4: What are the obstacles for achieving this item implementation?	Two issues: 1. Fund availability 2. Goods coordination	In case of fund is available, there would be no obstacles	Fund availability	Fund availability and goods entrance to Gaza	Fund availability	
		Q5: As a customer do you believe in metering system?	Yes We will be glad receiving our bills with correct water consumption quantities.	Yes	Yes	Yes	Yes At least we will pay what we are consume	
1.1.5: Upgrading and maintenance of wastewater pumping stations.	This component will finance adding additional pumping capacity, maintenance of existing pumps, and improvement of electromechanical systems to improve efficiency and safety, and reduce cost of operation. The work shall include rehabilitation (physical cleaning and electromechanical) of wastewater lagoons and pump stations in all of Rafah, Khan Younis and North due to IDF shelf steadfast operation. Added to that a replacement of damaged wastewater networks and 10 wastewater pumping stations including all its	Q1: What are the main problem in wastewater pump station from your point view?	Wastewater pump stations is focal point towards delivery wastewater to the treatment plant. where some of the existing stations become very old due to un-availability of fund and spare parts as well. Other stations become under sized due to increased of connected customers without upgrading the associated wastewater pumping station due to fund availability.	Three problem: 1. Size of existing WW pump stations capacities does not fit the existing flow. 2. Old equipments and pumps. 3. Fund availability	One of the major problem flooding occurs around those stations where it exposes the stations neighborhood to health hazards.	Due to fund availability and Gaza Siege in the past years, the pumps become old and needs to be rehabilitated as well as some pumps needs to be re-designed to match the current flow.	Flooding of wastewater towards the people in nearby areas is the most problem and it becomes due to an existing of old equipments without any rehabilitation carried out from the municipalities	We are afraid of winter time because it is the time when wastewater floods around the stations and enter our houses due to old equipments and small size of pumps in the station where it can not take all flow in its pipe.
		Q2: What is your satisfactory level towards the existing wastewater pump stations?	At the current status some WW stations needs to be rehabilitated and others needs more studies toward achieving a satisfactory efficiency.	Not happy with the current wastewater condition in Gaza Strip.	Not satisfy due to flooding happen here and there from those stations.	We know that the current conditions of some WW pump stations is not adequate and needs more involvement towards achieving an improvement	Poor and needs to be improved	Very poor

Project Components	Brief Description	Questions	Stakeholders Opinions					
			PWA and CMWU	EQA	MOH	Mayors and municipal technical staff	Community Representative	Public Consultations
	associated civil and electromechanical accessories	Q3: Have you ever experience sewage flood to your house? frequent? and what do you do in that case?	Only one member of the group (16 person) has an experience of wastewater flood to his house. Frequent: it happen when rainfall intensity is high within a short time, some times twice in winter season. In flooding moment, the first thing we do at home is keep my kids away from the flooding area, and then start calling 102 and the utility for emergency call to send us vacuum pump trucks to suck all the WW from the house.	None of the group have face flooding of waste water in their houses.	None	Never experience this in our houses but we are working very quick in such cases. and usually this happen in low land areas and in winter season where the WW pump station is designed for a specific capacity while the coming flow exceeds its capacity, at this moment flooding occurs. But we would like to reassured the people that we are working with PWA and CMWU towards an improvement of those stations to fit within the coming flow.	Seven members out of 15 have experience this accident and they all agreed that the existing stations can not take all the coming wastewater due to old equipments and pumps, added to that the stations were located in higher level than the surrounding people houses and should become in lower land to avoid flood.	All the surrounded houses of required station for rehabilitation have experienced WW flooded to their houses. Most of the winter time flood occurs during heavily storm. First thing they do in such cases is to keep the young kids in safe place then they start suck the WW from their houses.
		Q4: Who is responsible to improve this component?	PWA, CMWU, EQA, municipalities and the Government	PWA, CMWU, EQA	Municipalities, PWA and EQA	PWA, CMWU	PWA and the Government	The Government
		Q5: How to solve their (Wastewater pump stations) problem?	1. Re-design 2. Rehabilitations 3. upgrading the facility	Upgrading and rehabilitations	Upgrading the station and look for new location	Rehabilitation and Upgrading and Fund availability	Rehabilitation	Rehabilitation is required
2.2.1: Warehouse and Workshop.	Warehouse and Workshop. The work shall include repair and rehabilitations of damaged civil and electrical activities due to IDF shelf operation	What is the importance of warehouses and workshop?	All the current maintenance carried out by PWA and/or CMWU is done through service contracts, where these services can be carried out in house by providing an equipped workshops to do all the required maintenance for the different equipments.	It is good to be self dependent towards daily maintenance schedule.	No comments	One of the most important services should be in house maintenance and that can be done only if CMWU and/or PWA have its own warehouse and workshop for different facilities.	We only care about the service level and suitable drinking water and if this item will improve the services, we will be happy.	Not consulted for this specific item
2.2.2: Technical Assistance	This subcomponent will include the provision of technical assistance to improve the administration, tariff system and efficiency of CMWU	Q1: Is the current tariff structure satisfactory?	No, it is not satisfactory and that because it does not cover the running services (operation and maintenance and staff salaries). and also the tariff is not unique in all areas of the Gaza Strip.	The existing tariff is not the same in all municipal areas and needs to be unified.	No comments	Not satisfy with the current tariff and needs to be increased to cover the services (water and wastewater) costs.	We believe that if the services improve we can accept additional cost but within the same services (bad quality) the existing tariff is more than enough.	Not consulted for this specific item
		Q2: Why do you need a new tariff?	New tariff will be based on a comprehensive study about the exact water cost and exact wastewater treatment and disposal cost, in which it will cover itself (self dependant).	Yes it is needed	There is no free services, there should be a tariff.	Tariff is very essential towards services sustainability.	New tariff should be take into account the current economical situation of the people.	
		Q3: Is CMWU working efficient?	We know that there is challenges during the past years which CMWU could maintain its institution stand in the field and could maintain the services of water and waste water running without major faults.	Yes they working hard but sometimes they face some problems with some municipalities where they become project obstacles instead of solving the problem with CMWU.	They are working in high spirit but needs more staff to carry out different activities.	Yes they are working hard and we try to work with them and gain some experience from their staff.	They are working in Rafah and Khan Younis and Middle Gov. but not in Gaza and we wish they will start working in Gaza to resolve some problems here.	

Project Components	Brief Description	Questions	Stakeholders Opinions					
			PWA and CMWU	EQA	MOH	Mayors and municipal technical staff	Community Representative	Public Consultations
		Q4: Do you think the municipalities staff can play the same CMWU roles?	To some extent but not as professional as the existing CMWU staff.	No	We are not sure, but there is specialty in CMWU staff the municipalities can not do it.	We are trying to get the more experience with our engagement with CMWU but we are doing and working very hard.	We do not know.	
2.2.3: Operational Assistance	This component will support the operations of CMWU by financing purchase of chemicals, chlorine, chemical regents to the desalination plant, fuel to run the water and wastewater facilities, IT equipments, heavy machinery loaders, excavator, maintenance vehicles and PMU expenses. The operational assistance will be provided on a descending scale to encourage the utility improve on collection and achieve better operational cost recovery	Q1: What is priority level of chlorine?	It is top level due to its health impact.	Level 1 since it is a disinfection of any pollution in the network.	This is health related and should place top priority.	Without chlorination we can not be responsible for the people health.	The water should be disinfected and clean from any hazardous	Not consulted for this specific item
		Q2: Does the water facility in need for chemicals	Added to the groundwater wells we have desalination plants, and as known desalination plants depend mainly on chemicals. Added to that CMWU lab needs chemical and reagent to carry out its regular water quality monitoring.	Yes, they are needed for all treatment process	Yes, chemicals are very essential in desalination process and in their lab	Yes	If it does not harm the customers.	
		Q3: Can CMWU sustain without donors support?	At this stage it is very difficult to do so due to political and economical situation, where the water tariff still needs to be developed.	Not in this stage	Not this time	Not now since we are facing a lot of problems where donors money can contribute in solving it	We do not know	
		Q4: Who can run the water and waste water facilities in Gaza Strip (municipalities or utilities)?	It is better and strategic planned to be a unified utility dealing with the regulator and customers. Utility is better in institution setup and its staff is more experienced in the field.	Utility is better than municipalities, where instead of communicating with 25 municipal area, we can contact one responsible body covers all the areas.	Utility and Municipalities are the same. But for future cooperation better to have one body as Utility to communicate with.	We can run the sector and we ran it before the CMWU existence but the cooperation together; the services become better.	Dealing with one body is good for us.	

6.2. Future without the Project

6.2.1. Environmental Future without the Project

Following nearly of twelve years of protracted and often violent conflict since October 2000, which has caused severe damages to the Gaza's physical and institutional infrastructure, including housing, public facilities, as well as vital water, wastewater and electrical networks. Municipal and village distribution networks suffered direct damage and negligence. If the present situation continues there will be an accelerating load of the existing water facilities, over abstraction of water from the existing wells, and additional deterioration of networks. This will be negatively reflected on the health and wellbeing of the citizens, as poor sanitation, unsafe water and unhygienic practices cause children to suffer needlessly from disease. Water and sanitation related disease, despite being preventable, remains one of the most significant child health problems worldwide. Diarrhoea is the most serious of these diseases. Children typically have four to five bouts of diarrhea a year. Even when they don't kill these diarrhoea episodes can physically and mentally stunt children, affecting them for the rest of their lives. By weakening children, diarrhea increases mortality rates from other opportunistic diseases, including ARI (Acute Respiratory Infections). ARI and diarrhea together account for two-thirds of all child deaths worldwide.

On the other hand, without the planned project activities, the impacts on the other environmental items would just follow the general impacts due the increasing population and the related activities (road traffic, development of infrastructure, construction of buildings, increased industrial and commercial activities, etc.).

The installations of water networks and transmission lines, water wells and reservoirs and the wastewater pumping station seem to have no or minor impacts on wildlife concerning fauna and flora. The magnitude of these installations is somewhat small and hence, their environmental and/or ecological impacts seem to be low importance. The noise generated from these facilities could not have significant environmental or ecological impacts, and could be neglected. Some of these facilities are located in urban areas, where the occurrence of wildlife has little concern in the sense that the urban areas are not so natural to attract faunistic species. For example, wastewater pumping station, water wells and reservoirs are often found in urbanized localities.

Concerning Deir ElBalah desalination plant, it seems to have a common low noise pollution problem due to its use of the Reverse Osmosis (RO) Technology in spite of its current low production capacity (600 m^3/day). It is worth mentioning

that this desalination plant is located in a semi-populated area. The study team didn't report any major or specific impacts in terms of noise and odors. Baseline noise measurements were carried out within the boundaries of the proposed Station. The observed noise levels for two locations were within the recommended values. In both locations, noise level varied generally between 45 and 78 dB. Some jumps were observed due to traffic movement and other sources of noise, such as some work activities.

6.2.2. Social Future without the Project

The project idea stems from the need to develop the deteriorating current situation of the project components that imposes negative impacts on their beneficiaries and the community at large. The socialimpacts without the project components can be outlined as follows:

***Rehabilitation of water wells*:** the existing condition of the wells under consideration, whether for rehabilitation or re-location, is considered critically risky and, thus, needs remedial actions. Otherwise, a valuable efficiency will be lost and the productivity, salinity level and efficiency of such wells will be jeopardized.

A. **Al Farouq Well:** the existing location of Al Farouq well at the main entrance of Al Nusairate Cemetery is problematic. Its location limits the space available for the cemetery and imposes a psychological stigma to its water. Local residents are under the fear that the well collects its water from the groundwater laid under the bones of dead people which detests people from using such water for drinking and/or cooking. Moreover, all local residents expressed their distress of the salinity of the well's water and they said that they only use it for laundry and cleaning purposes only whereas drinking and cooking water need to be purchased.

   Um Mohammed Khatab (70) said that I wish they transfer it as soon as possible. I am very obsessed of using water coming from a grave and its plants. Hani Abo Khatab (28) said that the location of the well is totally inadequate and the quality of water provided should have been much better. Mohammed Abo Jibara (35), on the other hand, said that he has no problem in removing the well or not because it only provides saline water for cleaning and laundry purposes only.

B. **F191 well:** This well is located at Al-Moghraqa area inside a piece of land designated to Al-Azhar University. The current location of the well shall hinder the future development of the land as it cannot be part of the university campus and the operators will no longer have easy and permissible access to the well.

C. **F192 well:** This well is located nearby Al-Nour Entertainment Park. It is laid within the area designated to the main road of Al-Nour Park which constraints the road pavement work upon its design. Therefore, this well needs to be removed and shifted towards the Park walls regardless that the proposed location might be used for parking or future expansion purposes, as reported by Al Nour Park general manager (Mr. Ahed Shamali). However, he said the obstruction will not be very harmful to the Park and its facilities and the municipality can initiate the shift if necessary.

D. **Wadi Al Salqa well:** a well that is located 300 meters away from the buffer zone with Israel. The well is the sole sources of water providing 50 m^3/hr of water supply for over 6,000 persons at Wadi Al Salqa area and around 100 persons living at Al Qarara area and works in average of 16 – 20 hours a day. The current location of the well is seriously critical and imposes a threat to the operators and maintenance teams at times of Israeli aggressions. Being in such area makes it very frequently nearly impossible to reach by the operators and therefore local residents are subjected to continuous water shortage problem. The local municipality was often obliged to come up with poor alternatives to the water supply problem; such as distributing small water tanks to local houses during the 26 days of water cessation at the end of 2008 Operation Cast Lead.

   In addition, being in such unsettled area, the well was frequently subjected to bombing and shelling by the Israeli forces and was targeted many times which severely weakens its productivity and efficiency rates.

   Zakher Association stated that moving the well will enhance the water supply to the people in Wadi Salqa area because most of the summer time the well needs rehabilitation and most likely the coordination with Israeli side is difficult to achieved which led to water shortage in the area. Also MOH showed their interest to move the well from its current location because in the time of well rehabilitation, the people reply on their own agricultural wells for water supply (some times the rehabilitation take longer time to achieve the coordination required to allow for reaching the well from Israeli side), which is not disinfected which may led to bad health condition in Wadi Salqa.

E. **Abu Hamam (T46) well:** the well is also very close to the buffer zone with Israel. It produces nearly 30,000 m^3/ month of water and serves 20 – 30 thousand persons. This well was put out of services for over 3 years and was labeled ‘inaccessible’ ever since. This well needs to be removed and transferred to some a safer location to continue providing its services as designed.

Zakher Association and MOH saysthat the same condition apply in this well as Wadi Salqa Well,.

In general, water shortage threatens the life of people and all living habitats. Fresh water share per person continues to decline in the Gaza Strip imposing health

***Wastewater stations*:** Wastewater stations in the Gaza Strip are hardly capable of providing the minimum services to local residents. The stations suffer from poor and malfunctioned equipment and poor maintenance which incapacitate their efficiency and productivity levels. This has imposed serious hazards to local residents of leaking wastewater into their houses when the stations were not able to pump the wastewater adequately. This situation frequently endangers the life of citizens. It is well known that pathogens are disease-causing agents, which can be in the form of bacteria, viruses, mold spores, or protozoans, and which are normally present in large numbers in sewage wastes. The nature and extent of potential pathogen risks of sewer backups and floodwaters will depend in large part on the potential contaminants expected to be in the waters.

In general, the greater the extent of the sewage component, the more likely the potential for adverse impacts, and the more important the proper cleanup of the materials that have come into direct contact with the contaminated waters. The severity of the health threat therefore depends on the source of the water and the extent of penetration into the building environment. The extent of penetration is dependent on the porosity of contaminated materials, the quantity of floodwater, and the amount of time the water remains in contact with materials. Even floodwater or storm water which has not been directly impacted by sewage discharges is likely to contain a wide variety of microbiological organisms (e.g., from animal wastes, street runoff, etc.) and must be properly managed. Some of these pathogens, such as mold spores, can even establish an ecological niche and present a health risk from chronic exposure for some time after the event. Preventive measures, and proper cleanup procedures are essential in mitigating the risk of infection; this guidance is intended to assist the public in these actions.

PWA, EQA, MOH and Zakher association shows an interest to the propose components because it will improve the nearby people conditions as accident happened (sewage flooding around the stations) before due to lake of maintenance and rehabilitations.

A. **Al Nusairat Camp Wastewater Pumping Station:** the station serves over 1,000 houses at Al Nusairat New Camp (Al Ghoula Area) particularly those houses surrounding Al-Arouba School. The station is reported to be working under deteriorating conditions with poor equipment and maintenance. The electricity generator, in addition, is very poor which highly affect the pumping

efficiency. The station was constantly reported to be down of service which resulted in overflowing houses with wastewater. This has cost the local residents a lot where local furniture, sheets, carpets and clothes were ruined. In addition, this has caused psychological distress to aggrieved families.

Um Mohammed (Intesar Abo Kash) from Al Nusairat Camp said that they constantly suffered from the wastewater entering all over their house from bathrooms during the day or night. For instance, we were once sudden by the wastewater leaking under our beds at 02:00 after midnight. We woke up by our children crying and we had to call for help from our neighbors to save whatever we could save from our belongings. We spent over a week cleaning and rearranging our house but almost everything on the ground was ruined. Intesar Abo Kash also reported that this instance happened more than once and we had sometimes to use buckets for over 4 hours to remove the wastewater to the street.

A young lady (18) from Al Nusairat added that they also suffer from the same problems when the station is turned off or during the rain saying that they pray to Allah when it rains, it only water the ground and save them from wastewater flooding. What is worse, according to Um Mohammed, is that when this happens, we lose our main supply of sheets and mattresses and we have to spend days in the winter without proper cover.

B. **Deir El Balah Wastewater Station:** the station is located at one of the lowest zones of Deir El Balah where it collects the wastewater from the local area and discharge nearly 350m^3/hr to the Gaza Wadi. The station is incapacitate to keep abreast to the discharge quantities which means that the wastewater retention time is quite long and therefore the surrounding area subjected to bad odors, diseases and infections amongst the children playing nearby.

The wastewater flooding into local houses in the area could also be attributed to either malfunction problems or to the rainfall. This has resulted in financial loss of the aggrieved families and psychological distress. Abu Tamer (Medhat Barood) from Deir El Balah said that when the sewer water floods into the streets, it leaks into our houses. I, along with some other neighbors living at Akeela Road, had experienced this issue three times so far where the sewers flooded my house to a depth of over 20 cm and ruined our property. He said the dirty water damaged his refrigerator, washing machine and all kitchen utilities. Kamal Shaqora, the operator at the station, confirmed that those who live in houses below the street level (like most houses in Akeela Road) are most vulnerable to the flooding. Therefore, most households around the station had to invest a lot of money in adjusting their houses to be remarkable above the street level to avert such crisis.

Moreover, pumping the wastewater to the sea highly contributes to the pollution of the sea shores which negatively affects the sea life and creatures especially the fish which is fed on by the Gazans.

Deir El Balah Desalination Plant:the plant produces almost 600$m^3$of fresh water a day throughout desalinating the sea water. Where existing intake pipe lines from beach wells and brine rejection pipes (diameter of 18 inch) will remain the same while upgrading the plant because it still accomodate the additional quantities of 2,000m^3/d (the brine pipe was designed to hold 5,000m^3/d of desalinated water with 40% water recovery). The additional quantities of 2,000m^3/d is relatively small compared to the future regional plant (60Million m^3/year) but the plant highly contributes to lessen the fresh water shortage problem in the Gaza Strip especially in the Middle Governorate where groundwater is being deteriorated in this area. Therefore, upgrading the plant will produce more fresh water and will reduce the aquifer deteriorations and will be very beneficial.

PWA stated that they are in the process of fund appraisal to the regional desalination plant which will be financed by EU and Arab Fund, were EU and UNICEF is currently working on the first stage of the regional plant to produce 6,000m^3/d.

Purchasing and installation of 20,000 water meters:the idea sprung from the need to properly monitor the residential water consumption level. The current water meters are worn out and do not work properly and therefore reliable estimates of water consumptions cannot be made. This negatively influences the local municipality's ability to manage and monitor water consumption. In addition, poor water meters encourage water theft which undermines the municipality and results in poor services to the citizens. However, installing new meters will not solve of problem of the large number of unpaid water bills among the citizens particularly in poor areas where unemployment rates hit the roof. Therefore, the installation of water meters should be accompanied by an awareness and educational program to the local people. Mr. Yaqubi (PWA) stated that those meters will enhance the water distribution by knowing exactly the Un Accounted For Water from illegal connections and damaged meters.

6.3. Environmental Benefits

Through the assessment process of these projects it is expected that significant benefits would accrue to the population. Significant environmental benefits are expected after implementation of the project. The identified positive environmental impacts would include the following:

- Improvement in the accessibility and efficiency of water supply service delivery by further reducing the losses due to water leakage and illegal house connections and increasing the capacity of the systems in terms of quality and quantity.

- Improve water quality and more regular supply to customers with fewer breaks in service. This will enhance the quality of life, health and well being of the citizens. The incidence of water borne diseases especially diarrhea among children would be reduced. This will help reduce child mortality. General improvement in sanitation will also lead to a healthy environment.

- Construction of water tanks can balance the water shortage in distribution networks and ensure long pumping periods and availability of sufficient water quantities.

- Reduce the pollution of water resources by wastewater through the improvement of distribution networks and wastewater pumping stations. This, in turn, will improve the environmental health situation concerning the reduction of health problems associated with wastewater such as mosquitoes and parasites.

- Improvement in public health and environmental conditions due to expansion and rehabilitation of water networks.

- Such projects will improve the capacity of the distribution systems.

- After construction, the implemented projects will have no impacts on most of the physical environment factors such as noise, dust, and air pollution.

- Employment generation will be elevated due to the engagement of many unemployed people in the project construction and operation.

- Compensatory Afforestation: Green belts will be built at the periphery of the proposed water resource projects (reservoirs, water wells, …..etc.). Such green belts and re-vegetated areas are thought to attract and increase biodiversity.

However, these impacts are positives and enhance the project idea. The CMWU, municipalities, contractors and other parties, are responsible to increase these positives as much as possible.

6.4. Socioeconomic Benefits

Implementing the project components will necessarily help mitigating the problems identified before and will contribute to achieve the following:

- The rehabilitation of wells and transferring them to a safer location will guarantee the sustainability of its services. This will also significantly develop their capacity and productivity to the benefits of the end user.
- Transferring the wells to a safe location far away from the buffer zones will facilitate a safe and sound access to the operation and maintenance services without jeopardizing the facility or the life of workers.
- Transferring the wells located at Al-Azhar University land and the one located in the Cemetery will provide extra space for both places.
- Ensure safe and sound provision of fresh water to different purposes.
- Enhance the quality of life and well being of the citizens.
- Provide more fresh water for drinking and cooking throughout the expansion of the Desalination Plant will positively reflect upon the health and safety of the end users.
- Mitigating sewer water flooding problems by rehabilitating wastewater pumping stations will minimize loss of properties.
- Rehabilitating wastewater stations also facilitates the mobility of people and vehicles and will minimize the risks of diseases amongst children playing in the streets.
- Rehabilitating wastewater stations will also significantly release the psychological distress of citizens living in houses subjected to flooding. Such residents live under constant fear and suspension of sewer floods especially at rainfall times.
- The development and rehabilitation of wastewater stations will lessen the pollution of the surrounding air and soil that happens as a result of discharging sewer water to the streets.
- Installing water meters will help reducing water theft cases but will not guarantee full payment of water bills by the citizens. However, it is a step in the right way of retrieving some of the municipality costs but needs to be accompanied by educational and awareness campaigns.
- Carrying out such projects with tangible benefits will reflect a positive image of the municipalities and its services and will therefore help in encouraging local citizens to pay their water bills to the municipality.
- The entire population within the service areas under this phase of the Project (estimated around 784,486) of the total population of the Gaza Strip (45.8% of

total population). will benefit from these projects. The project will ensure the beneficiaries access to reliable water supplies. These beneficiaries will also experience health and environmental benefits from improved access to water services.

- Women and children as well as most community categories would benefit from the proposed project components.
- Economical benefits are gained as short-term job opportunities for local skilled and unskilled laborers. Moreover, the project would include the following economical benefits:
    - Opportunities for local private sector participation and development through consulting, contracting, working and manufacturing inputs throughout the project period.
    - Employment generation to unemployed skilled and unskilled laborers.
    - Increase revenues generation and greater cost recovery.
- It is recommended to enforce the contractors to employ workers and emphasize the labor content in the contract documents in order to create direct and indirect job which will help to reduce the hardship situation.
- Annex V contains a samples of the field social survey carried out for the different project components. Other location such as wells nearby the borders cannot be visited due to security reasons.

6.5. Environmental Negative Impacts

6.5.1. Air Quality

The construction of various components of the project would generate dust, vehicular emissions, and noise. The amount of these impacts is largely a factor of the size of the facility/pipeline and duration of construction. The short-term impacts to the local air quality from construction would be localized, and these impacts could be minimized to some extent through the use of dust suppressants (such as water) or construction methods (such as covering storage piles, and removal of construction waste directly to dump sites). Emissions generated during the construction phase include:

- Vehicle and diesel emissions from large construction equipment and generators.

- Volatile organic compounds (VOC) emissions from storage and transfer of fuels for construction equipment.

- Small amounts of air pollutants (carbon monoxide, nitrogen oxides, and particulates) from the different activities engaged in the construction phase.

Fugitive dust from many sources such as disturbing and moving soils (clearing, grading, excavating, trenching, backfilling, dumping, and truck and equipment traffic), mixing concrete and drilling. All the mentioned activities are expected to be extensively and intensively used in the proposed water supply rehabilitation and expansion project for the Middle and Southern Governorates of the Gaza Strip. Air quality impacts could also occur if local cleared vegetation (trees, shrubs and grasses) is burned. It is worth mentioning that burning of solid wastes, including the agricultural ones, is a common negative practice in the Gaza Strip.

Diesel backup generators, which are anticipated to operate infrequently, could emit SO_2, NO_x, or other combustion by-products and could generate noise. With some facilities, such as the wastewater treatment plants, storm water reservoirs, and infiltration basins, there is a potential for a slight increase in odors. Moreover, properly functioning treatment and infiltration facilities are not anticipated to generate significant off-site odors. Localized air quality impacts from odors are anticipated to be of short duration and quick dispersal and would not pose a threat or nuisance to human health.

Sources of noise during the construction phase of the proposed project in the Gaza Strip would primarily occur from the equipment used (bulldozers and diesel engines) and the vehicular traffic. The noise levels would actually depend on the distance to the nearest residence. If near or within a residential area as in Deir El Balah and Nusirat Camp, noise levels from equipment operation could exceed the recommended guidelines, but would be intermittent and extend for only a limited time. Therefore, they should be equipped with appropriate acoustic technology to reduce noise level.

Sources of noise during the operation phase of the proposed project would primarily occur from operating the motors of water wells and wastewater pumps. Particular emphasis is to be paid on the Deir El Balah RO Desalination Plant. High pressure pumps and energy recovery systems, such as turbines or similar, are expected to produce a significant level of noise over 90 dB. Therefore, they should be equipped with appropriate acoustic technology to reduce noise level. EQA stated that reducing the noise would be better if using generator silencer (brand name and not local made) as their experiment in this regard.

6.5.2. Land Use and Transportation

The physical components of the proposed project include some installations of infrastructure above or below ground. The above ground activities associated with the proposed project is limited to rehabilitation work of existing facilities and minimal new sites development. The necessary areas for new construction activities (for water wells and water tanks) are governmental and already allocated for the project. Thus, the impact on land use will be minimal. Below ground components such as pipe replacement and installation of new water and wastewater pipes will dominate the project physical activities.

The new construction activities of the desalination plant will be at the northern side of the existing desalination plant. There are no changes on the existing land use at the site. Only minimal disturbances during construction could be occurred, and could be mitigated efficiently by proper construction management.

Other components of the project are not anticipated to have as perceivable an impact on land use. Construction activities of the proposed project may result in short-term disruptions to the existing adjacent land uses. Construction vehicle emissions and dust would present a short-term nuisance.

Construction activities associated with the proposed project is relatively of small scale. Thus, it is not anticipated to generate unreasonable traffic. Construction of water and wastewater pipelines along the main roads may result in short-term disruptions to the existing traffic.

Visual impacts resulting from large areas of exposed surface, increases in dust and the presence of large-scale equipment, machinery, and vehicles during the construction phase. This is a temporary situation. The area of work should be separated by artificial barriers.

6.5.3. Agricultural resources and use

The implementation of the various components of the project requires the construction of few structures aboveground. Vegetation within the immediate vicinity of the footprints of these facilities would be cleared. No unique vegetation of special concern is anticipated to be found in the vicinity of the proposed footprints. Thus, the project is not expected to result in significant loss in vegetation and habitat.

Surface disturbance, heavy equipment traffic, and changes to surface runoff patterns can cause soil erosion. Impacts of soil erosion include soil nutrient loss and reduced water quality. Ground disturbance (e.g., trenching and grading) would result in visual impacts that produce contrasts of color, form, texture, and

line. Soil scars and exposed slope faces could result from excavation, leveling, and equipment movement. Re-vegetation should be performed using local plants. All slopes and working surfaces should be returned to a stable condition. However, the project components will include very limited impacts on soil.

6.5.4. Biological Habitat and Species

The Impacts on the biological habitat and species during the Construction Phase of the Proposed Project would include:

- **Ecological Resources (Fauna and Flora):** Adverse impacts to biological or ecological resources could occur during construction phase from erosion and runoff, fugitive dust, noise pollution, modification, fragmentation and reduction of ecological habitats and mortality of biota (fauna and flora). Site clearing and grading, coupled with construction of wells, and support facilities, could reduce, fragment, or dramatically alter existing habitat in the disturbed portions of the project area. Clearing of surface vegetation is sensitive to ecosystems in the sense that each plot of land supports a certain habitat, and is part of the biodiversity of the region. Earth nests of some bird species are expected to be destroyed during the construction activities. Hence, the breeding biology and potential of these birds are to be put at risk. Examples are the nests of some resident and breeding bird species, e.g. the Chukar Alectoris chukar and Stone Curlew Burhinus oedicnemus. Wildlife in surrounding habitats might also be affected if construction activities (and associated noise) disturb normal behaviors, such as feeding, roosting and reproduction. It is worth mentioning that most mammalian fauna (e.g. Egyptian Mongoose Herpestes ichneumon) of the Gaza Strip are of nocturnal habits (Figure 16) thus, they are unlikely to be affected much by noise which is generally generated during the construction at the daytime. Define the area of the project which will lie under tension to minimize potential damage to remaining ground vegetation and earth nests.

Figure 16: The Egyptian Mongoose Herpestes ichneumon is a nocturnal carnivore in eastern parts of the Gaza Strip as well as in Wadi Gaza area

- **Workers Health and Safety:** Potential impacts to workers and public health and safety during the construction phase of each part of the project in question in the Gaza Strip are known to be the same as those associated with any construction project involving earthmoving, use of large equipment, transportation of overweight and oversized materials, and construction and installation of industrial facilities. Health and safety issues include working in trenches and possible contact with natural hazards, such as uneven terrain and dangerous plants, animals, or insects. Health and safety impacts of the project on workers and communities in the area of influence of the project will be reasonably managed according to the national Occupational Health and Safety Regulation (Ministry of Labor) in order to reduce the likelihood of accidents and work-related illnesses on the job as well as accidents occurring between construction related equipment and local vehicles. It is worth mentioning that biting by the Palestine Viper (Vipera palaestinae), a very venomous snake in the Palestinian Territories is frequently recorded. The entire workforce of the project items and components should be trained in the use of protective gear, emergency response and care procedures. Training given to the employees should be backed by regular on- site training in safety measures.

The main expected impact of the Deir El Balah Desalination Plant on the marine environments is due to the discharge of the concentrated brine to the shore line of the sea, and its magnitude depends on environmental and hydro-geological factors which area characteristics of the sea: bathymetry, waves, currents, depth of water column, … etc. These factors will determine the extent of the mixing of the brines and therefore the geographical range of impact. It is worth mentioning that the feed water intake for the Deir El Balah Desalination Plant is done through beach wells. The solution for ensuring good dilution and minor impact of brines on the marine life is to have a long outfall discharging into the sea.

Given the wave action and the near shore currents, it is anticipated that the brine would be relatively quickly diluted and dispersed, and thus it is not anticipated to impact negatively the marine life.

6.5.5. Solid waste

Solid waste during the construction phase will be minimal. Solid wastes resulting from the excavation, rejected components and materials, packing and shipping materials (pallets, crates, Styrofoam, plastics, etc.), and human garbage will be disposed properly to sanitary landfills as required by the Palestinian Environment Law. The amount of solid was generated by the personnel is estimated based on 0.8 kg/cap/day solid waste generation assumption.

6.6. Social Impacts

Based on stakeholders input, feedback and concerns regarding different project components showed that most of the project components are not expected to have negative impacts on the population and housing allocation.The project's positive impacts clearly overweigh its downsides (refer to section 6.1 and table 6A). The WASSSIP AF will not impact internally displaced people and is not expanding its geographical extent in any way, therefore we do not anticipate any additional negative social impacts. Furthermore, it has been verified during recent Gaza mission in September 2014 that the CMWU is utilizing a grievance redress system and has agreed to continue to improve the documentation of the process. The following social aspects were examined:

6.6.1. Population and Housing

The project is not expected to incur social safeguard compliance issues. The project new locations will have little or no land acquisition for public purposes. As detailed in Table 5 only limited areas are necessary to some water wells and water tanks. The new lands are either available in the project boundaries or allocated for this purpose (by the Governmental responsible authority). There is no resettlement is expected, and the issue of indigenous people does not arise. Accordingly, no public consultation is necessary for this specific purpose; discussion of impacts of land taking and resettlement. On the other hand CMWU and the consultant invite the project stakeholders (Palestinian Water Authority "PWA" [Eng. Rebhi Al Shiekh and Eng. Ahmed Yaqubi], Environmental Quality Agency "EQA" [Eng. Bahha Agha], Ministry of Health "MOH" [Mr. Ahmed Tibbi], Mayor of Municipalities [Rafah, Khan Younis and Deir El Balah] to discuss the project components and their input towards land availability needs, and any concerns that could be benefits the project components. The meeting was individual due to difficulties found to gather all the concerned parties in one

meeting. They all agreed that CMWU will ask for the land acquisition and they will support having the official documents from the land owner. Mayors (Khan Younis, Rafah and Deir El Balah) showed their interest to increase the water and waste water charges, where the current tariff does not cover the operation and maintenance cost, where PWA shows sensitivity towards increasing the water and waste water tariff due to current political and economical situation of the Gaza Strip but Eng. Rebhi (PWA deputy) stated that once the current political and economical situation become better in Gaza Strip, PWA will support discussing this option with CMWU and with the Government. Hence CMWU will be responsible for re-assessing the water pricing, if applicable, in the Gaza Strip as the price might increase to account for cost recovery of the project subcomponents. In parallel, the level of service, however, will improve significantly. Consumer attitudes and behavior, patterns of water use, and customers perceptions for the rehabilitated and improved facilities and the level of service.

6.6.2. Employment and Income

In summary, the operational impacts of the project are largely associated with the costs to be borne by the customers (municipal, industrial, and agricultural).Prices paid for water and wastewater might slightly increase, but the level of service would also be substantially improved. This is also raised during the individual stakeholders meetings where this option will be based on tariff structure study to be reviewed by PWA as the water regular institution to be approved at later stage from the Government once the political and economical situation become better in the Gaza Strip.

Although a small number of workers may be required for the construction and operation of the proposed project, overall, the implementation is not anticipated to significantly alter the employment structure and unemployment rate of the Gaza Strip. However, some short-term benefits may be realized during the construction and rehabilitation of these facilities, directly due to the employment of laborers and/or indirectly from the purchase of equipment and materials.

6.6.3. Future Water and fairness distribution

The calculated future water volume required based on two important factors, which are the improvement of the water distribution system and fairness distribution all over the Gaza Strip to reach 150L/C/D by year 2035. Those factors were calculated based on the current situation and expected future development to reach 80% water distribution efficiency by year 2035. PWA and EQA showed an interest to achieve those figures which complies with their future strategic plans while MOH stated that all illegal connections from the water

distribution network shall be traced and cut off due to their possible negative impact to other domestic customers health because they could store the delivered water in improper situation, where Mayors stated that they will support CMWU by all means towards legalized the illegal connections.

6.7. Archaeological Resources and Tourism

Implementation of the project would require some construction of new facilities and some new pipelines. According to the understanding of the project activities, there are no expectations for potential to uncover, damage, or destroy archaeological resources. All of the project components are not located in known archaeological resources.

Wadi Gaza is another potential recreational area if the existing situation of dumping raw sewage and solid waste is solved. Improving the wastewater connections in the middle Governorate camps will increase the amount of raw sewage disposal to Wadi Gaza and ultimately to the beach. But at the long run and by implementing the regional wastewater treatment plant, the potential for Wadi Gaza to be a recreational area will increase. The project may not have any impact on other tourism resources, as the physical constructions are limited. EQA and MOH state that the Wadi problem will be resolved in new proposed projects which will tackle the wastewater problem in Wadi Gaza.

6.8. Public Health and Safety

The proposed project may not directly decrease the problems associated with high nitrates and chlorides but the new proposed institutional setup will accelerate funding of water treatment projects such as brackish water treatment and seawater desalination. Disposal of wastewater by cesspits, sludge disposal sites by individual municipality, effluent disposal or reuse, brine disposal will follow strict regulations. This in turns will have positive impact in reducing the pollution sources to the ground water aquifer and thus, reduce health hazards.

Implementation of the project components would directly benefit the health of people in the Gaza Strip because it would increase the reliability, volume, and quality of drinking water. Implementation of the water storage and distribution component would enable a more reliable water supply and consistent delivery pressure. This will indirectly cause lower incidence of disease, lower infant mortality, and an overall longer life span. Similarly, several direct human health benefits would follow from improvement of the wastewater services. The provision of additional, improved treatment facilities would decrease the risk associated groundwater pollution, thus reducing the spread of pathogenic

infectious diseases.However, it should be noted that several of the treatment processes (for both water and wastewater) require the storage and handling of small amounts of chemicals; these must be controlled in a responsible manner to minimize potential risk to human health from accidental release.

On the hand, during construction and operation activities, some impacts are expected on public health and safety. They will have major impacts if the contractors and responsible entities neglected the mitigations measures. The impacts will be minor or negligible if they are strictly mitigated as issued later on section 6.8. Risk of accidents and injuries that may occur during loading up and loading down (lifting), trucks movement, using of sharp materials, falling, electricity chocks, high level of noise, and dust generation are examples for potential impacts for public health and safety.

6.9. Summary of Environmental and Social Impacts

Table 7Bsummarizes the environmental impacts of the project on the different environmental issues. Only potential negative impacts are detailed in table7B;

Table 7B: Potential Environmental Negative Impact

Issue	Project Component	Impact	phase	Significance
Physical Resources				
Topography	- NA	- Negligible		- Negligible
Climate	- NA	- Negligible		- Negligible
Water resources	- 1.1.2	- Increase in water abstracted from aquifer and over pumping due to potential drilling of new wells and rehabilitation of existing wells	- Operation	- Major
	- 1.1.1	- Risk of water contamination through distribution system in case of breaks.	- Operation	- Moderate
	- 1.1.1, 1.1.2	- Water quality deterioration	- Operation	- Major
	- 1.1.1, 1.1.2, 1.1.3	- Risk of chemical spillage and/or leakage from treatment tanks (During water disinfection / chlorination)	- Operation	- Moderate
	- 1.1.2, 1.1.3	- Health hazards from extra dosage of chemical	- Operation	- Major

Issue	Project Component	Impact	phase	Significance
	- Common*	- Continuous use of cesspits for wastewater disposal	- Operation	- Moderate (major at the long run)
Solid Wastes	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Solid waste that result from trenches excavation and other domestic wastes may result in the impairment of the local traffic in the vicinity of the construction sites; risk of traffic accidents.	- Operation	- Moderate
Air Quality	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Dust generation, nuisance value that in extreme cases may affect health of general population. Vulnerable groups could have much higher health threats.	- Construction	- Minor
	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Gas emissions from vehicles movement	- Construction	- Moderate
	- 1.1.1, 1.1.2, 1.1.3, 1.1.5	- Gas emissions from electricity generator	- Operation	- Minor
Noise	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Nuisance value that may in extreme cases affect health	- Construction	- Moderate
	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Nuisance value that may in extreme cases affect health due to generators noise during electricity cutoff periods and Movement of trucks	- Operation	- Moderate
Land use				
Land use	- Common	- Unplanned induced urbanization of neighboring areas or areas facilitated by new infrastructure facilities	- Operation	- Minor
Transportation / infrastructure	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Impacts of medium-heavy truck movement	- Construction	- Moderate
	- 1.1.1	- New routes of movement (for limited periods)	- Construction	- Minor

Issue	Project Component	Impact	phase	Significance
	- 1.1.1	- Obstruct the accessibility or property and impairment of the local traffic in the vicinity of the construction sites; risk of traffic accidents	- Construction	- Minor
	- 1.1.1, 1.1.2	- Potential accidental break of existing water, wastewater and irrigation network.	- Construction & Operation	- Moderate
	- 1.1.5	- Increase sewage inflow in the networks, pumping stations and to the treatment plants (or to Wadi of Gaza at the existing conditions).	- Operation	- Moderate
	- 1.1.5	- Over flooding of wastewater from pumping station during peak periods or emergencies	- Operation	- Major
Aesthetics	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Impact to landscape and disturbance of aesthetic feature.	- Construction	- Moderate
	- 1.1.3	- Impact to landscape and disturbance of aesthetic features, expansion of built-up areas	- Operation	- Minor
Agriculture and Soil				
Agriculture activities	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Construction activities cause Impairment of agricultural activities especially during the flowering period from October until April or May.	- Construction	- Minor
	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Dust resulting from construction activities lowers the photosynthetic rate of neighboring vegetation and agricultural crops thus, may affect the growth rate	- Construction	- Minor
	- 1.1.1	- Loss of older or historic trees and shrubs (Acacia, Eucalyptus, and Sycamore) along the roadsides and in the project areas.	- Construction	- Minor
Vegetation (Flora)	- 1.1.1, 1.1.2	- Loss of agricultural area	- Construction & Operation	- Minor
	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Loss of lower vegetation forms (grasses and herbs) in the project areas	- Construction	- Negligible
	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Disturbance of the soil structure, densification	- Construction	- Negligible

Issue	Project Component	Impact	phase	Significance
Biology				
Fauna	- 1.1.3, 1.1.5	- Spread of rodents and other vertebrate and invertebrate pests around the new facilities of the proposed project.	- Operation	- Minor
	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Escape of some sensitive bird species from the sub-project sites.	- Construction	- Minor
	- 1.1.1, 1.1.3, 2.2.1	- Earth nests of some terrestrial bird species will be destroyed due to transportation and construction activities. Hence, the breeding biology and potential of these birds are to be put at risk.	- Construction	- Minor
Marine Life	- 1.1.2	- Toxicity and/or reduction in the populations and the breeding biology of marine biota such as (Sea grasses, worms, molluscs, crabs) are expected.	- Operation	- Major (--)
Social Issues and Human Life				
Awareness	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Negative publicity and misconceptions of neighbors	- Construction & Operation	- Minor
Population and Housing	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Impacts on population	- Construction & Operation	- Negligible
Public Health / Safety	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 2.2.1	Risk of accidents and injuries that may occur during the following activities: - Loading up and loading down (lifting) - Trucks movement - Using of sharp materials - Falling - Electricity chocks	- Construction & Operation	- Major
Economic issues	- Common	- Increase in service prices and potential customer un-acceptance	- Operation	- Minor
Culture and Heritage				
Archaeological Resources	- Common	- Archaeological remains could be discovered	- Construction	- Negligible

Issue	Project Component	Impact	phase	Significance
Recreation and Tourism	- 1.1.3	- Minimizing bathing an swimming activities at the brine outlet in the sea	- Operation	- Minor

*= this impact is a common impact and not resulted from a specific component.

7. ENVIRONMENTAL MANAGEMENT PLAN

The purpose of impact mitigation is to look for alternative and better ways of implementing the proposed project or associated activities so that the negative impacts are eliminated or minimized, while benefits are enhanced. Impact mitigation requires that the full extent of the anticipated environmental problems are understood. In view of this, this section of the EIA presents mitigation measures resulting from the impacts identified.

Mitigation measures require a successful impact management plan implemented at the correct time and in a correct way. This usually requires a clearly written and agreed plan of action for managing impacts so that these are kept within the limits of acceptability. The monitoring plan describes how and who will carry out the monitoring activities for addressing the negative environmental issues.

This section aims to coordinate the environmental policies, plans, programs and decisions of the various parties involved in the project, which exercise functions that affect the environment. Environmental monitoring is an important component of the EMP. It provides the information for periodic review and refinement modification of the EMP as necessary, ensuring that environmental protection is optimized at all project phases. Through monitoring, unwanted environmental impacts are detected early and remedied effectively. It will also validate the impacts predicted in the Environmental Impact Assessment (EIA) and the effectiveness of the proposed mitigation measures. Lastly, it will also demonstrate compliance with national and World Bank regulatory requirements. The EMP aims to minimize the duplication of procedures and provide consistency in the protection of the environment.

In order to ensure smooth and uncomplicated achievement of the ESMP components, it would include the following basic components:

- Environmental Monitoring and Enforcement
- Institutional Component

7.1. Environmental Mitigation and Monitoring Plan

Environmental mitigation includes a matrix identifying the issues, mitigation measures, responsibility for carrying out the mitigation measures and the approximate cost estimates for the actions. Avoiding or mitigation of environmental impacts is by far preferable to compensation or rehabilitation measures after an impact has happened. It is the task of the ESIA and especially

the ESMP to identify significant impacts, to define measures to avoid or at least to minimize these impacts and to take care that these measures are properly applied at all project phases. The following paragraphs describe the proposed mitigation measures and monitoring actions for each project phase in general before the most significant measures are defined in detail.

- As identified earlier, impacts during construction phase are primarily associated with the construction of the networks and small buildings. The significant accompanying activities comprise earthworks, material transport and movement of heavy machinery. Such impacts are mostly short-term, local, and caused by the contractors activities at the construction sites and the access roads and can be mitigated through proper construction management in coordination with the contractor and the authorities concerned. The contractor in cooperation with the monitoring agency and PWA/CMWU are responsible for implementing the mitigation measures during the construction phase.

- Impacts during the operation phase of the project are primarily associated with ground water, soil, health and land use. The most significant impact at this phase is the over abstraction of ground water.

- Environmental monitoring is the timely and proper survey of the significant environmental impacts of a project during all project phases. Monitoring results help judge the success of mitigation measures in protecting the environment. They are also used to ensure compliance with environmental standards, and to identify necessary changes in the project design or operation.

- In addition, the PWA and CMWU are responsible for monitoring and enforcing the various environmental issues as related to the project activities as outlined in Table 8A, while the monitoring steps with estimated cost is illustrated in table 8B. Also, they are responsible for executing any necessary measure out of those highlighted in the table according to the prevailing conditions at the site. Environmental mitigation and monitoring actions are presented in a simple matrix format. They include identification of the problems, mitigation measures, monitoring responsibilities, and the responsibilities to carry out the mitigation and monitoring measures. All the mitigation measures should be incorporated into the construction and supervision contracts.

Additional Recommendations

The following are recommended issues during the implementation phase in order to enhance the social acceptance and maximize the benefits:

- The tangible benefits of the project components make it important to start with the implementation phase as soon as possible.
- A rigorous set of safety and security procedures need to be followed whilst implementing the project components of destruction, construction and rehabilitation to ensure the safety of the workers and citizens especially in densely populated areas.
- Taking extra precautions of leaving construction materials, waste or tools that might be of risk to local residents especially children.
- Using proper signs to indicate construction works at populated area and around schools and clearly makes such signed apparent at nights.
- The importance of utilizing skilled and unskilled labor from the local area to work in the proposed projects which should positively reflect an ownership and citizenship feeling amongst residents.
- Make sure that the project components do not violate lands or private properties.
- Striving for excellence and quality of work with an objective of meeting people needs.
- Conducting water consumption and citizenship awareness sessions to local people using proper media and public workshops.
- Taking all possible measures to ensure safe removal and transfer of the wells located near the buffer zones without jeopardizing the life and safety of workers.
- Properly select new locations for the removed wells so that they can be easy accessible and provide fresh water to the end users without extra costs.
- The importance of carrying out a post-evaluation impact assessment upon finishing the project to identify positive impacts and learn lessons from success stories.
- The desalination plant upgrading will produce more brine water dispose to the shoreline. The expected brine quantity is fit within the existing brine rejection pipe with required modification to have a brine reservoir of 200m^3 capacity and extend the existing brine pipe to the sea by 150m and include an outfall diffuser at a distance of 150m in the sea (see figure 5).
- Special outfall diffusers shall be installed at the off shore edge of the brine outfall. The outfall diffuser shall be installed at the deeper end of the pipeline

to create better diffusion, diluting and mixing conditions of the brine with seawater.

- Special care should be done after cleaning the filters in the desalination plant since the chemicals which are used for this activity will be part of the brine. Consequently the PH should be measured to keep it around 7 (if PH < 7 dosing of NaoH is added and if PH > 7 HCL dosing is added) in order to keep the marine life

In order to implement sufficient and adequate ESMP in terms of project monitoring, reporting and supervision, the following actions are recommended:

- Site-specific environmental screening and review process conducted at least twice a month for randomly selected projects. The screening and review process should be conducted in close coordination with municipalities and other involved parties such as EQA and MOH. Specific projects that have been earmarked will be subjected to detailed site review and the implementation of construction works shall be closely monitored. A standard appraisal / mitigation form shall be used. The form should basically include:

  a- Current environmental problems such as water supply contamination at the site, dust and air pollution.

  b- Any potential environmental impacts of the project, if any, due to the project.

  c- Mitigation measures.

- Prepare a monthly progress report (Environmental Audit) addressing the environmental issues, status of mitigation measures taken and recommendations.

Table (8A): Potential Environmental Impacts, Mitigation, and Monitoring Plan for the project components.

Issue	Project Component	Impact	phase	Significance	Mitigation measures	Monitoring (Measure and Method)	Responsibility of Execution	Monitoring & enforcement Responsibility	EMP Estimated Cost (USD$) *
Water resources	1.1.2	Increase in water abstracted from aquifer and over pumping due to potential drilling of new wells and rehabilitation of existing wells	Operation	Major	- Proper spatial distribution of new wells. - Controlling measures, penalties for non compliance, employing guards and installing fencing (to prevent the illegal use of water in basins for agricultural purposes by local farmers. - Implement proper tariff system - Public education awareness programs for water conservation.	- Comprehensive testing program including; (a) yearly water abstraction quantities and compare it with previous records. (b) quarterly water quality monitoring by CMWU central Lab to ensure the aquifer is not being deteriorated	- CMWU - MOA - LGUs - PWA	- CMWU - PWA	- **Yearly** groundwater abstraction Report is carried out by CMWU Planning Department staff every year. Hence cost is reflected in PWA/CMWU core budget. - Water quality monitoring is carried out by CMWU Lab for major chemical (Cations and Anions) and biological components** **four times a year**. Each well yearly cost is 500$/well. Paid by CMWU
	1.11.1, 1.1.2	Water quality deterioration	Design & Construction	Major	- Pilot drilling to determine proper design and pumping test to determine optimal operation patterns	- Comprehensive testing program. The main parameters to be tested is the biological tests (fecal and total Coliform) to ensure healthy water distribution after washing up the network and chlorination take place.	- CMWU - LGUs	- CMWU - PWA	- Biological Test** will be carried out by CMWU after pressure test is performed and succeed. The sampling point shall not be in **segments larger than 500m**. Expected 20 samples, each sample cost 150$ (total as 3,000$), which will be paid by CMWU
	1.1.1, 1.1.2	Risk of water contamination through distribution system in case of breaks.	Operation	Moderate	- Survey of existing facilities during the design, monitor the excavation and immediate repair if happened, and check disposal plans. - Proper design and draw emergency plans	- Periodic monitoring to the biological parameters** - Periodic water sampling and quality testing especially for chemical ions and cations.	- CMWU - LGUs - MOH	- CMWU - PWA	- Residual Chlorine is carried out by MOH after sampling collection by CMWU staff is sent to MOH. The number of samples is **more than 550 sampling locationtested bi-weekly.** - Periodic Chemical and biological tests** is carried out by CMWU for the 5 wells. Each round cost 500$ (500$ * **2rounds a year** * 3years = 3,000$). Paid by CMWU
	1.1.1, 1.1.2, 1.1.3	Risk of chemicals and fuel/oil/dieselspillage and/or leakage from treatment tanks (During water disinfection / chlorination)	Construction & Operation	Moderate	- Ensure fuel storage are enclosed within a bund wall. - Ensure periodic inspections of tanks are carried out - Training of operational staff. - Locate fire extinguishers in strategic areas and train personal in its use. - Soil and groundwater contamination from diesel and oil leaks and spills	- Periodic monitoring and tests will include Heavy metal parameters twice a year. - The water produced from the desalination plant will be monitored on a weakly basis for chemical components and biological parameters (fecal and total coliforms) While heavy metals will be monitored twice a year.	- CMWU - LGUs	- CMWU - PWA	- Heavy Metal analysis is carried out by CMWU Lab using ICP instrument. Periodic monitoring is carried out **Twice a year**. Each sample cost 200$ (total 200$***15 samples** yearly * 3 years = 9,000$). Paid by CMWU

	1.1.2, 1.1.3	Health hazards from extra dosage of chemical	Operation	Major	- Follow operating instructions	- Continuous monitoring of the disinfection devices. - Periodic water sampling and quality testing. especially for residual chlorine	- CMWU - LGUs	- CMWU - PWA	- Residual chlorine is carried out on **a monthly basis** by portable device and carried out by CMWU staff. cost is reflected in CMWU core budget since it is routine inspections by CMWU.
	- Common *	- Continuous use of cesspits for wastewater disposal	Operation	Moderate (major at the long run)	- Develop not serviced areas	- Needs assessment	- CMWU	- CMWU - PWA	- Can be covered by the periodic chemical and biological testing** of domestic water wells (**200 wells**) which carried out by CMWU Lab **four time a year**.
Solid Wastes	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Solid waste from trenches excavation and other domestic wastes may result in the impairment of the local traffic in the vicinity of the construction sites; risk of traffic accidents. - Old, ruptured pipes will be removed from the pipelines for replacement. This will constitute massive solid waste which will deface the landscape of the areas if not well managed.	Construction	Moderate	- All sorts of solid wastes should be collected systematically and protected storage should be provided. - Solid wastes should be disposed to a sanitary landfill.	- Ensure all the solid wastes is being taken out from the construction site to the landfill	- Contractor	- CMWU - PWA	- Field supervision will take place by PWA/CMWU supervision team. Cost is reflected in PWA/CMWU core budget.
Air Quality and Noise	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Dust generation, nuisance value that in extreme cases may affect health of general population. Vulnerable groups could have much higher health threats. (Including gas emissions from vehicles movement).	Construction	Moderate	- Definition of Noise and dust mitigation measures, the construction supervision takes care that these measures are applied - Dust suppressants, watering the site, and proper transporting and storage of construction materials - Particulate emissions control unit such as scrubbers, cyclones, fabrics, or electric precipitators - Proper activity scheduling and working hours and days and limit the activities to day times and prevent any construction activities at weekends. - Covering of stored spoil material and vehicles removing waste, use of dust suppression - Water spraying - Using relatively new construction and transportation vehicles with lower emissions	- Site monitoring - Complaint monitoring - Site supervision - public consultation	- Contractor/ LGUs/ CMWU	- CMWU / LGUs - EQA	- Field supervision will take place by PWA/CMWU supervision team to ensure mitigation measures take place by the contractor at the construction phase. Cost is reflected in PWA/CMWU core budget.
	- 1.1.1, 1.1.2, 1.1.3, 1.1.5	- Gas emissions from electricity generator	Operation	Minor	- Particulate emissions control unit such as scrubbers, cyclones, fabrics, or electric precipitators	- Site monitoring	- LGUs - CMWU	- CMWU - EQA	- Periodical investigation will be carried out by LGUs and CMWU staff to ensure generator functionality and emissions. Cost is reflected in CMWU core budget.

	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Nuisance value that may in extreme cases affect health due to generators noise during electricity cutoff periods and Movement of trucks	Operation	Moderate	- Plant trees as noise barrier - Avoid working at night as possible - Use of mufflers and/or noise dampers. - All equipment that produces significant noise levels is contained within buildings. The maximum noise level from an individual piece of equipment is estimated to be approximately 100 dB(A). Noise levels outside the building will not exceed 72 dB(A).	- Regular noise monitoring - Complaint monitoring.	- Contractor / LGUs	- CMWU	- Periodic testing of noise by the Digital Noise Measurement Instrument available at CMWU operation department each inspection round. Cost is reflected in CMWU core budget.
Land use	- Common	- Unplanned induced urbanization of neighboring areas or areas facilitated by new infrastructure facilities	Operation	Minor	- Restrictions for buildings (and building licensing) - Compensate for new land ownership	- Continuous follow up	- LGUs - CMWU	- MOLG	-
Transportation / infrastructure	1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Impacts of medium-heavy truck movement	Construction	Moderate	- Traffic signs to ensure proper routing and distribution of traffic - Provision of adequate notification procedures for any road closures - Traffic Management Plan	- Complaint monitoring	- Contractor LGUs - Police	- CMWU - Police	- CMWU will notify the Police Department for medium-heavy trucks movement during the construction phase. - Police Department will charge the CMWU contractor for road diversion and signs. Expected charge is around 2,500$.
	- 1.1.1	- New routes of movement (for limited periods)	Construction	Minor					
	- 1.1.1	- Obstruct the accessibility or property and impairment of the local traffic in the vicinity of the construction sites; risk of traffic accidents	Construction	Minor	- Proper planning of construction activities, monitoring of risky activities such as excavation and backfilling. - Provision of adequate notification procedures for any road closures. - Monitoring the use of safety measures and tools. - Traffic management (signs, traffic flow) - Speed limits for construction vehicles	- Site monitoring - Complaint monitoring	- Contractor - LGUs - Police	- Police	- Police Department will be notified for projects construction to take their actions towards spreading out the proper signs to avoid any accidents and/or road closures. Police Department will charge the CMWU contractor for road signs and obstacles in traffic around 2,500$.
	- 1.1.1, 1.1.2	- Potential accidental break of existing water, wastewater and irrigation network.	Construction & Operation	Moderate	- Consideration in the detailed design, construction supervision, in case of damage immediate repair.	- Report about compliance with the as-built drawings	- Contractor - LGUS - CMWU	- CMWU	- Field supervision will take place by CMWU supervision team and PWA/CMWU. Cost is reflected in CMWU core budget.
	- 1.1.5	- Increase sewage inflow in the networks, pumping stations and to the treatment plants (or to Wadi of Gaza at the existing conditions).	Operation	Moderate	- Upgrade the associated system mains if found under capacity (design stage).	- Check the design	- LGUs / CMWU	- LGUs / CMWU	- Regular work and cost is reflected in LGUs/CMWU core budget.
	- 1.1.5	- Over flooding of wastewater from pumping station during peak periods or emergencies	Operation	Major	- Consideration in the detailed design, - Prepare Emergency Plans	- Check the design	- LGUs / CMWU	- LGUs / CMWU	- Regular work and cost is reflected in LGUs/CMWU core budget.

Aesthetics	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Impact to landscape and disturbance of aesthetic feature.	Construction	Moderate	- Landscaping (esp. screening by planting of trees, substitution of cut-down trees) - Following all mitigation impacts that minimize and/or control the dust, odor, noise, and aesthetic features. - Considering of not only onsite but also offsite effects - Proper operations and maintenance management, and reshaping of construction sites	- Supervision - Site visits	- LGUs / CMWU	- CMWU - MOTA	- Field supervision will take place by CMWU supervision team. Cost is reflected in CMWU core budget.
	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Improper disposal and pile up of construction materials	Construction	Minor	- Cleaning and removal of wastes or deposits to landfills or designated areas.	- Construction supervision, - Complaint monitoring	Contactor	- LGUs / CMWU	- Cost reflected in contract requirements.
Agriculture activities	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Construction activities cause Impairment of agricultural activities especially during the flowering period from October until April or May.	Construction	Minor	- Construction activities in the targeted agricultural areas should be implemented in times that are NOT contradicted with the plant flowering processes. - If this is NOT possible, compensation is essential for the damaged sectors.	- Site supervision, coordination with local farmers	- Contractor - LGUS	- CMWU	- Cost reflected in contract requirements.
	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Dust resulting from construction activities lowers the photosynthetic rate of neighboring vegetation and agricultural crops.	Construction	Minor	- Minimizing the release of dust by using appropriate technology and tools. - Dust generating activities should be avoided during the flowering period as much as possible. - Water spraying.	- Construction supervision	- Contractor - LGUS	- CMWU	- Cost reflected in LGUs/CMWU core budget.
	- 1.1.1	- Loss of older or historic trees and shrubs along the roadsides and in the project areas	Construction	Negligible	- Minor modifications of the pipeline route in order to avoid tree felling or uprooting. - Replanting of similar trees and shrubs.	- Construction supervision	- Contractor - LGUs - MOA	- CMWU	- Cost reflected in CMWUcore budget.
	- 1.1.1, 1.1.2	- Loss of agricultural area	Construction & Operation	Minor	- Check proper implementation before hand over process - Compensation	- Coordination with authorities and local residents	- LGUs - Palestinian Land Authority	- CMWU - Palestinian Land Authority	- Cost reflected in CMWU core budget.
Soils and vegetation (Flora)	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Loss of lower vegetation forms (grasses and herbs) in the project areas	Construction	Minor	- These plant forms have a fast regeneration time. They are found elsewhere. No action is needed here.	- Site monitoring	- --	- --	-
	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Disturbance of the soil structure, densification	Construction	Negligible	- Vehicle movement outside the construction site only on existing roads, no crossing of agricultural areas	- Construction supervision - Public consultation	- Contractor	- LGUs - CMWU	- Cost reflected in contract requirements.
Wildlife, Fauna	- 1.1.3, 1.1.5	- Spread of rodents and insects around the new facilities	Operation	Minor	- Sanitation and appropriate pest control methods.	- Good planning - Site investigation - Pest control	- CMWU - MOH	- CMWU	- Cost reflected in CMWU core budget.

	- 1.1.1, 1.1.2, 1.1.3, 2.2.1	- Escape of some sensitive bird species from the sub-project sites.	Construction & Operation	Minor	- Monitoring and avoidance of noise-generating machines and disturbances.	- Good planning for activities - Site investigation	- Contractor - CMWU	- CMWU - EQA	- Cost reflected in contract requirements.
	- 1.1.1, 1.1.3, 2.2.1	- Earth nests of some terrestrial bird species will be destroyed due to transportation and construction activities.	Construction	Minor	- Monitoring especially for rare or threatened bird species. - Work should be limited to targeted areas only.	- Good planning for activities - Site investigation	- Contractor - CMWU	- CMWU - EQA	- Cost reflected in contract requirements.
Marine Life	- 1.1.3	- Brine disposal may affect marine life or pollute the aquifer if leaks occurred	Operation	Major	- Regular checking for pipe leakage shall be carried out (measure the brine quantity at the existing plant and compare it with a measured quantity at the discharge point to the sea). - Follow effluent disposal regulation regarding quality and distance offshore.	- Monitoring the brine quantity to avoid brine leakage to the ground.	- CMWU	- CMWU - EQA	- Regular duties for CMWU and cost is reflected in CMWU core budget.
Awareness	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Negative publicity and misconceptions of neighbors	Construction & Operation	Minor	- Public information campaigns before the project is executed	- Public consultation	- LGUs - CMWU	- LGUs - CMWU	- CMWU with LGUs will make awareness workshops and media to educate the public of the construction activity taking place. Estimated cost is around 15,000$[1]
Population and Housing	- 1.1.1, 1.1.2, 1.1.3, 1.1.5, 2.2.1	- Impacts on population	Construction & Operation	Negligible	- Pubic awareness and consultation	- Public consultation	- LGUs - CMWU	- LGUs - CMWU	- Cost reflected in LGUs/CMWU core budget.
Occupational and Public Health / Safety	1.1.1,1.1.2, 1.1.3, 1.1.4, 1.1.5, 2.2.1	Risk of accidents and injuries that may occur during the following activities: - Loading up and loading down (lifting) - Trucks movement - Using of sharp materials - Falling - Electricity chocks	Construction & Operation	Major	- Follow safety instructions, worker should wear proper clothing - A first aid station with trained staff, which is able to coordinate with local hospitals in case of emergencies - Personnel will be trained in Occupational and Environmental Health and Safety matters including accident prevention, safe lifting practices, safe chemical handling practices, proper control and maintenance of equipment and facilities. - Adequate sanitary facilities, potable water, and garbage bins should be provided. - Security of the project site should be imposed at all times. - Warning signs and instructions in case of emergencies should be properly displayed, workers must be informed about these precautions. - Requirements of Palestinian Labor Law especially regarding safety should be applied.	- Training program - Site supervision Public consultation.	- Contractor - LGUs - CMWU - Public	- LGUs - CMWU - MOL	- CMWU field supervision will take place in the project construction sites, to ensure safety procedures and to coordinate with other institutions in case of any accident occurred at the site. Cost reflected in LGUs/CMWU core budget.

Economic issues	- Common	- Increase in service prices and potential customer un-acceptance	Operation	Minor	- Proper design of tariff system with sufficient services for poor.	- Public consultation - Monitor private sector pricing and services	- CMWU	- CMWU - MONE	- Cost reflected in CMWU core budget.
Archaeological Resources	- Common	- Archaeological remains could be discovered	Construction	Negligible	- Monitoring of site excavations - In case of findings the contractor is responsible to: ▪ Strop work activities ▪ Information should be provided to the supervision team and the concerned agencies (MOTA). ▪ Coordinate with the supervision team and responsible agencies to consult an archeological expert at the site in case of chance finds.	- Site monitoring during excavations	- Contractor	- CMWU - MOTA	- Cost reflected in contract requirements.

*** When ever mentioned "No cost is associated" Means that No Cost from CMWU account will be endorsed and it will be regular work for CMWU staff (All other cost associated to the EMP will be covered from CMWU account)**
**** Biological parameters are Total Coliform and Fecal Coliform**
! Awareness campaigns usually carried out through UNICEF budget with close coordination between PWA and CMWU for the awareness target groups

Remark: - Water Domestic wells are monitored 4 times a year for Cations and Anions parameters
- Heavy Metal monitoring in Water Domestic wells is carried out ONCE a year by the ICP instrument
- Residual chorine is tested in more than 550 points along the main water network distribution all over the Gaza Strip tested on bi-weekly basis

Table (8B): Monitoring Plan Steps, Frequency and Estimated cost for the project components

Project Component	Parameters to be monitored	Monitoring Steps	Monitoring Responsibility	Frequency	Who will do it	Estimated Cost (USD$)
Networks Rehabilitation, Expansion, and Reconfiguration	Total and Fecal coliform	1. Washing the new installed pipes by chemical and chlorinate them. 2. Run pressure test to the installed new pipe segment to ensure no leaks in connections. 3. After pressure test success a biological samples will be taken at the pipe ends.	PWA and CMWU	Total of 20 samples, Every 500m length of the new installed pipe.	The contractor will be double checked for random samples by the CMWU lab	3,900$ will be paid by CMWU
		1. Washing the new constructed water reservoirs by chemical and chlorinate them. 2. Run pressure test and leaks detections for the water reservoirs to ensure the reservoir is constructed well. 3. Taking two samples for biological test.		Total of 6 samples.		
	Residual chlorine	1. CMWU is collecting 550 sample (monthly) from different locations along the water networks 2. The samples are tested by CMWU staff for residual chlorine monitoring. 3. Samples checked by MOH.	MOH, LGUs and CMWU	Bi-weekly	CMWU through the field monitoring team	Cost reflected in CMWU core budget.
	Heavy Metal	1. CMWU lab team expert is collecting water sampling for heavy metal parameters at locations close to potential source of pollution	CMWU and LGUs	Total of 10 samples each year (for 3 years)	The contractor for the first year and CMWU for the rest years	6,000$ will be paid by CMWU

Project Component	Parameters to be monitored	Monitoring Steps	Monitoring Responsibility	Frequency	Who will do it	Estimated Cost (USD$)
	Solid waste	Any solid waste produced during the excavation process of the project implementation phase will be moved to the disposal sanitary landfill.	PWA and CMWU	During the project component implementation	The contractor	Cost reflected in contract requirements
	Transportation	The contractor will be in touch with the police department for 1. changing traffic route in specific areas. 2. Traffic management (signs and traffic flow). 3. Speed limit in some roads which require police team monitoring the roads	LGUs and Police	During the project component implementation	The contractor with the police department	5,000$ will be paid by the contractor
Rehabilitation of Water Wells	Water chemistry (ions and cations)	1. The contractor will collect water samples from the new drilled wells (5 wells). 2. The samples to be send to CMWU lab for analysis against ions and cations (especially Nitrate and Chloride) and for the total and fecal coliform.	PWA and CMWU	Twice	The contractor	3,000$ will be paid by the contractor
		CMWU field monitoring team collecting water samples from all wells and analyze them against cations and anions	PWA and CMWU	Four times a year	CMWU	Each well analysis cost 500$ and done through CMWU existing lab (will be paid by CMWU)
	Groundwater abstraction	CMWU visit each well for writing down the water meter readings	PWA, CMWU, MOA and LGUs	Every month	CMWU	Cost reflected in CMWU core budget.
	Heavy Metal	1. CMWU lab team expert is collecting water sampling for heavy metal parameters at locations close to potential source of pollution	CMWU and LGUs	Total of 5 samples each year (for 3 years)	The contractor for the first year and CMWU for the rest years	3,000$ will be paid by CMWU

Project Component	Parameters to be monitored	Monitoring Steps	Monitoring Responsibility	Frequency	Who will do it	Estimated Cost (USD$)
	Residual chlorine	CMWU visit each well and test the residual chlorine contents in the water before distribution to the networks.	CMWU and LGUs	Monthly	CMWU	Cost reflected in CMWU core budget.
Upgrade Existing Desalinated Plant (water produced from existing desalination plant	1. Water chemistry (ions and cations) 2. Microbiology Testing 3. Heavy Metal	CMWU Lab experts will monitor the produced water from the desalination plant before distribution to the networks and reservoirs.	PWA and CMWU	- Twice a week for Chemical and biological tests - Once a year for Heavy Metal Analysis	CMWU	CMWU regular work (Cost reflected in CMWU core budget)
Service connections and district meters replacement	Meters Functionality	CMWU will witness a sample test for meter delivered through the project to see its functionality	CMWU and LGUs	Total of 20 meters	The contractor	1,000$ will be paid by the contractor
Upgrading and maintenance of wastewater pumping station	Solid waste	Any solid waste produced during the upgrading of the waste water pumping stations will be moved to the disposal sanitary landfill. PWA/CMWU will supervise the project implementation and will report any solid waste production at the sites for further mitigations	PWA and CMWU	During the project component implementation	The contractor	Cost reflected in contract requirements.
	Gas emissions	CMWU and during its monitoring program will monitor the Gas emissions from the stations to ensure healthy air quality through a portable device that monitor Co2, NH4 and N2	CMWU and LGUs	Monthly basis	CMWU	Cost reflected in CMWU core budget.
	Awareness Workshops*	CMWU and LGUs will invite the people to educate them of the safety steps to be taken in any case of disaster related to this component	LGUs and PWA	Twice a year	LGUs	15,000$ will be paid through CMWU

* Awareness campaigns usually carried out through UNICEF budget with close coordination between PWA and CMWU for the awareness target groups

7.2. Institutional Component

The Institutional Component details out the responsibilities for management, monitoring, reporting and enforcement of the ESMP components and activities. This section includes any needs for capacity building, training or equipment.

7.2.1. Institutional Overview and Strengthening Needs

CMWU can and should be expected to acquire the institutional and technical capabilities required to incorporate ESMP measures which are integral to the activities which it performs or for which it has responsibility. The mobilization of other national institutions such as EQA and Local Government Units (LGUs) is necessary. EQA is responsible for the development of the environmental policy, legislation and environmental planning. It is also responsible for developing standards, norms and guidelines for creating environmentally sustainable conditions. CMWU, EQA and LGUs should have the capacity and strength which enable staff to be involved in monitoring the project activities. The cooperation of the three parties will ensure proper implementation, smooth follow up of the ESMP issues and know-how transfer.

7.2.2. Strengthening Environmental Expertise

Environmental expertise will be established within the implementation agencies for the coordination and supervision of the environmental activities funded through the project.

The Project Management Unit (PMU) “as part of the PWA” has the overall responsibility to monitor and follow up the project implementation activities. The PMU role includes; identify priorities, establishing criteria for projects selection, approve projects, participate in bids evaluation, review technical and financial reports as well as daily monitoring, site visits and supervising of projects implementation. The PMU should also be responsible for taking the responsibility of monitoring the implementation of the monitoring plan and mitigation measures as well as enforcing the environmental regulations. Member of the PMU staff should also be designated to coordinate and follow up with PWA, EQA, LGUs, and the consultant to ensure transfer of knowledge and build up the LGUs capacity. One of the PMU’s staff members should be an environmental specialist or an engineer with strong environmental background to participate in the screening and monitoring processes. The expert would basically do the following:

a- Conduct environmental review of the proposed packages and monitoring the implementation of the project.

b- Conduct site visits to review progress of and abidance with environmental measures.

c- Coordinate environmental training activities for staff, engineers and contractors.

Part-time environmental advisor(s) contracted from local firms could support occasionally the implementing agency staff. The success of the project can be seen very much dependent on the role of the environmental advisor in co-operation with CMWU and LGUs. The environmental advisor's role could include the following responsibilities:

- Monitor construction materials transportation and storage and construction activities.
- Follow up the environmental management plan during construction activities inside the project area.
- Coordinate with PMU, CMWU, PWA, LGUs, EQA and other involved parties in order to mitigate the environmental impacts by providing instructions for the implementing agencies.
- Site-specific environmental screening review and assessment of key environmental issues through an environmental audit of sample projects.
- Preparation of the progress reports which follow-up the implementation of EMSP and recommendations that rise-up during site visits of the sample projects.

7.2.3. Environmental Capacity Building and Training Program

The training program would be designed and implemented by local experts and consultants. The training would target three levels:

1- On-the-job training for a dedicated PMU staff to direct activity planning, design, and implementation with respect to environmental protection.

2- Training for staff of local authorities, municipalities, and village councils. The training should be provided through short duration seminars and workshops. Oriented site visits and intensive training, should also be provided for selected staff members.

3- Training for contractors should be provided, including one or two day's workshops for local contractors, focusing on: preparation and use of the appraisal/ mitigation forms, use of environmental guidelines, and implementation of mitigation measures. Also, they should be trained on

safety measures for construction works, proper waste disposal and cleaning measures during construction.

A comprehensive capacity building program is needed to provide a range of aids that can be used to engender skill development and knowledge transfer. This can include:

- Developing a library of environmental assessment reports and maintaining a database of information collected during the assessment;
- Collecting examples of good practice and establishing environmental awards in the workplace;
- Holding an environment 'day', inviting guest speakers on environmental issues; and
- Producing desk aids such as a yearly calendar based on environmental themes and designing corporate environmental posters

7.3. Project Documentation

The TOR and tender documents of the Projects packages should reflect the importance of the environmental management and monitoring plan. The impacts, mitigation measures and responsibility of execution should be annexed to the contract documents and the contractors should be informed that all the possible environmental impacts listed in the ESMP must be avoided by the appropriate identified mitigation measures. According to the ESMP, all the responsibilities of contractors that listed in the ESMP should be emphasized in the contract.

7.4. ESMP Cost Estimate

The estimated cost for the ESMP including proposed AF1 is US$394,600 and all the related activities will be carried out by existing CMWU staff, as well as individual international experts (when needed), under the supervision of PWA-PMU, which include the environmental expert, while other items such as capacity building and training programs will be totally covered by CMWU budget (separated than World Bank Budget). Table 9 lists the main components of the ESMP and the related cost;

Table 9: EMP Cost Estimates

#	Components of ESMP	Quantity	Unit Rate$	Total Cost $	Source of financing
1	Environmental Expert (PMU)	24 Months	2,000	48,000	PMU staff through World Bank
2	On-the-job training for CMWU/ LGUs staff	20 Days	500	10,000	CMWU account
3	Seminars and workshops for CMWU/LGUs staff	2 Workshops	2,000	4,000	CMWU account
4	Compliance monitoring by CMWU/LGUs (Quarterly)	8 Quarters	3,000	24,000	PMU staff
5	Individual International Consultant. Soil and water sampling. International expert visits and exchange knowledge (i.e. training). Supply some laboratory devices (portable and lab). Mitigation measures due to IDF operation	4 Reports (bi-annual report)	300,000	300,000	AF1-World Bank
	Total			**386,000**	
6	Miscellaneous	-	-	8,600	CMWU account
	Grand Total			**394,600**	

8. Conclusions and Recommendations

For the Project construction and implementation, no major negative environmental impacts are envisaged since the project will invest in activities that support rehabilitation and improvements of infrastructure. Potential negative impacts that are localized and limited in nature will be avoided by the recommended instructions and mitigations. The rehabilitation and upgrading of the Gaza water resources are of utmost priority to the Palestinian community. In spite of the negative environmental impacts that could results from implementing the Gaza Strip Supply Rehabilitation and Expansion Project, the project is essential to the Palestinian life and welfare.

As discussed in the report partial restoration of Deir El Balah Desalination Plant will result in desalinated water will be distributed to Zawaida and Deir El Balah city through reconstructed water networks.. Hence monitoring of the produced desalinated water shall be carried out on a daily basis to ensure that the water distributed is healthy, added to that a new configuration of brine rejection pipe will be implemented during the UNICEF-EU regional desalination plant project, where the existing Deir El Balah desalination plant and the regional desalination plant will share the same brine rejection point to the sea. For the time being a schematic drawing of the new brine pipe layout is also provided in this study in case of increasing the desalinated water.

In the event that monitoring indicates that any environmental quality is deteriorating to unacceptable levels, PWA and CMWU will correct operation procedures that are contributing to the problem and/or undertake necessary engineering installations.

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Annexes

Annex I: ESIA & ESMP TOR

Annex II: Guidelines and Regulatory Standards

Annex III: Allowable Standards

Annex IV: Details of Baseline Environment

Annex V: A sample of Field Social Survey Forms

Annex VI: Contractor Responsibilities

Annex VII: Selected Photos

Annex VIII: Land Ownership Documents

Annex I: ESIA & ESMP TOR

Annex I

ESIA & ESMP TOR

Environmental and Social Impact Assessment (ESIA)
&
Environmental and Social Management Plan (ESMP)

For

Gaza Water Supply and Sewage Systems Improvement

Final Report

"Environmental and Social Impact Assessment (ESIA) and Management Plan (ESMP) of Gaza Water Supply Rehabilitation and Expansion Project (P101289)"

1. Introduction

This project would provide financing to support the rehabilitation and expansion of basic water supply infrastructure in Gaza as well as capacity building and operational assistance to Coastal Municipality Water Utility (CMWU). The network investments financed by the Project will rehabilitate and expand capacity of the water supply networks to support transmission of additional supply resources, restore operations of the networks to acceptable quality standards and improve the efficiency and operational management of the networks while operating under stressed water supply conditions. The final scope of the investment schemes and technical assistance financed by the proposed project will be further assessed and finalized during project appraisal.

The proposed Project will be implemented by CMWU, a semi-public entity, established by a ministerial decree, with general assembly from Gaza Strip member municipalities. The shareholdings of member municipalities are proportional to their valuated water and sanitation assets. The board of the utility is composed of nine member municipalities, the chairman of the board being the mayor of Gaza municipality, who is a permanent member on the board of the utility. The utility has succeeded (largely through the ongoing Bank operations Gaza Emergency Water Project (GEWP) I and II) to build its management capacity, with a unified billing system, financial management system, and GIS. The utility retains financial management (FM), procurement, and internal financial controller functions and submits its audited accounts to the Ministry of Finance. The utility currently runs a headquarters in Gaza City and regional offices in Rafah, Khanyounis, and Deir el-Balah.

The existing Project Management Unit (PMU) at CMWU, which is currently handling the implementation of other Bank and donor-financed projects including GEWP and its additional financing, will be responsible for managing this new operation. The PMU is fully staffed with a director, procurement, FM, accountant, environmental, and other relevant technical staff. Key members of the PMU are experienced in implementing similar projects under the Bank's procurement guidelines, policies and procedures. Therefore, the PMU will be responsible for handling all procurement and FM related to the proposed Project. The PMU will also be responsible for coordination with COGAT, World Bank and government authorities with respect to the supply of equipment and materials and contract execution.

CMWU is seeking a qualified firm to conduct an environmental and social impact assessment (ESIA) towards preparation of an Environmental and Social Impact Management Plan (ESIA/ESMP). Upon identification of the environmental and social impacts, appropriate mitigation measures to address these impacts will be identified towards fulfilling all requirements as per of the Palestinian Environmental Law and World Bank safeguards policies.

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2. Background

The proposed project appeals to a main pillar in the Interim Strategy for West Bank and Gaza 2008-2010, namely, to support public infrastructure development, as well as the PA's National Development Plan 2011-2013 designating more than US$500 million for reconstruction and rehabilitation of infrastructure (including water and wastewater) in Gaza. The World Bank's assistance program to the West Bank and Gaza for 2011-2012 amounts to US$75 million. In agreement with the Palestinian Authority, US$20 million out of these funds will be used to finance three infrastructure projects in Gaza including electricity, water/wastewater, and solid waste management. Further discussions between the World Bank and Islamic Development Bank (IsDB) management have resulted in a principle agreement to cooperate in financing these projects, a start of a strategic partnership and cooperation for the reconstruction of Gaza.

The proposed Project is very important to Gaza despite its modest size when compared to the enormous investment needs required to improve water supply. The Project is critical to improving the deteriorated water supply networks and facilities, to boost the level of service efficiency, while expanding its capacity to allow for the transfer of any additional supply resources that may become available to Gaza. The interventions of this project come as a natural continuation of a strategic involvement of the Bank in the water sector in Palestine through (i) technical assistance and capacity building of the water institutions and the reform of the sector, and (ii) investing in critical infrastructure projects of water and sanitation. The activities and interventions of the proposed project build on the previous and ongoing operations of the Bank (i.e., GEWP I and II), and its three additional financing phases) which aimed at rehabilitation of the water and sanitation sector and building the capacity of a well-functioning water utility.

The project to be implemented will include the following two components:

- Component 1: Rehabilitation and Expansion of Water Supply and Sanitation facilities.
    - Subcomponent 1: Networks Rehabilitation, Expansion, and Reconfiguration. This component will finance: (1) construction and installation of four water reservoirs, associated pumping booster stations, and transmission lines to connect to the supply distribution networks. Those reservoirs will be added to the network at four predetermined locations according to the water supply master plan, namely a 4000 cubic meter reservoir serving Deir El-Balah, 3000 cubic meter reservoir in Al-Moghraka to serve the middle area, 4000 cubic meter reservoir to serve Bani Suhaila and Easten villages (Khuza'a, Abasan Kabira and Abasan Sagheira). The reservoirs will be connected to the major well fields supplying the middle and southern governorates, will be used to blend the water supply from the wells and desalination plants to improve the water quality, and will improve the performance of the networks and help the utility cope with demand and improve the quality of service, (2) replacement of old transmission lines in the middle and southern governorates, especially asbestos lines, to reduce losses and improve service quality.

- Subcomponent 2: Rehabilitation of Water Wells. This will finance the upgrading 30 water wells and the relocation of 5 additional wells in the middle and southern governorates to improve yield, reduce specific energy demands and unit production cost, and reduce stress to the aquifer.

- Subcomponent 3: Upgrading and Expansion of Deir-Elbalah Seawater Desalination Plant. The existing plant is an old module with production capacity of 600 CM/day, currently being upgraded to reduce energy requirements. This subcomponent will install an additional module of 2000 CM/day capacity utilizing the existing seawater carrier and intake; connect the desalination plant with the proposed reservoir to blend the desalinated water with other water supply to bring the water quality to acceptable standards. The proposed expansion of the plant will serve the communities of Deir-Elbalah and Al-Zawaida municipalities in the middle governorate suffering water supply of low quantity and quality.

- Subcomponent 4: Service connections and district meters replacement. This subcomponent will finance the supply and installation of 20,000 water meters, in addition to bulk meters and pressure gauges on selected areas in the network. This component will be designed with proper targeting to improve utility billing, reduce network losses, and improve collection.

- Subcomponent 5: Upgrading and maintenance of wastewater pumping stations. This component will finance adding additional pumping capacity, maintenance of existing pumps, and improvement of electromechanical systems to improve efficiency and safety, and reduce cost of operation.

- Component 2: Utility Capacity Building and Operational Support

  - Subcomponent 1: Warehouse and Workshop.

  - Subcomponent 2: Technical Assistance for CMWU. This subcomponent will include the provision of technical assistance to improve the administration, tariff regulation and efficiency of CMWU.

  - Subcomponent 3: Operational Assistance for CMWU. This component will support the operations of CMWU by financing purchase of chemicals, chlorine, regents to the desalination plant, fuel to run the water and wastewater facilities, and PMU expenses. The operational assistance will be provided on a descending scale to encourage the utility improve on collection and achieve better operational cost recovery.

3. Objectives

Prior to project appraisal, an environment and social impact assessment (ESIA) should be conducted in order to (i) ascertain the possible environmental and social impacts of the infrastructural subcomponents; (ii) detail the possible environmental and social impacts of

the water meter installation, subsequent tariff collection, and system efficiency; (iii) construct an environmental and social management plan (ESMP) to manage, mitigate, and monitor any possible negative impacts during the construction and operational phases of the project; (iv) assess the capacity of the implementing party to implement the ESMP; and (v) suggest any capacity building needs necessary to fill gaps.

The scope of the ESIA will include confirming whether there will be any temporary or permanent land acquisition arising from this project including through proposed civil works: facilities, reservoirs, wells, pumping stations, water mains and transmission lines, among others. The ESIA will detail the extent of lands required (both temporary or permanent), it will all detail the source of how these lands are to be acquired (waqf, state, private sources). ESIA findings will help determine if whether any Bank safeguards instruments need preparation. ESIA findings will also enable the borrower to carry out informed consultations.. The ESIA, ESMP and any relevant resettlement instruments will be available prior to project appraisal and will be disclosed at the Infoshop and in-country in Arabic and English. The Environmental Quality Authority (EQA) requires that the ESIA and ESMP be disclosed in its entirety in Arabic, separate from World Bank disclosure requirements.

4. Environmental and Social Safeguard Policy Requirements

Initial screening for applicable World Bank environmental and social safeguards policies indicate these policies would be/might be triggered:

OP/BP 4.01: Environmental Assessment. Construction-related impacts include both rehabilitation of existing water infrastructure as well as expansion of new infrastructure in the form of reservoirs, water booster stations, desalination plant, pumping stations, water mains, transmission lines, and water wells. Replacement and safe disposal of asbestos lines will be handled and managed through the ESMP. The expansion of new water supply infrastructure, i.e., the expansion of the desalination plant and the rehabilitation and relocation of the water wells are expected to have an overall positive impact on the local water balance, including groundwater. Negative impacts are expected mainly in the construction phase and can be minimized with careful planning and implementation of the ESMP. Category B environmental classification is assigned for the project.

OP/BP 4.12: Involuntary Land Acquisition and Resettlement. It is possible that several of the project interventions will require temporary or permanent acquisition of lands resulting in possible relocation, loss of assets or loss of income sources. These might arise from Subcomponent 1: on networks rehabilitation, expansion, and reconfiguration which finances construction and installation of water reservoirs, associated pumping booster stations, transmission lines, and water mains. The ESIA will confirm what the land needs of the project are, how these will be met.

Potential resettlement impacts will be reviewed based on appropriate resettlement instruments. The resettlement instruments may include a Resettlement Policy Framework (RPF) or a Resettlement Action Plan (RAP) depending on the level of detail available by appraisal. In order to carry out this assessment adequately, it is expected that the consulting

firm will have deep familiarity with the World Bank Operational Policy 4.12 on Involuntary Land Acquisition and Resettlement.

BP 17.50: Disclosure of Operational Information. The proposed project is subject to the Bank access to information policy concerning the disclosure of project information including the environmental and social impact assessments.

The environmental and social impact assessment (ESIA) is expected to examine these three policies closely, and when warranted, prepare the environmental and social management plan (ESMP), as well as any other necessary instruments to comply with Palestinian environmental law as well as Bank safeguards policies.

5. Scope of Work

Task 1. Description of the Proposed Project:
Provide a full description of the project in terms of: location; general layout; unit process description and diagram for rehabilitation/new components; population served, present and projected; number and types of connected households; water supply characteristics, adjacent facilities, natural, or cultural facilities close to project site; existing/new road or other supportive infrastructure. This should be short and oriented to providing a background so that the reader can understand all relevant environmental and social characteristics, impacts, and mitigation measures.

Task 2. Description of the Environment:
Assemble, evaluate and present relevant baseline data on the environmental characteristics of the study area.

(a) *Physical environment:* The table below gives specific details for physical environmental elements to be covered for each element of the ESIA. For the water metering sub-component, the physical environment to be treated is the entire service area. For the water wells sub-component, the physical environment to be treated is the well site and neighboring affected catchment area. For the other areas, the physical environments to be treated are the current sites, expansion sites, as well as those adjoining sites to be affected by adverse and/or beneficial effects, both on land and in water.

With regards to sand, seawater, and living marine species sampling specific to the desalination plant, the consultant is requested to collect sand samples settled close to the desalination egress (see map). Similarly, seawater is to be collected and tested according to the same map. Any freshly-caught living marine species caught near the site are to be tested as well.

	Water tanks / Water networks	Water wells	Water metering	Desalination Plant	Wastewater Pumping Station
Geology		X		X	
topography	X	X	X	X	X
Soil	X	X		X	X
monthly average temperature		X	X	X	
rainfall and runoff characteristics	X	X	X	X	X
description of water bodies*		X		X	
wastewater quantity					X
Sampling (sand, water, living marine species†)				X	

*identity of streams, springs, wadis, groundwater, water quality; existing discharges or withdrawals
†can include fish and/or crabs

(b) *Biological environment:* terrestrial communities in areas affected by construction, facility sitting, land application or disposal; aquatic, estuarine or marine communities in affected waters; rare or endangered species; sensitive habitats, including parks or reserves, significant natural habitats; species of commercial importance in land application sites. This description section is particularly relevant with respect to the expansion of the desalination plant.

(c) *Social environment:* present and projected populations; present land use and ownership; public health issues specific to water supply and water quality; willingness to pay for water; cultural heritage sites on or near proposed infrastructure interventions.

Task 3. Legislative and Regulatory Considerations:

Describe the pertinent Palestinian laws, regulations and standards governing environmental quality, industrial/pollutant discharges to surface waters, seawaters and land, water reclamation and reuse, worker health and safety, protection of sensitive areas (especially shorelines) and endangered species, land use control, etc.

Task 4. Determination of the Potential Environmental Impacts of the Proposed Project:

In this analysis, distinguish between significant positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Identify impacts that are unavoidable and/or irreversible. Wherever possible, describe impacts quantitatively, in terms of environmental costs and benefits. The environmental impacts should be classified for both the construction and operational phases of the project. The main impacts to be investigated are not limited to:

(i) Impacts on water supply and water quality.
(ii) Impacts on demand for wastewater treatment.
(iii) Impacts on cultural physical resources.
(iv) Impacts to any significant natural habitat.
(v) Sanitation and public health benefits anticipated.

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Task 5. Clarify what the social issues in the project are including on issues related to involuntary resettlement:

- Briefly describe whom are the affected communities
- Summarize positive and adverse social impacts that will be accrued by community members
- Clarify what the permanent and temporary land requirements of the project are
- For each project intervention (water reservoir, booster stations, transmission lines etc), clarify all direct economic and social impacts caused by the involuntary taking of land (if any) resulting in: relocation or loss of shelter; loss of assets or access to assets; loss of income sources or means of livelihoods (regardless of whether the affected persons must move to a new location)
- Clarify the nature of linked or parallel investments associated with this project such as that of the Islamic Development Bank towards clarifying how these are critical to the design or performance of this proposed Bank project.
- Summarize Palestinian legislation on the acquisition of land through eminent domain principle.
- Conduct a rapid assessment of community's willingness and ability to pay for services, with special attention to more vulnerable households (poorer families, widows, disabled persons). Specifically, this would include detailing the social impacts of the water meter installation, subsequent tariff collection, and system efficiency.

Task 6. Development of an Environmental and Social Management Plan (ESMP):

To address the negative environmental and social impacts that may arise as a result of this project, the consulting firm will prepare an ESMP.

It is a plan to mitigate each negative impact that is identified by the ESIA. The ESMP would need to account for the capital and operating costs for each mitigation element as well as a description of other inputs (such as training and institutional strengthening) needed to implement the ESMP. Assess compensation to affected parties for resettlement-related impacts if at all relevant. Review the authority and capability of institutions at municipal and Gaza CMWU levels and recommend steps to strengthen or expand them so that the ESMP may be effectively implemented. The recommendations may extend to inter-sectoral arrangements, management procedures and training, staffing, operation and maintenance training, budgeting, and financial support. The ESMP might include, but may not be limited to:

- Construction spoils management mitigation, to manage the disposal of construction spoils generated in an environmentally-friendly manner. Similarly, life-cycle management mitigation of replaced materials to be disposed of due to rehabilitation works. If asbestos materials are generated due to replacement of old networks, an asbestos management plan should be prepared to facilitate the replacement and safe disposal of asbestos materials;
- Fugitive dust control mitigation plan as so to control fugitive dust emissions during construction activities;
- Noise abatement mitigation plan to control noise impacts on the surrounding communities during construction activities as well as to abate reservoir and booster station generators located in residential neighborhoods;

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- Traffic control mitigation plan to minimize the disruption of daytime traffic flows along important access roads;
- Provide alternative scenarios for possible mitigation of desalination brine egress to the sea, based on results of testing completed in the ESIA phase as well as economic and operational feasibility;
- If necessary, cultural resources mitigation plan to manage any archeological or cultural impacts that might be encountered during the construction phase.
- A detailed plan for addressing tariffs associated with water meter installation according to the willing to pay and affordability study.

In sum, the ESMP should include the following: a proposed work program, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures, as well as a detailed monitoring plan. This monitoring plan will include for each mitigation measure the responsible party for mitigating the impact, how often the mitigating measure should be assessed, as well as a monitoring indicator and parameters. The monitoring plan may be split with one for use during rehabilitation/construction and a second for the length of project operation for ease of use.

The ESMP should identify one or two 'key indicators' from the monitoring plan that may be used as overall 'safeguard indicators' in the project-level Results Framework as a measure of general environmental and social safeguards performance.

An outline of the contents of the ESMP to be included in the project's Operational Manual should be provided along with environmental/social protection clauses for contracts and specifications.

The ESMP will not address issues related to the involuntary acquisition of land or relocation of households resulting in loss of shelter, income or access to income sources. These impacts would be addressed through a specific Bank safeguards instrument: the Resettlement Planning Framework (RPF) or Resettlement Action Plan (RAP).

Task 7. Conduct Stakeholder Consultations with the CMWU:

The Firm will conduct ESIA-specific consultations with relevant stakeholders likely to be affected, both positively and negatively, by the proposed project. It is expected that stakeholder consultations will be conducted to support the preparation of the ESIA and to provide some of the data therein. In addition, in fulfillment of World Bank requirements, project stakeholders will be consulted on a draft and final ESIA. The firm with CMWU will ensure that drafts and final ESIA is available in a public place accessible to affected groups and local NGOs.

Relevant materials will be provided to affected groups in a timely manner prior to consultation and in a form and language that is understandable and accessible to the groups being consulted. The Consultant should maintain a record of the public consultation and the records should indicate: means other than consultations) e.g., surveys used to seek the views of affected stakeholders; the date and location of the consultation meetings, a list of the attendees and their affiliation and contact address; and summary minutes

6. Delivery.

Provide ESIA and ESMP reports that are concise and limited to significant environmental and

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social issues. The main text should focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. Detailed or uninterrupted data are not appropriate in the main text and should be presented in appendices or a separate volume. Unpublished documents used in the assessment may not be readily available and should also be assembled in an appendix. Organize the ESIA and ESMP report according to the outline below:

- Executive Summary (both Arabic and English)
- ESIA, to include:
  - Description of the Proposed Project
  - Description of the Environment
  - Legislative and Regulatory Considerations
  - Potential Impacts of the Proposed Project
- ESMP
- Stakeholder Consultation Process
- List of References
- Appendices:
  - List of Environmental Assessment Preparers;
  - Records of Stakeholder Consultations, including all participants, consultation dates, places, minutes of meetings, comments and feedback;
  - Data and Unpublished Reference Documents:

- Delivery Time Frame
  This service will be worked closely with CMWU assigned staff to ensure accuracy, adequacy and quality control to the assignment, in which two main reports shall be delivered in this service which is **ESIA and ESMP reports** in which it will be submitted based on the following schedule;
  - DRAFT ESIA and ESMP reports: After 40 days of the service agreement
  - FINAL ESIA and ESMP reports: After 50 days of the service agreement

8. Required Consultant Staff

All the required staff shall have an experience in the World Bank Environmental Guidelines and Regulation, resettlement projects and background in design implementation and/or monitoring and evaluation of development projects in developing countries. All the required staff shall have an Arabic/English language skills in writing.
This assignment is required the following staff as minimum to accomplish its objective but not limited to;

a. Team Leader; with an experience of 10 years as an environmental engineer. (2month)
b. Environmental planning (or other environmental generalists); with an experience of 5 years in environmental planning field (1.25 month).
c. Ecology and Water Quality Expert; with an experience of 5 years in the field of water/wastewater quality as well as good experience in ecology science (1 month).
d. Social Scientist; Master or PhD Degree in relevant disciplines of urban sociology, anthropology, development studies with an experience of 5 years in the same field (2 weeks).

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9. Assignment Schedule

This section will specify interim delivery dates, consultations and final delivery dates, and other significant events. The overall assignments shall be completed by 2 months.

Report Name Delivery	Duration to submit after signing the contract in days
ESIA and ESMP DRAFT Report	35
CMWU Review	7
ESIA and ESMP FINAL Report	12
CMWU Final Review	6
Total Duration in Days	60

10. Payment

This assignment will be paid in two payments,

- Payment no. 1 (30% of the total services budget): after the submission of the draft reports (ESIA and ESMP reports).
- Payment no. 2 (70% of the total services budget): after final submission of the two reports based on report components listed in item no. 6 above of this TOR and accompany to the CMWU final approval.

11. Other Information

CMWU will provide the consultant with all relevant data available in regards of;
Land acquisitions location and Authority Approvals,
Network track layout and all the detail required,
Location of water reservoirs and all associated official documents,
Water/wastewater stations location and related documents in this regard,
Any other available data that the consultant team may need.

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Annex II: Guidelines and Regulatory Standards

Annex II
Organizations, Legislations and Standards

Environmental and Social Impact Assessment (ESIA)
&
Environmental and Social Management Plan (ESMP)

For

Gaza Water Supply and Sewage Systems Improvement

Final Report

Annex II - A - Relevant Ministries and Institutions

a- The Palestinian Water Authority

PWA is responsible for management of the available water resources in Palestine to achieve the balance between available water quantities and qualities, and the needs of the Palestinian people in the present and the future. Law No.2 for 1996 identified the role of PWA in the following areas:

1. *Strategic planning for the water resources:* In this context, PWA has the authority to develop, enhance and allocate the water resources among the various demand sectors in order to achieve its goals which are:
   - Find the optimal way to manage, protect, and conserve the limited national water resources.
   - Guarantee the right of access to water of a good quality for both present population and future generations at cost that they can afford.
2. *Monitoring and protection of water resources:* PWA has developed a comprehensive monitoring program. The program identified the needs, the number of monitoring wells and their locations. Also vulnerable areas by different sources of pollution like wastewater treatment plant, industrial estates, ports and intensive farms were considered carefully [PWA Monitoring, 1998].
3. *Regulation:* Aiming at maximization of the benefit from the water resources and due to existing conflict of interests, it is necessary to have a mature regulator for the water sector in general. Regulations should organize the relationship between service providers, users environment and water resources. The role of PWA will be:
   - *Environmental Regulation:* aims at controlling the utilization of water resources and wastewater disposal and/or reuse in such a manner that enables the environment and optimizes the benefit.
   - *Water Quality Regulation:* aims at controlling the drinking water quality. In this context the PWA will be responsible for imposing a set of regulations on the service provider. These regulations should satisfy the requirement of the various stakeholders and mainly the Ministry of Health (MOH).
   - *Economic Regulation:* aims at reviewing the prices of water in order to protect the customer from the service provider, which is normally working in a monopolistic environment. Also the regulator should ensure that all cost related activities are performed adequately by the utility.

b- The Coastal Municipalities Water Utility

The Coastal Municipalities Water Utility (CMWU) is a Semi – Public entity financially independent, responsible for the water supply services, wastewater treatment and disposal and storm water collection. The CMWU is funded to integrate all water and wastewater services into a unique service for better service and performance.

CMWU aims at providing safe and clean water services and environmental friendly wastewater services to the residents of Gaza strip, through the efficient operation, maintenance, and improvement of the utility assets and services. CMWU strives to meet the needs of the customers through innovative solutions.

CMWU role in the Gaza Strip is one of the most important organizational roles in the water and wastewater sector, especially in the light of the difficult circumstances the area undergo; lacking of the raw material, the tightened siege, and lack of financing for strategic and developmental projects.

CMWU was established to improve the water and wastewater sector through unified and connected administration of planning, resources and performance in all the regions of the Gaza Strip. CMWU also aims at enhancing the municipalities' role through sustaining their censorship in this field in order to achieve the CMWU goals.

c- Environmental Quality Authority (EQA)

Presidential Decree No. 6 in June 2002 established the Environment Quality Authority as the successor body to the Ministry of Environmental Affairs during the administrative reforms. The responsibility of EQA is to promote a sustainable environmental development of the Palestinian society. Its main task is the protection of the environment, including its water, soil, air, natural resources, nature and Biodiversity, and the prevention of public health risks related to environmental issues. The main responsibilities of EQA are in the field of planning, monitoring, licensing and enforcement. EQA is responsible for the development of the environmental policy, legislation and environmental planning. It is also responsible for developing standards, norms and guidelines for creating environmentally sustainable conditions. For a number of standards EQA has primary responsibility. The Agency, EQA, plays a complementary role to the MOH in setting standards related to the conservation and protection of the environment such as:

- Minimum water requirement to preserve the environment.
- Disposal of treated sewage in wadis, streams, rivers, lakes and seas.
- Disposal of treated sewage in environments, which affects the bio-diversity.
- Regulation of the industrial wastewater which is not treated by the utility.
- Disposal of brine from the desalination plants.

Monitoring of the physical environment is an important task of EQA. It also includes the monitoring of the compliance with the environmental laws and regulations, as well as the enforcement by means of putting sanction on violations and transgressions.

d- Ministry of Planning (MOP)

MOP also took the initiative to develop an Emergency Natural Resources Protection Plan through their former Environmental Protection Directorate (EPD) and the Regional Development Plans through their Directorate for Urban and Rural Planning (DURP). MOP objectives are matching with the current objectives of EQA, which aim at the distribution of responsibilities and tasks among the ministries, institutions and agencies for the sake of achieving or working towards sustainable development.

The development objectives of MOP are to:

1. Institutionalize the strategic planning process at the national level;
2. Support the participation of the all ministries and agencies of the PNA in the preparation and implementation of the three - five years plans “Palestinian Development Plan **PDP**”.
3. Coordinate the development at the national level between environment, socio-economic and physical sectors in a sustainable manner.

e- Ministry of Local Government

Historically, local governments have been the cornerstone of Palestinian governance and the key providers of public goods and services in West Bank and Gaza. Municipalities, particular, have well-established service delivery and regulatory functions including electricity, water supply, sanitation, solid waste management, local roads, libraries, parks and recreation, slaughterhouses, markets, land use planning, building and development approval, and business and professional licensing.

Until November 1996 the governmental organization basically consists of two levels: central and local levels. In November 1996 a new intermediate level was introduced as Governorate, thus three levels were established: central, regional and local governments. MOLG is responsible for the following activities:

1. To work towards an inclusive and unified local administration and establish local and municipal councils.
2. To provide the infrastructure services to all areas, both within and outside municipal boundaries.
3. To develop the organizational structure and public administration at local levels based on studies and a close dialogue with concerned localities.

f- The Ministry of Health

Environmental Health Department (EHD) is a central department in the Ministry of Health. One of the main objectives of EHD is promote research and information exchange related to health and environment (water, air, hazardous waste, vectors, and toxic materials). The Preventive Medicine Department (PMD) is responsible for monitoring the water quality. The MOH pays an important role in the water industry regulation. This covers setting the standards, which are related to the public health such as:

- Drinking water quality.
- Disposal of treated sewage in bathing waters.
- Disposal of treated sewage in environments which affects the quality of some products like fish.
- Treated wastewater reuse for irrigation, which may affect the agricultural products.
- Disinfection and drinking water storage.

g- Ministry of Agriculture

The Ministry of Agriculture plays an important role in managing the agricultural resources in Palestine. Its responsibilities are summarized as follows:

- Achieving food security.
- Establishing cooperation with the Palestinian Water Authority to achieve rehabilitation of water sources, their protection from pollution, and promotion of their rational and economic use for agricultural production.
- Achieving the legislation that controls the extension of urban areas at the expense of agricultural areas and ensure sustainable development.
- Establishing methodologies for conservation of biological diversity and for sustainable use of resources by utilizing legislation, rules, procedures, budgetary allocations and other regulatory measures.
- Advancing public awareness concerning the advantages of Biodiversity conservation and sustainable development.
- Indicating the types of crops that can be irrigated by treated wastewater using the international standards.

h- Ministry of labor

The Department of Occupational Safety is responsible for:

- Performing periodical visits to work places and giving instruction regarding workers and equipment safety,
- Monitoring chemical, physicaland biological impacts on workers, and
- Keeping records and monthly reports on work places.

i- Energy and Natural Resources Authority (ENRA)

The objectives of the ENRA are to develop current electricity sources and develop sustainable and cost-effective new sources and to minimize the emission of air pollutants. This can be achieved by full adoption of the actions specified in the National Environmental Action Plan (NEAP) to protect health and the environment from the effects of air pollution.

j- Ministry of Tourism and Antiquities (MoTA):

The ministry in general has the following responsibilities:

1. To protect antiquities.
2. To develop internal and external tourism,
3. To bring Palestinian history to the world's fingertips,
4. To work with other institutions in establishing specialized department/programs that is specialized in protecting ancient sites, cemeteries and monuments.

k- Ministry of Public Works and Housing (MPWH):

The main responsibilities of the Ministry of Housing and Public Works are:

1. To improve the standard of housing to safeguard the health of the inhabitants, which comprises improvement of the housing conditions and services such as sanitary facilities and ventilation.
2. To complete and upgrade the infrastructure required for economic development and social activities and to improve the quality of public buildings.

3. To ensure the use of high-quality construction materials to improve safety standards.
4. To concentrate on issues that has a direct impact on the environment such as air pollution and wastewater treatment and disposal.

l- Ministry of Religious Affairs

The ministry is responsible for management the religious issues in the West Bank and Gaza Strip. The ministry manages the Waqf lands. Some of these lands may rented to other ministries to implement a public facility.

m- United Nations Relief and Works Agency (UNRWA)

UNRWA has a monitoring program for drinking water in refugee camps.

Annex II - B - Applicable Regulatory Standards and Guidelines

A number of draft and adopted laws, standards and policies that are of particular interest to this EMP study have been reviewed. These legislative, policies and regulatory standards are summarized as follows:

a. The Draft Water Law

The draft Water Law, which is being debated in the Legislative Council, confirms the status of PWA as an autonomous institution supervised by the President of the Palestinian Authority. The draft Law assigns the following powers to PWA: to allocate water for beneficial uses; to issue licenses and permits for the uses of water resources and for the discharge of pollutants; to assure optimal utilization of water resources for public uses (by monitoring water use and sources of pollution, as well as by enforcing licenses and permits); to regulate existing water institutions; to establish regional water and wastewater utilities; to set water tariff policies; and to prepare a National Water Master Plan. The Draft Water Law allows water services to be contracted out to the private sector.

b. Palestinian Environmental Law

The Palestinian environmental legal and administrative framework has taken major strides towards protecting environmental resources and institutionalizing their sustainable management. The Palestinian Environment Law of (PEL) is comprehensive, covering the main issues relevant to environmental protection and law enforcement.

Among the objectives of the PEL are:

- Protecting the environment from all sorts and types of pollution
- Protecting public health and social welfare
- Incorporating environmental resources protection in all social and economic development plans and promote sustainable development to protect the rights of future generations;
- Conserving ecologically sensitive areas, protecting biodiversity, and rehabilitating environmentally damaged areas;
- Setting inter-ministerial cooperation regulations and standards various environmental protection areas and jurisdictions;

- Promoting environmental information collection and publication, public awareness, education and training.

The PEL addresses various environmental issues including:

- Management and protection of various resources. Issues covered are related to land environment, air environment, water resources and aquatic environment, and natural, archeological, and historical heritage protection.
- Environmental Impact Assessment (EIA) and auditing, permitting of development projects, monitoring of environmental resources and their parameters.
- Penalties to be applied in case of violation of any article presented under the law.
- Other issues addressed by the legislation include emergency preparedness, public participation, research training and public education.

The PEL of 1999 has stated in article 45, “The (EQA), in coordination with the competent agencies, shall set standards to determine which projects and fields shall be subject to the environmental impact assessment studies. It shall also prepare lists of these projects and set the rules and procedures of the environmental impact assessment”.

Article 47 of the PEL states that: “The (EQA), in coordination with the competent agencies, shall determine the activities and projects that have to obtain an environmental approval before being licensed. This includes the projects that are allowed to be established in the restricted areas”.

In relation to water and wastewater disposal, article 29 of the PEL (Aquatic Environment) state that: “The (EQA) shall formulate, in coordination with the competent authorities, the standards and criteria of dispose of the wastewater and rain water in a sound manner which is consistent with the preservation of the environment and public health”.

c. Palestinian Environmental Assessment Policy

The Palestinian Ministerial Council approves the Palestinian Environmental Assessment Policy (PEAP), through resolution No: 27-23/4/2000. This Policy shall be interpreted and implemented to support the sustainable economic and social development of the Palestinian people through assisting in meeting the following goals:

1. Ensuring an adequate standard of life in all its aspects, and not negatively affecting the basic needs, and the social, cultural and historical values of people as a result of development activities.
2. Preserving the capacity of the natural environment to clean and sustain it.
3. Conserving biodiversity, landscapes and the sustainable use of natural resources.
4. Avoiding irreversible environmental damage, and minimizing reversible environmental damage, from development activities.

According to the PEAP, there are three documents that represent sequential stages in the project life cycle and the Environmental Approval (EA) review process: an Application for Environmental Approval; an Initial Environmental Evaluation (IEE); and An Environmental Impact Assessment (EIA). The EQA shall provide guidance on the content and preparation of these documents.

The IEE is for projects where significant environmental impacts are uncertain, or where compliance with environmental regulations must be ensured; whereas EIA is required for projects, which are likely to have significant environmental impacts. An EIA may be carried out as a result of an IEE.

Based on the Application for Environmental Approval, screening criteria are used to determine whether IEE or EIA is required for a project. Wastewater treatment plants are listed as number 3 among the major development projects for which an EIA shall be conducted. Therefore it is to prepare a complete EIA as part of the Jericho Wastewater Collection, Treatment system and Reuse project. The EIA is to define the environmental impacts of the project and the measures to mitigate the adverse impacts or capture potential environmental benefits.

For project types not listed above, a determination of whether or not an IEE or an EIA must be conducted will be based on a screening criterion. Extensions to existing projects of the types listed above shall be screened for the need for IEE or EIA studies.

The project proponent must first obtain initial approval from the appropriate Ministry or Local Planning Committee. The proponent then submits an Application for Environmental Approval to the EQA. The EQA will notify the appropriate permitting authorities that an Application for Environmental Approval has been received and that an EIA is required.

For projects not mentioned above, the proponent submits the Application for Environmental Approval to the appropriate permitting authorities as part of his overall application package for initial approval.

These authorities then refer the project to the EQA. The EQA may ask the proponent for further information to ensure the Application is sufficient for consideration under the PEAP. In consultation with these authorities and others through the EA Committee as required, the EQA then applies the screening guidelines and determines whether IEE or EIA is required.

If neither IEE nor EIA are required, the EQA will determine, in coordination with the relevant permitting authorities or the EA Committee as required, whether or not Environmental Approval will be granted and, if so, under what conditions.Once the EQA considers that an Application for Environmental Approval is complete, it has a maximum of 14 business days to determine the need for an IEE or an EIA, or to determine whether Environmental Approval will be granted based on the Application alone. If this deadline is not met, the proponent has the right to submit a written complaint to the Head of the EQA, who must respond in writing within a week from receipt of the complaint.

The screening process will be based on requirements of relevant land use plans, and on whether the project is likely to:

1. Use a natural resource in a way that pre-empts other uses of that resource,
2. Displace people or communities,

3. Be located in or near environmentally sensitive areas such as natural reserves, wetlands, or registered archeological and cultural sites,
4. Generate unacceptable levels of environmental impact,
5. Create a state of public concern, or
6. Require further, related development activities that may cause significant environmental impacts.

Without limiting its content, an Environmental Approval may specify:

- Required measures to mitigate adverse environmental impacts or capture potential environmental benefits, including a compliance schedule,
- Measures that the proponent must implement in order to comply with relevant standards and requirements; and
- Monitoring and reporting duties of the proponent.

d. Land Ownership

If a land is needed for public services, the procedure to repossess the land is as follow:

- The concern agency has to send an official application to the central planning committee in the Ministry of Local Governments describing the situation and the necessity to repossess the land.
- The committee from its side studies the application and if it is accepted they have to apply to the President asking him to confiscate the land.
- When the application is accepted by the President, he gives his approval and sends an order to the Ministries of Housing, Justice and Finance to formulate a committee in order to visit the site and estimate the amount of compensation to the owners.

e. Antiquities Law

A person must have a license to dig or search in any manner for antiquities. Work on land on which an antiquity has been discovered must be suspended, and the Director must (1) notify the owner or occupier of the land of the conditions by which the works may be continue on the land, or (2) order the work be permanently stopped. Persons damaged by these orders may demand compensation. At Present the Ministry of Tourism and Antiquity through the department of Antiquity within the ministry is responsible for this issue. The department drafted a Palestinian Law of Antiquity which is in the PLC since 1996. The department modifies a system now to deal with any antiquity issue with regard to any project as fellow: The proponent or concern agency should apply in written about the project with all data needed. Then the Department will ask the inspection section to carry a survey at that area of the project and reply in written about their finding and opinion.

f. Labor Law

Labor law No. 7 for the year 2000 is the Palestinian Labor Law applicable for West Bank and Gaza Governorates. Labor Law is the reference for work and labor regulations and different parties rights.

g. DraftLaw on Local Government

The Ministry of Local Government (MOLG) has focused its efforts initially on preparing for national, which were successfully held in January 1996. It is also actively developing managerial systems and drafting a new local government law for consideration by the Palestinian Council. It is not yet clear what would be the functions and degree of autonomy of local governments and their relationship to the central government. Two versions of the potential law on local government have been drafted. One would give local governments substantial autonomy, building on the existing situation, while the other would confer heavy control to the central government. The new law on local government would add the Higher Planning Council to existing local and central planning committees and would define the roles and responsibilities of these three planning bodies:

- Local Planning Committee: comprised of the president and members of the Municipal Council.
- Central planning Committee: comprised of representatives of all ministries and chaired by the Ministry of Local Government. Although there is one local planning committee for each Governorate, there is only one central planning committee for all Governorates.
- Local councils: A new law on Palestinian local authorities was promulgated and signed in 1997. The new law clarifies the roles and responsibilities of local governments in Palestine, including procedures for electing local councils and presidents of local councils, the roles and responsibilities of local councils and the presidents of local councils, and fiscal and financial management.

h. Draft National Environmental Health Strategy (1999)

The Department of Environmental Health (EHD) in the Ministry of Health at 1998 has formulated a draft environmental health strategy. This strategy explains the current situation of environmental health in Palestine and indicates the strategy and the action plan for five years (1999-2003). The main subjects tackled in this strategy are:

- Environmental Health Information
- Drinking Water Monitoring and Control
- Wastewater and Solid waste Monitoring and Control
- Air Pollution Control
- Vector Control
- licensing of Crafts and Industries
- Food Safety

Annex III: Allowable Standards

Annex III
Allowable Standards

Environmental and Social Impact Assessment (ESIA)
&
Environmental and Social Management Plan (ESMP)

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Test	Water	Reference
Turbidity (NTU)	Penetration of light through the water shall not be less than 10% above the natural seasonal average	
Salinity %	3.8 - 4.0	Israel Oceanographic and Limnological Research
Temperature oC	17 - 27	http://seadatanet.maris2.nl/v_edmo/print.asp?n_code=963
pH	pH of 8.0-8.3 and change of pH relative to the natural environment shall be less than -/+ 0.2 pH units	
DO (mg/l)	5 - 7	Israel Oceanographic and Limnological Research
BOD as O2 (mg/l)	Max.: 10% higher than the natural seasonal average or: Average concentration of 1 mg/L Maximum concentration of 3 mg/L	
Total Phosphorous (mg/l)	Average total phosphorus as P, 0.1 mg/L	
TKN (mg/l)	Average Total nitrogen as N, = 1.0 mg/L	
NO3- (mg/l)	0.15 - 0.55	Nutrient budget for the Eastern Mediterranean
NO2- (mg/l)	< 0.1	
NH+4 (mg/l)	– Average of 0.50 mg/L – Maximum of 2.4 mg/L	
Boron (B) (mg/l)	4 - 5	N. Nadav, Boron removal from seawater reverse osmosis permeate utilizing selective ion exchange resin, Desalination 124 (1999) 131.
Chlorophyll *a.* (µg/l)	0.1 - 12	Vladimir I. Haltrin, Chlorophyll-based model of seawater optical properties, APPLIED OPTICS y Vol. 38, No. 33 y 20 November 1999
Residual Chlorine (mg/l)	Main Source: Seawater Desalination Plant. (Max. 0.1 mg/l) Residual levels in the discharge	

Test		Water	Reference
		may be toxic to marine life in the discharge area.	
Fecal Coliform, (CFU/100ml)		Main Source: wastewater discharge pipe Less than 100/L: Free from contamination, 100 to 1000 /L, slightly contaminated, 2000 to 10,000/L highly contaminated, and ,more than 10,000/L dangerously contaminated.	WHO Standards
Heavy Metals	Cadmium (Cd) (µg/l)	Average 0.0005 mg/L Maximum 0.002 mg/L	
	Chromium (Cr) (µg/l)	Total chromium: Average 0.01 mg/L / Maximum 0.02 mg/L Chromium (VI+): Average 0.005 mg/L / Maximum 0.10 mg/L	
	Nickel (Ni) (µg/l)	Average 0.01 mg/L Maximum 0.05 mg/L	
	zinc (Zn) (µg/l)	Average 0.04 mg/L Maximum 0.1 mg/L	
	Cupper (Cu) (µg/l)	Average 0.005 mg/L Maximum 0.010 mg/L	

Annex IV: Details of Baseline Environment

Annex IV
Details of Baseline Environment

Environmental and Social Impact Assessment (ESIA)
&
Environmental and Social Management Plan (ESMP)

For

Gaza Water Supply and Sewage Systems Improvement

Final Report

Annex IV – A: Gaza Strip Climatological Conditions

Table A-1: Gaza Strip Climatological Conditions – Year 2010

Element	Month												Average
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
Mean Temp.(c˚)	13.4	13.7	15.6	18.7	20.7	23.3	25.4	25.8	24.3	22.9	18.7	15.1	19.8
Pressure (mbar)	1016	1016	1013	1012	1011	1009	1006	1008	1011	1013	1014	1017	1,012
Mean Sunshine Duration(h/day)	5.2	5.9	7.3	8.2	8.9	9.7	10.5	10.4	9.3	8.5	6.5	5.1	8.0
Mean RH (%)	67	67	70	70	73	75	76	75	73	69	67	68	70.8
Total Rainfall (mm) *	105	88	37	9	1	0	0	0	0	36	71	99	446.0 (total)
Total Evaporation (mm) *	68	76	115	142	162	190	193	183	165	132	87	69	131.8
Total PET (mm) *	53	49	50	72	79	119	96	100	94	96	76	60	78.7

* Monthly Total
** Source: Palestinian Meteorological Office, www.pmd.ps, 2012-02-10

Annex IV – B: Water Resources and Quality

The Gaza Strip is located on the extreme western edge of a shallow coastal aquifer. The water resources in Gaza are limited. The coastal aquifer is considered the only source of fresh water for the Palestinian population in the Gaza Strip.Gaza has a water crisis and faces serious challenges for future sustainability of water resources.

Gaza Strip Aquifer

The Coastal Aquifer in the Gaza Strip is the only natural source of water supply for all activities (domestic, irrigation and industrial supply). The groundwater is being pumped through more than 4,600 wells all over the Gaza Strip (Figure 2). The latest published values for groundwater abstraction was around 164 MCM for year 2007 (CMWU report), 162.25 MCM for year 2008 (PWA report) and 166.7 MCM for year 2009 (CMWU report). More than 50% of the abstracted groundwater was for domestic water supply. The natural groundwater recharge from different components are around an average of 100 – 110 MCM yearly (recharge from rainfall, agricultural return flow, water and waste water network losses, and recharge basins in different places all over the Gaza Strip)(HWE report, 2010)[4].

In year 2009, the recorded water abstracted from groundwater was around 86.7MCM, while agricultural water abstraction is assumed to be around 80MCM. The following table illustrates the overall groundwater abstraction for each governorate in year 2009.

Table B-1: Groundwater Abstraction for Each Governorate

Governorate	Water Supply (m^3)
North	22,030,009
Gaza	33,226,214
Middle	12,524,944
Khan Younis	13,677,696
Rafah	7,866,840
Total (m^3)	89,325,703
Mekorot Water (m^3)	**4,864,880**
Water Abstracted from Groundwater (m^3)	**84,460,823**
UNRWA wells Abstractions (m^3)	**2,269,361**
Agricultural wells Abstractions (m^3)	**80,000,000**
Total Groundwater Abstracted (Year 2009) in MCM	**~166.7**

Reference: CMWU 2010

The groundwater elevation map shows two sensitive areas for groundwater depression, the north and the south areas, where the groundwater level elevation drops more than 4m in the north and more

[4]House of Water and Environment, final report, Setting-up Groundwater Protection Plan of the Coastal Aquifer of Gaza Strip,2010 .

than 12m in the south below mean sea level. This drop in the groundwater will led to lateral invasion of seawater due to pressure difference and direct contact with the aquifer, and also vertical invasion from deep saline water. This invasion laterally and vertically will affect the overall groundwater quality in the system. This has become from yearly deficit which occurs as a result of unbalance between what is being recharged and abstracted from the groundwater. Yearly average groundwater deficit is ranged from 40 to 60 MCM(CMWU report, 2010).

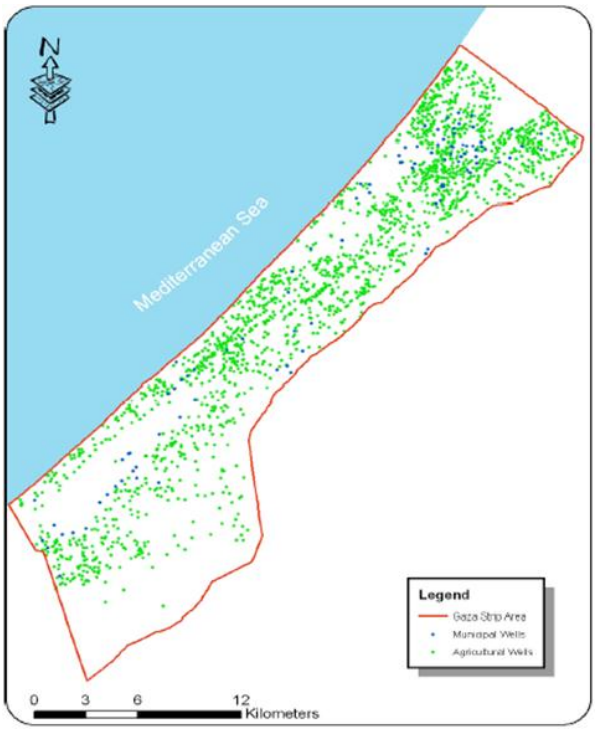


Figure B-1: Wells in Gaza Strip (PWA, Archived data)

Geological Formation of Gaza Aquifer

The thickness of the saturated groundwater aquifer underneath the Gaza Strip ranges from few meters in the eastern and south east of the Gaza Strip to about 120-150m in the west and along the Mediterranean Sea. The aquifer is mainly composed of unconsolidated sand stone known as Kurkar formation, which overlaying the impermissible layer called Saqiya formation which is considered as the bottom of the Gaza Coastal Aquifer with thickness varies from 800-1000m. Figure 4 shows the soil map of the Gaza strip (CMWU report, 2010).

Aquifer Hydraulic Properties

During the CAMP[5] project, five locations has been selected to run long term pumping test, each test last more than three continuous days to be completed followed by recovery measurements. All the collected data has been studied and found that the aquifertransmissivity values range between 700 m2/d to 5,000m2/d. Corresponding values ofhydraulic conductivity (K) are mostly within a relatively narrow range, 20 m/d to 80 m/d.Specific yield values are estimated to be about 15-30 percent whilst specific storability isabout 10-4 from tests conducted through the CAMP project.

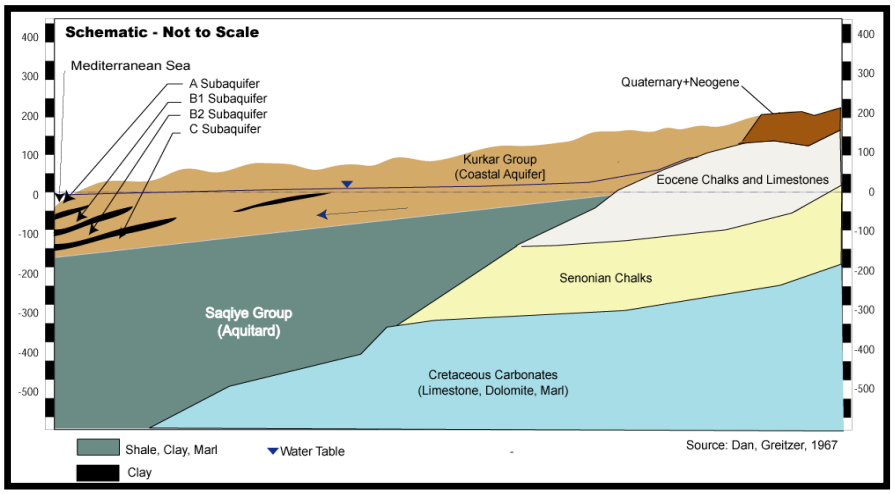


Figure B-2: Hydrogeological Cross Section of Gaza Aquifer (CMWU report, 2010)

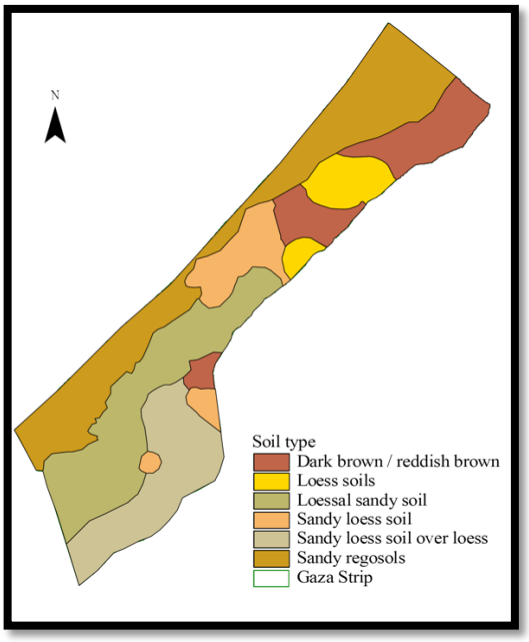


Figure B-3: Gaza Strip – Soil Map, Ministry of Planning, 2009

[5]CAMP, Coastal Aquifer Management Project, Integrated Aquifer Management Plan, PWA, Final Report

Water Demand Forecasting

The calculated future water volume required based on two important factors, whichare the improvement of the water distribution system and fairness distribution all overthe Gaza Strip to reach 150L/C/D by year 2035. Those factors were calculated basedon the current situation and expected future development to reach 80% waterdistribution efficiency by year 2035. The following table showed the water volumerequired for each governorate till year 2035.

Table B-2: Water Demand Required for Each Governorate (CMWU report, 2010)

Planned Water Volume Required (MCM)				
Year	North Gov.	Gaza & Middle Gov.	South Gov.	Total (MCM)
2009	18.6	44.9	19.0	82.5
2010	20.4	48.4	22.1	90.9
2015	24.1	59.2	31.2	114.5
2020	29.9	72.1	43.3	145.3
2025	34.9	87.5	56.1	178.5
2030	40.8	106.0	67.1	213.9
2035	48.5	125.9	79.7	254.0

Based on PWA records over the past eight years, the municipal water abstraction has been increasing based on the population growth as well as the increasing in water demand become bigger as shown in the following table.

Table B-3: Municipal Water Abstraction (HWE report, 2010)

Year	Municipal Well Production (Mcm)	Water Consumption (Mcm)
2000	57.02	35.05
2001	59.14	37.84
2002	62.68	39.72
2003	68.07	41.09
2004	69.67	42.84
2005	74.60	43.81
2006	76.81	44.31
2007	80.69	45.5
2008	84.17	47.1

Since year 2000, the agricultural activities have been shrinking due to Israeli Militaryactivities along the eastern border of the Gaza Strip, which consequently decrease theagricultural demand. But since year 2006/2007, a jump in the total irrigated area wasobserved as a result of the induced efforts of NGO's to replant the uprooted lands of citrus and olives, but unfortunately, most of the new shrubs were uprooted again especially in the buffer zones and border lands. Table 7 shows the cultivated areas and the total agricultural water Demand.

Table B-4: Cultivated Areas and Water Demand

Hydrological Year	Total Cultivated Area (Dunums)	Total Estimated Agricultural Water Demand (Mcm)
2002/2003	167,016	79.5
2003/2004	158,055	77.5
2004/2005	154,000	73.5
2005/2006	167,861	80
2006/2007	175,755	85.5
2007/2008	156,945	74

Source: Ministry of Agriculture records (2002-2008)

Groundwater Quality

The groundwater quality is monitored through all municipal wells and some agricultural wells distributed all over the Gaza Strip. The chloride ion concentration varies from less than 250mg/L in the sand dune areas as the northern and southwestern area of the Gaza Strip to about more than 10,000mg/L where the seawater intrusion has occurred. The chloride concentration is used as a reflection of water salinity which can be tasted when drinking. The source of the nitrate ion in the groundwater chemical components has resulted from different sources i.e. intensive use of agricultural pesticides beside the existence of septic tanks to dispose the domestic wastewater in the areas where there is no wastewater collection system. The nitrate ion concentration reaches a very high range in different areas of the Gaza Strip, while the WHO standard recommended nitrate concentration less than 50mg/L. The overall Chloride and Nitrate concentration maps for Gaza Strip are illustrated in the following maps (CMWU 2010).

The area in the north, Khan Younis and Rafah are the most affected areas with highly nitrate concentration since year 2000/2001 and that is also referred to agricultural activities and waste water collection basins in the north of the Gaza Strip, while leakage from existing sewage septic tanks in Khan Younis and Rafah are the reformation of highly nitrate concentration added to that the agricultural activities in Shoka and Israeli ex- settlement areas in Khan Younis and Rafah areas.

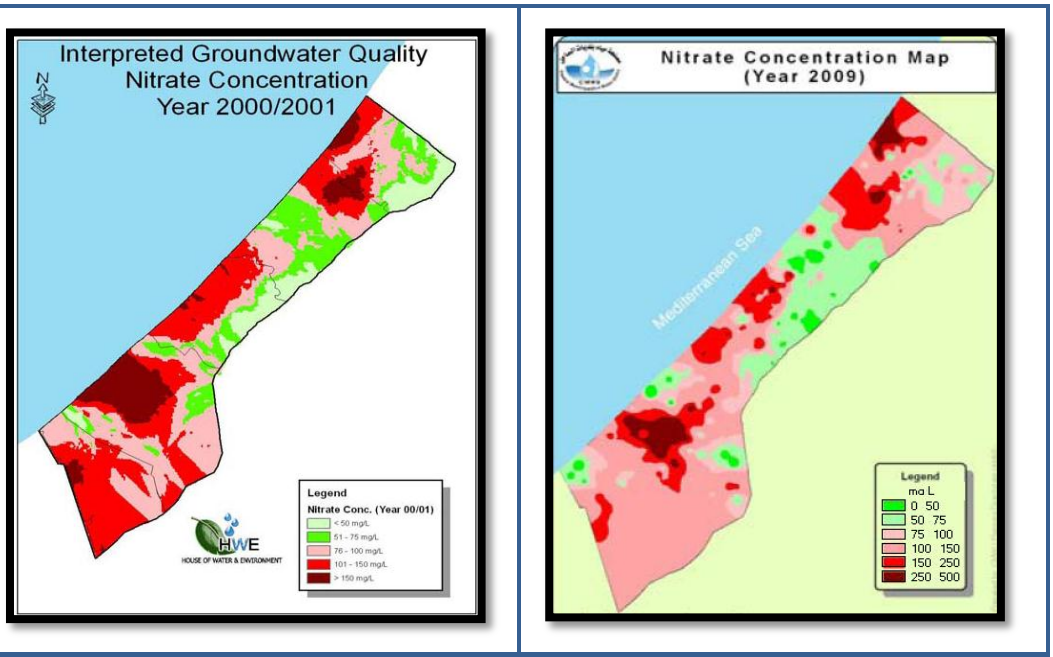


Figure B-4: Nitrate Concentration in Gaza strip aquifer, 2009 (CMWU, 2010) and 2001 (HWE, 2010)

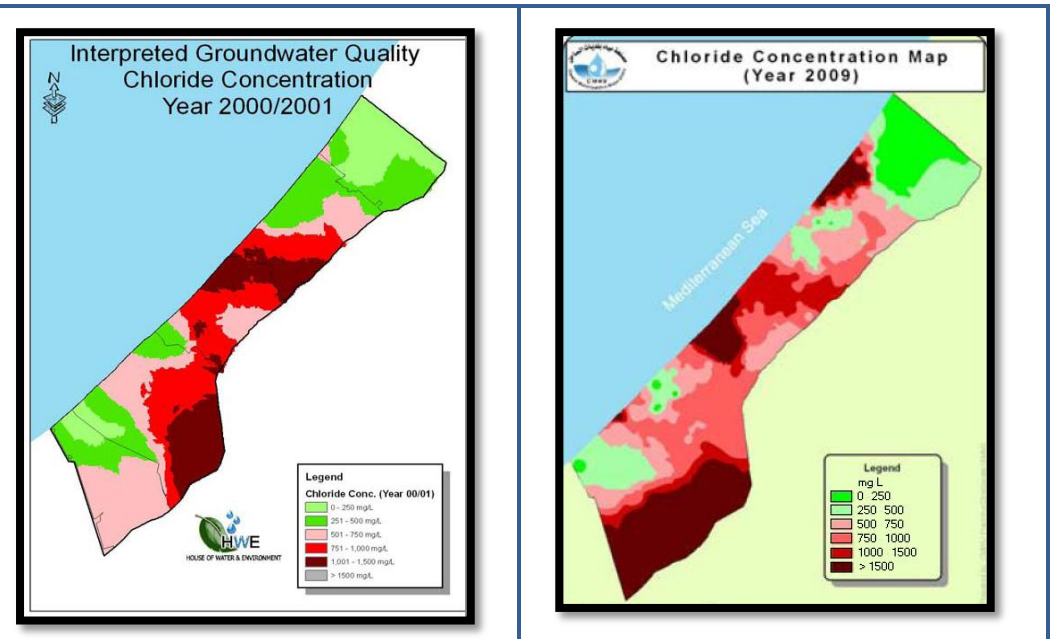


Figure B-5: Chloride Concentration in Gaza strip aquifer, 2009 (CMWU, 2010) and 2001 (HWE, 2010)

Wastewater Services

Recent reports indicate that 60 percent of the population now lives in areas served with sewage networks, while the other 40% use septic tanks and cesspits (Ashour et al., 2009). About 90 percent of the population of Jabalia, 60 percent of BeitHanoun, 40 percent of BeitLahia, 25 percent of Khan Younis, 65 percent of Rafah are connected to wastewater collection systems. The three existing wastewater treatment plants function intermittently (in addition to Khan Younis temporary treatment plant). Little sewage is treated and most is returned to lagoons, wadis and the sea. Along the Gaza Strip, 16 outfalls discharge directly into the sea, including Wadi Gaza, which discharges up to 70,000-80,000 cubic meters per day.

Table B-5: Sewage in the Gaza Strip, UNEP, 2009

Parameter	Governorate				
	Rafah	Khan Younis	Middle	Gaza	North
Population	184000	250000	190000	470000	445000
Total sewage collected	8500	5000	None	60000	17000
Sewage treatment plant	Yes	Partly to treatment, partly to storm water lagoon	None	Yes	Yes
Method	Treatment lagoons	Aerobic and anaerobic lagoons	No treatment	Aerobic and Anaerobic lagoons and biotowers	Aerobic, anaerobic lagoons and polishing ponds
Capacity	4000	N/D	N/D	50000	5000
Type of disposal	Pipeline to sea	Infiltration to ground	Wadi Gaza	Disposed to sea	35-hectare holding lake

In 2009, UNEP collected sewage data at nine locations ranging from a treatment basin to final disposal points. Ammonia, chemical oxygen demand (COD) and coliforms were analyzed. They concluded that, none of the sewage samples are fit for infiltration or marine disposal, which are the two alternative methods of sewage disposal currently used in the Gaza Strip. Table 8 shows Summary of Waste Water Treatment for Gaza Strip.

A soil sample was collected near to the WWTP in north, Wadi Gaza, Khan Younis infiltration basins, and Rafah, to evaluate the impact of the wastewater outflow. Soil samples were tested for heavy metals as well as for groups of organic contaminants. For the area, it was found that none of the parameters analyzed were found in great concentrations that would give reason for concern.

Table B-6: Summary of Waste Water Treatment for Gaza Strip (CMWU,2009)

Area	Average BOD5	Average COD	Average TSS	% Removal	Discharge to the sea (Y/N)	Average waste Water (m^3/day)	Risk Index for sea water pollution	Palestinian Standard for Discharge to the sea			Palestinian Standard for Infiltration to the aquifer		
								BOD5	COD	TSS	BOD5	COD	TSS
Northen Area	N/A	N/A	N/A	N/A	No	20,000	very low	-	-	- 40	150	50	
Gaza	138.78	297.64	104.3	68.02	Yes	60,000	high	60	200	60	-	-	-
Middle Khan Younis	N/A	N/A	N/A	N/A	Yes	20,000	medium	60	200	60	-	-	-
	105	223.75	130.75	75.26	Yes	9,000	low	60	200	60	-	-	-
Rafah	123.25	285	123.75	71.71	Yes	8,000	low	60	200	60	-	-	-

Annex IV – C: Biological Habitat and Species

Table C-1: Wild mammals recorded in the Gaza Strip

Family	Scientific Name	Common Name	Status*
Erinaceidae	*Hemiechinusauritus*	Long-eared Hedgehog	R
	Paraechinusaethiopicus	Ethiopian Hedgehog	R
Pteropoidae	*Rousettusaegyptiacus*	Egyptian Fruit Bat	R
Vespertilionidae	*Pipistrelluskuhlii*	Kuhl'sPipistrelle Bat	R
Canidae	*Canisaureus*	Golden Jackal	?
Felidae	*Felissilvestris*	Wild Cat	R
	Felischaus	Jungle Cat	?
Herpestidae	*Herpestes ichneumon*	Egyptian Mongoose	R
Spalacidae	*Spalaxleucodonehrenbergi*	Palestine Mole-rat	R
Muridae	*Musmusculus*	House Mouse	R
	Rattus spp.	Commensal Rat	R
Dipodidae	*Jaculusjaculus*	Lesser Egyptian Jerboa	R
Leporidae	*Lepuscapensis*	Cape Hare	R

R = Resident; ? = Unknown status
Reference: (AbdRabou, 2011)

Table C-2: Bird species recorded in the Gaza Strip

Family	Scientific Name	Common Name	Status*
Ardeidae	*Bubulcus ibis*	Cattle Egret	R,M
Accipitridae الكواسر	*Milvusmigrans*	Black Kite	R
	Buteobuteo	Common Buzzard	M
	Aquila heliaca	Imperial Eagle	M
Falconidae	*Falco naummani*	Lesser Kestrel	R,M
	Falco tinnunculus	Common Kestrel	M
	Falco subbuteo	Eurasian Hobby	M
Phasianidae	*Alectorischukar*	Chukar	R
	Coturnixcoturnix	Quail	M
Burhinidae	*Burhinusoedicnemus*	Stone Curlew	R
Charadriidae	*Vanellusspinosus*	Spur-winged Plover	R
Laridae	*Larusridibundus*	Black-headed Gull	M
	Laruscachinnas	Yellow-legged Gull	M
	Larusmarinus	Great black-backed Gull	M
Sternidae	*Sterna hirundo*	Common Tern	M
Columbidae	*Columba livia*	Rock Dove	R
	Streptopeliaturtur	Turtle Dove	R
	Streptopeliasenegalensis	Laughing Dove	R
Cuculidae	*Clamatorglandarius*	Great Spotted Cuckoo	M
Strigidae	*Athenenoctua*	Little Owl	R
	Tyto alba	Barn Owl	R
Alcedinidae	*Halyconsmyrnensis*	White-breasted Kingfisher	R
	Cerylerudis	Pied Kingfisher	R
Meropidae	*Meropsapiaster*	European Bee-eater	M
	Coraciusgarrulus	European Rollar	M
Upupidae	*Upupaepops*	Hoopoe	R
Picidae	*Dendrocopossyriacus*	Syrian Woodpecker	R
Alaudidae	*Galeridacristata*	Crested Lark	R
Hirundinidae	*Hirundurustica*	Barn Swallow	R
Motacillidae	*Motacillaflava*	Yellow Wagtail	M
	Motacilla alba	White Wagtail	M
Pycnonotidae	*Pycnonotusxanthopygos*	Yellow-vented Bulbul	R
Turdidae	*Erithacusrubecula*	European Robin	M
	Lusciniasvecica	Bluethroat	M
	Phoenicurusphoenicurus	Common Redstart	M
	Saxicolatorquata	Stonechat	M
	Oenantheoenanthe	Northern Wheatear	M
	Oenanthehispanica	Black-eared Wheatear	M
	Turdusmerula	Blackbird	R
	Turdusphilomelos	Song Thrush	M
Sylviidae	*Priniagracilis*	Graceful Prinia	R
	Hippolaispallida	Olivaceous Warbler	M
	Sylvia atricapilla	Blackcap	M
Nectariniidae	*Nectariniaosea*	Palestine Sunbird	R
Laniidae الصرود	*Lanius senator*	Lesser grey Shrike	M
	Laniusnubicus	Great grey Shrike	M
	Laniusnubicus	Masked Shrike	M
Corvidae	*Corvuscorone*	Hooded Crow	R
Passeridae	*Passer domesticus*	House Sparrow	R
Fringillidae	*Carduelischloris*	Green Finch	M
	Carduelis carduelis	Goldfinch	M
	Carduelis cannabina	Linnet	M
	Rhodospizaobsoleta	Desert Finch	M

R = Resident; M = Migrant
Reference: (AbdRabou, 2011)

Table C-3: Reptiles recorded in the Gaza Strip

Family	Scientific Name	Common Name	Status*
Testudinidae	*Testudograeca*	Spur-thighed Tortoise	R
Varanidae	*Varanusgriseus*	Desert Monitor	R
Agamidae	*Agama stellio*	Agama	R
Scincidae	*Chalcidesocellatus*	Ocellated Skink	R
Chamaeleonidae	*Chameleo chameleon*	Mediterranean Chameleon	R
Geckonidae	*Hemidactylusturcicus*	Turkish Gecko	R
Lacertidae	*Acanthodactylusboskianus*	Bosc's Lizard	R
Boidae	*Eryxjaculus*	Sand Boa	R
Colubridae	*Coluberjugularisasianus*	Syrian Black Snake (Arbeed)	R
	Colubernummifer	Coined Snake	R
	Coluberravergieri	Ravergier's Whip Snake	R
	Coluberrubriceps	Red Whip Snake	R
Viperidae	*Viperapalaestinae*	Palestine Viper	R

* *Status: R = Resident*
Reference: (AbdRabou, 2011)

Table C - 4: Amphibians recorded in the Gaza Strip

Family	Scientific Name	Common Name	Status*
Bufonidae	*Bufoviridis*	Common or Green Toad	R
Ranidae	*Ranabedriagae*	Levantine Frog	R
Hylidae	*Hylaarborea*	Tree Frog	R

**Status: R = Resident*
Reference: (AbdRabou, 2011)

Table C - 5: Floristic species recorded in the Gaza Strip

Order	Family	Scientific Name	Common Name
Pinales	Cupressaceae	*Cupressussempervirens*	Evergreen Cypress
Cyperales	Graminae (Poaceae)	*Phragmitesaustralis*	Common Reed
		Polypogonmaritimus	Mediterranean Rabbit's Foot Grass
		Cynodondactylon	Bermuda Grass
Liliales	Liliaceae	*Pancratiummaritimum*	Sea Daffodil
Arecales	Arecaceae	*Phoenix dactylifera*	Date Palm
Caryophyllales	Aizoaceae	*Carpobrotusedulis*	Hottentot Fig
		Mesembryanthemumcrystallinum	Common Iceplant
	Cactaceae	*Opuntiaficus-indica*	Tuna Cactus
	Caryophyllaceae	*Silenesucculenta*	Campion
	Chenopodiaceae	*Atriplex sp.*	Shrubby Saltbush
		Salsola kali	Russian Thistle
		Chenopodiummurale	Nettleleaf goosefoot
	Portulaceae	*Portulacaoleracea*	Little Hogweed
Gentanales	Apocynaceae	*Nerium oleander*	Oleander
Campanulales	Campanulaceae	*Campanula sulphurea*	Bellflower
Asterales	Asteraceae (Compositae)	*Anthemisleucanthemifolia*	Chamomile
		Artemisia monosperma	Sagebrush
		Artemisia herba-alba	Worm Wood
		Centaureapallescens	Knapweed
		Cichoriumpumilum	Cichorium
		Scolymusmaculatus	Spotted Golden-thistle

Order	Family	Scientific Name	Common Name
		Scolymushispanicus	Common Golden-thistle
		Silybummarianum	Blessed Milk-thistle
		Xanthium strumarium	Rough Cocklebur
		Xanthium spinosum	Spiny Cocklebur
Capparales	Brassicaceae (Cruciferae)	*Brassica tournefortii*	Asian Mustard
		Cakilemaritima	European Searocket
Euphorbiales	Euphorbiaceae	*Ricinuscommunis*	Castor Oil Plant – Castor Beans
Fabales	Leguminosae (Fabaceae)	*Acacia cyanophylla*	Acacia
		Acacia arabica	Gum Arabic Tree
		Ceratoniasiliqua	Carob – John's Bread
		Astragalusannularis	Milk Vetch
		Alhagimaurorum	Camel-thorn
	Rosaceae	*Sarcopoteriumspinosum*	Prickly Shrubby (Thorny) Burnet
Malvales	Malvaceae	*Malvaparviflora*	Least Mallow
Urticales	Moraceae	*Ficussycomorus*	Sycamore Fig
		Morus sp.	Mulberry
	Urticaceae	*Urticamembranacea*	Roman Nettle
		Urticaurens	Roman Nettle
Myrtales	Myrtaceae	*Eucalyptus camaldulensis*	River Red-gum Tree
Scrophulariales	Orobanchaceae	*Orobancheaegyptiaca*	Broomrape
Papaverales	Papaveraceae	*Papaverhumile*	Poppy
Polygonales	Polygonaceae	*Polygonumequisetiforme*	Knot Weed
		Rumexpictus	Dock
Rhamnales	Rhamnaceae	*Ziziphusspina-christi*	Christ's Thorn
Solanales	Solanaceae	*Datura sp.*	Datura
		Hyoscyamusaureus	Henbane
		Lyciumeuropaeus	Bramble
		Solanum, elaeagnifolium	Silver-leaf Night Shade
		Nicotianaglauca	Tree Tobacco
Apiales	Apiaceae	*Daucusguttatus*	Wild Carrot
		Foeniculum sp.	Fennel – Sweet Anise
		Petroselinumsativum	Parsley
Violales	Tamaricaceae	*Tamarixnilotica*	Nile Tamarisk
		Tamarixaphylla	Athel (Jointed) Tamarisk
Sapendales	Zygophyllaceae	*Zygophyllum album*	Beancaper
Lamiales	Boraginaceae	*Moltkiopsisciliata*	Maroon Seedheads
	Labiatae	*Salvia sp.*	Common Sage
		Mentha sp.	Peppermint
		Ocimumbasilicum	Sweet Basil

Reference: (AbdRabou, 2011)

Annex V: Samples of Field Social Survey Forms

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: تأهيل مياه الآبار وحفر آبار بديلة

2. المكان: الصبرات - بئر الفاروق

3. إسم المواطن و عمله
الحاجة أم محمد أبو خطاب
العمر: ٧٠ عاماً
العمل: ربة منزل

4. العنوان مقاربة مع جزئية المشروع:
تسكن في البيت المقابل مباشرة لمدخل المقبرة الموجود به بئر الفاروق

5. الأسئلة:

- ما هو مصدر المياه لديكم و من أين تصلكم ؟

مصدر المياه/مياه البلدية وتصل عبر الشبكة من وصلة مباشرة من البئر لقربه من البيت

- ما نوعية المياه لديكم؟

المياه مالحة ونستخدم المياه من الشبكة فقط لاعمال التنظيف والمسح واعمال البيت اما المياه الخاصة بالشرب والطبيخ فنشتريها من سواقي المياه (بائعي المياه).

- هل أنتم مرتاحون لوجود مصدر المياه بالمكان الحالي له؟ و لماذا؟

بعض مرات بنفكر انه ممكن نشرب مياه الموتى علشان البئر في المقبرة وكمان بعض مرات بنقرف نغسل فيها خصوصاً عندما تكون ضيوف ويعرفوا ان المياه بالبيت من البلدية.

- ما رأيك بتغيير مكان البئر و أين تفضل أن يكون؟

يا ريت يغيروا لنا هالمكان علشان نعرف نشرب مياه والله تعبنا من دفع النقود لشراء المياه ويا ريت يكون البئر بعيد عن المقبرة علشان نفتح نفسنا للشرب والغسيل.

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: تأهيل مياه الآبار وحفر آبار بديله

2. المكان: النصيرات - بئر الفاروق

3. إسم المواطن و عمله
السيد/ هاني ابو خطاب
العمر: ٥٠ سنة
العمل: عامل بناء

4. العنوان مقاربة مع جزئية المشروع:
يسكن في البيت المقابل مباشره للمقبرة والموجود به بئر الفاروق

5. الأسئلة:

- ما هو مصدر المياه لديكم و من أين تصلكم ؟

زي ما قالتلكوا الحاجه مصدر المياه من بئر الفاروق اللي في المقبره وتأتينا من شبكة المياه الخاصه بالبلديه

- ما نوعية المياه لديكم؟

صارلنا والله زمان مياه صالحه والله يعلم ايش فيها كمان بس احنا بندوق مالحه وما بنشربها إلا لما نغليها إذا ما لقينا سيارة المياه (سيارة بيع المياه)

- هل أنتم مرتاحون لوجود مصدر المياه بالمكان الحالي له؟ و لماذا؟

يا حبيبي لينا بئر في المقبره ونشرب منه طبعاً مش مرتاحين له علشان نفسياً بنفكر انه الناس اللي بتموت بتتحلل واحنا بنشرب المياه بعد ما يتحلل رفات الموتى والله ما بيرضيش حد يا اخي.

- ما رأيك بتغيير مكان البئر و أين تفضل أن يكون؟

ياريت يغيروا لنا المكان والله بأخير اشربها مياه من الحنفيه وياريت يكون المكان قريب علشان توصلنا المياه دون ما نتعب

هاني

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: أهيل مياه الآبار وحفر آبار بديلة

2. المكان: النصيرات - بئر الفاروق

3. إسم المواطن و عمله
السيد/ محمد حمدان أبو جبارة
العمر: ٣٥ عاماً
العمل: نجار

4. العنوان مقاربة مع جزئية المشروع:
محل بالمنجرة القريب من المقبرة (فقط - لانه بيعمل بالمنجرة على بوابة المقبرة)

5. الأسئلة:

- ما هو مصدر المياه لديكم و من أين تصلكم ؟
من بئر الفاروق التابع للبلدية

- ما نوعية المياه لديكم؟
مالحة

- هل أنتم مرتاحون لوجود مصدر المياه بالمكان الحالي له؟ و لماذا؟
والله انا والعمال بالمنجرة علشان نتوضى بنشتري مياه من السيارات (سيارات بيع المياه)
علشان بنخاف تكون المياه اللي جاية من البئر مش طاهرة.
البئر/ المقبرة فيها ناس موتى وبيندفنوا فيها وبيصيروا عظام في الآخر يعني المياه اللي
بنشربها اكيد فيها ريحة ناس ميتين ??
والله انا باستخدم المياه في الشطف والتنظيف فقط.

- ما رأيك بتغيير مكان البئر و أين تفضل أن يكون؟
والله لو اذا اتغير مكان البئر بيكون الف/ الف الف نور/ علشان يوفر علينا شراء المياه ويا ريت
يكون مكانه قريب علشان تجينا المياه. دايماً بس الأحسن يخلو البئر لأغراض المقبرة
علشان بتهم مياه متاحة لهم دائماً ومش مشكلة اذا كانت مالحة بس للشرب
لا.

محمد أبو جبارة

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: - تأهيل مياه الآبار وحفر آبار جديدة (بديلة)

2. المكان: منطقة المغراقة - منطقة فارغة تخلو من السكان المحليين

3. إسم المواطن و عمله
السيد/ ناصر حشالي
عمله / مدينة النور الترفيهية (مدير)

4. العنوان مقاربة مع جزئية المشروع:
بجوار البئر المراد إزاحته

5. الأسئلة:

- ما هو مصدر المياه لديكم و من أين تصلكم ؟

مصدر الماء هو بئر الغزالة (F192) وتصلنا عبر شبكة المياه من البلدية لمنطقة المدينة الترفيهية

- ما نوعية المياه لديكم؟

نوعية المياه جيدة ونشرب منها ونستخدمها في يومنا العادي .

- هل أنتم مرتاحون لوجود مصدر المياه بالمكان الحالي له؟ و لماذا؟

لا توجد مشكلة لدينا من مكان البئر الحالي وإذا ما أرادت البلدية إزاحته فلا مانع لدينا
إذ أن الشبكة الحالية تصلنا من البئر الحالي أو من أي بئر قريبا من المكان ولن
تؤثر علينا إزاحة البئر .
* لماذا: لا يوجد سكان بالمنطقة
هذه المنطقة كانت زراعية ولكن أصحابها ذهبوا للمدينة وتركوا الأرض كما تراه فلا يوجد أحد تقريبا
بالمنطقة عدا المارين للمدينة الترفيهية .

- ما رأيك بتغيير مكان البئر و أين تفضل أن يكون؟

لا مانع حيث أن شبكة المياه واصلة لدينا فأينما يكون البئر فستصلنا المياه عبر شبكة البلدية.

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: محطة الصرف الصحي

2. المكان: الدفرات

3. إسم المواطن و عمله
الحاجة ام محمد (الاسم رباعي: انتصار محارب عبد الله أبوكاميل)
العمل ربة منزل
العمر اواخر الخمسينات
جوال الحاج ابو محمد: ٠٥٩٩٣٤٧١٤٥.

4. العنوان مقاربة مع جزئية المشروع:
سكان الحي المجاور للمحطة (٥ متر بعيدة عن المحطة)

5. الأسئلة:

- كيف يتم تصريف مياة الصرف الصحي لديكم؟
المفروض انه في شبكة مجاري بالمنطقة وهي بتودي المجاري للمحطة لفتح بعيد عن الحي .

- هل لديكم مشكلة بهذا الموضوع؟
طول عمرنا مشاكل يا اختي احنا محرومين نعيش زي الناس، كل ما نتعب تطفح المجاري علينا بالليل والنهار وخصوصا لما تكون المحطة اللي جنبنا مطفية وكمان المحطة قديمة وقديمة وزمان ما جددوها

- هل سبق وأن تسربت مياه المجاري الي داخل بيتك؟
عدي يا اختي عدي مرة صحينا على صراخ الاولاد الساعة ٢ نص الليل والميه دخلت علينا بالمجاري الله يعين وصرنا ننادي على الجيران عشان يساعدونا ويا ريت لما تشتي الدنيا علينا ننسبح بالدار من المجاري ومياه المطر (الله يعينا)

- متى حدث ذلك؟ وكم مرة حدث ذلك؟
آخر مرة الشتاء الماضي لما اجت المطرة الكبيرة والله تعبنا ليلتها نشفنا من البرد لما نشفت الحمامات من المطر اللي دخلنا بالدار وراحت من المجاري مرض.
عادة بتحدث بالليل لما يطفوا المحطة بنصير نغرق في جداول (سطل) ونكبوا بالشارع كل [illegible]

- ما الأضرار التي ترتبت على ذلك
اضرار صحية واضرار نفسية يا ريت تصلحوا هالمحطة خلينا نعيش زي الناس [illegible].

[illegible] انتصار أبوكاميل

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: محطات الصرف الصحي

2. المكان: النصيرات

3. إسم المواطن و عمله
بدون اسم (حيث ان الفتاه رفضت الاعلان عن اسمها علشان صغيره ؟؟)
العمل: طالبه بالمدرسه
العمر: ١٨ سنه

4. العنوان مقاربة مع جزئية المشروع:
اسكان جنب المحطه

5. الأسئلة:

- كيف يتم تصريف مياة الصرف الصحي لديكم؟

التصريف عن طريق شبكة البلديه اللي بالشارع

- هل لديكم مشكلة بهذا الموضوع؟

كل المشاكل عندنا هنا بالمجاري وخصوصا بالليل ولما مايكونوش في سولار يشغلوا المحطه بالنهار علشان بتطفح علينا المجاري اذا مابيشغلوهاش

- هل سبق وأن تسربت مياه المجاري الي داخل بيتك؟

كثير والله وبنقعد ننظف اليوم والاثنين لغاية ما تجف وتروح الريحه وبتصير في الليل تروح منه دخول الحمامات علشان المحطه مطفيه والمجاري بتطفح علينا.

- متى حدث ذلك؟ وكم مرة حدث ذلك؟

آخر مره بالشتاء قبل كم من شهر وبيصير عندنا الطفح لما يكون في شتاء ولما يكون ما فيش سولار يشغلوا المولد ولما يكون استخدام كثير بالمنطقه للمياه

- ما الأضرار التي ترتبت على ذلك

الاضرار كثيره بالمطبخ عندنا بالدار والثاني بيضرر علشان المصفايه الرئيسيه للمجاري برا منه

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: محطه الصرف الصحي .

2. المكان: دير البلح

3. إسم المواطن و عمله
الاسم : مدحت احمد محمد بارود (ابو تامر)
صوال ٠٥٩٩٧٢٩٠٠٢

4. العنوان مقاربة مع جزئية المشروع:
شارع المعتقه بجانب محطه دير البلح (الجاريه)

5. الأسئلة:

- كيف يتم تصريف مياة الصرف الصحي لديكم؟

البلديه بتقدف المجاري بواسطه شبكه المجاري القائمه بالمنطقه ثم تضخ عبر المحطه الى مكان آخر او الى البحر .

- هل لديكم مشكلة بهذا الموضوع؟

شاكل كثيرة منذ امتداد الشوارع المحيطه بالمحطه ومنذ شارفنا بالمجاري وبتدخل في دورنا وكمان علشان منطقتنا واطيه (منخفضه) عم منشوف الشارع كل مياه الشتاء بتدخل علينا .

- هل سبق وأن تسربت مياه المجاري الي داخل بيتك؟

كتير والله دخلت مياه المجاري منا بالدار وآخر مره خربت لي كل الاجهزه الكهربائيه منذ الثلاجة والغساله وكل الاكاسه بالمطبخ مع الأرضيه .

- متى حدث ذلك؟ وكم مرة حدث ذلك؟

آخر مره صارت بالشتاء الماضي لما كانت الشتاوي كبيره .

- ما الأضرار التي ترتبت على ذلك

خربت الأجهزه الكهربائيه وربنا يلطف بالشاكل الصحيه

استبيان حول الاثار الإجتماعية لمشروع
Gaza Water Supply Rehabilitation and Expansion - Gaza II

1. جزئية المشروع: محطة الصرف الصحي

2. المكان: دير البلح

3. إسم المواطن و عمله
الاسم كمال شقورة
العمل عامل محطة مجاري دير البلح
جوال ٠٥٩٨٥٠٠٠٦٠.

4. العنوان مقاربة مع جزئية المشروع:
نفس المحطة حيث انني اعمل بالمحطة واسكن في الحي الثاني بعد المحطة.

5. الأسئلة:

- كيف يتم تصريف مياة الصرف الصحي لديكم؟

التصريف للمجاري يتم عن طريق شبكة الصرف الصحي التابعة للمصلحة ومن ثم يتم ضخها عبر المضخة لكي لا يزيد منسوب مياه الصرف الصحي عن منسوب الشوارع المحيطة مما يسبب فيضان مجاري بالشوارع.

- هل لديكم مشكلة بهذا الموضوع؟

المشكلة في المنطقة انها منخفضة عن منسوب الشارع بحوالي ٣٠سم مما يتيح الفرصة لدخول مياه الامطار والمجاري للبيوت المجاورة.

- هل سبق وأن تسربت مياه المجاري الي داخل بيتك؟

تسربت ولكننا رفعت مستوى عتبة باب الدار عندي ولا تدخل ثاني ولازم كل السكان المحيطين بالمحطة يعملوا نفس الشيء علشان يمنعوا دخول مياه مجاري او أمطار تدخل على البيوت.

- متى حدث ذلك؟ وكم مرة حدث ذلك؟

الشتاء الماضي كان قاسي حيث ان كمية الامطار كانت كثيرة

- ما الأضرار التي ترتبت على ذلك

الاضرار كثيرة منها صحية ونفسية.

كمال شقورة

Annex VI: Contractor Responsibilities

Annex VI

Contractor Responsibilities

For inclusion in RFPs and contracts

Environmental and Social Impact Assessment (ESIA)
&
Environmental and Social Management Plan (ESMP)

For

Gaza Water Supply and Sewage Systems Improvement

Final Report

Contractor Responsibilities

For inclusion in RFPs and contracts

Issue	Mitigation measures
Solid Wastes Management	- All sorts of solid wastes should be collected systematically and protected storage should be provided. - Solid wastes should be disposed to a sanitary landfillor designated areas. - No burning of wastes will be permitted.
Air Quality and Noise	- Dust suppressants, watering the site, and proper transporting and storage of construction materials - Particulate emissions control unit such as scrubbers, cyclones, fabrics, or electric precipitators - Proper activity scheduling and working hours and days and limit the activities to day times and prevent any construction activities at weekends. - Covering of stored spoil material and vehicles removing waste, use of dust suppression - Water spraying - Using relatively new construction and transportation vehicles with lower emissions - Use of mufflers and/or noise dampers.
Transportation / infrastructure	- Traffic signs to ensure proper routing and distribution of traffic - Proper planning of construction activities, monitoring of risky activities such as excavation and backfilling. - Provision of adequate notification procedures for any road closures. - Monitoring the use of safety measures and tools. - Speed limits for construction vehicles - Immediate repair in case of Damage.

Issue	Mitigation measures
Agriculture activities	- Coordinate with responsible authorities: Construction activities in the targeted agricultural areas should be implemented in times that are NOT contradicted with the plant flowering processes. - Minimizing the release of dust by using appropriate technology and tools. - Dust generating activities should be avoided during the flowering period as much as possible. - Minor modifications of the pipeline route in order to avoid tree felling or uprooting (in coordination with supervision team). - Vehicle movement outside the construction site only on existing roads, no crossing of agricultural areas - Work should be limited to targeted areas only. - Minimization of vegetation clearance activities. - Use of proper sealing techniques to minimize this impact on the aquifer.
Occupational and Public Health / Safety	- Follow safety instructions, worker should wear proper clothing - A first aid station with trained staff, which is able to coordinate with local hospitals in case of emergencies - Personnel will be trained in Occupational and Environmental Health and Safety matters including accident prevention, safe lifting practices, safe chemical handling practices, proper control and maintenance of equipment and facilities. - Adequate sanitary facilities, potable water, and garbage bins should be provided. - Security of the project site should be imposed at all times. - Warning signs and instructions in case of emergencies should be properly displayed, workers must be informed about these precautions. - Requirements of Palestinian Labor Law especially regarding safety should be applied.
Archaeological Resources	- Monitoring of site excavations - In case of findings the contractor is responsible to: ▪ Strop work activities ▪ Information should be provided to the supervision team and the concerned agencies. ▪ Coordinate with the supervision team and responsible agencies toconsult an archeological expert at the site in case of chance finds.

Annex VII: Selected Photos (field visits and Stakeholder Meetings)

Annex VII
Photos

Environmental and Social Impact Assessment (ESIA)
&
Environmental and Social Management Plan (ESMP)

For

Gaza Water Supply and Sewage Systems Improvement

Final Report

Site Visit to Wadi Al Salqa Water Well

F191 well

F192 well

Al Nusairat Camp Wastewater Pumping Station

Al FarouqWaterWell

Al Farouq Well inside the Cemetery

Deir El-balah Desalination Plant

Deir El-balah Desalination Plant

Samples Collection

Samples Collection

The Brine Outlet of the DeirEl-Balah seawater RO Desalination Plant

The Proposed Location for DeirEl-Balah Water Tank

Stakeholder meeting at Zakher Association

Field stockholder meetings

Stakeholder meeting for CMWU and PWA staff

Annex VIII: Land Ownership Documents

Annex VIII - A1

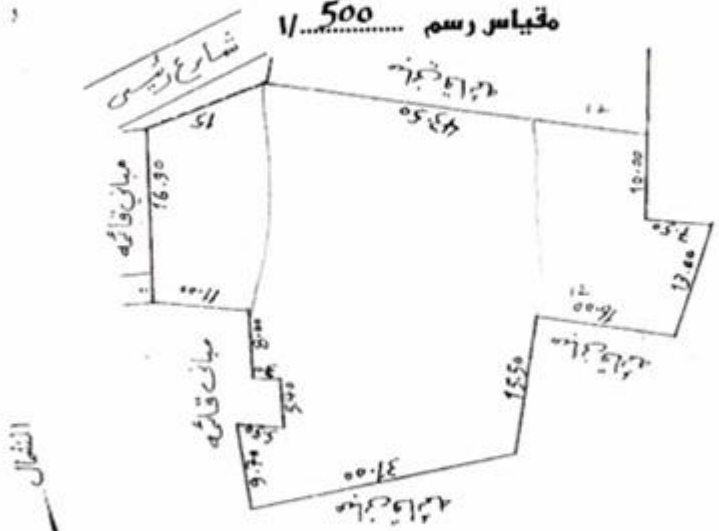
وزارة الحكم المحلى
بلدية بنى سهيلا
قسم الهندسة و التنظيم

الرقم :- 116
رقم الايصال:- .....
التاريخ :- 1997/10/13

مخطط الموقع العام

اسم المالك /الطالب بلدية بنى سهيلا
الموقع بنى سهيلا (مسطح البلد)
رقم القطعة مسطح البلد رقم القسيمة مسطح البلد مساحة القسيمة 1984.00 م2 رقم المقسم.....
مساحة المقسم..... منطقة التنظيم.....
النسبة المئوية.....
الارتدادات امامى ..... خلفى ..... جانبى ...../..... إرتفاع البناء .....

مقياس رسم 1/500



مساح/ رسام البلدية فتحى أحمد البناء توقيعه التاريخ.....
مهندس البلدية للتنظيم م. جبرى بركه توقيعه التاريخ.....
(١)الموقع صالح لسنه واحدة(٢)ان هذا الموقع يقصد بيان الشروط التنظيمية المختلفة
ولا يعتبر مستند لتحديد الملكية او ابعاد القطعة او مساحتها.

Palestinian National Authority
Ministry of Local Government
Municipality of Bani Suhaila

السلطة الوطنية الفلسطينية
وزارة الحكم المحلي
بلدية بني سهيلا

Annex VIII- 1.2

التاريخ: 2011/8/20م

الرقم:

الأخ/ م. منذر شملاوي حفظه الله
مدير عام مصلحة مياه بلديات الساحل

السلام عليكم ورحمة الله وبركاته،،

الموضوع/ تخصيص ارض لمشروع انشاء خزان مياه ومحطة ضخ رئيسية

تهديكم بلدية بني سهيلا أجمل تحياتها مع تمنياتها لكم بدوام الصحة والعافية وبالاشارة الى الموضوع اعلاه نتقدم بالشكر والتقدير على جهودكم وحرصكم على المصلحة العامة للمواطنين.

كما نفيدكم بان المساحة المطلوبة لمشروع متوفرة ونحن بصدد تجهيز تخصيصاتها لصالح الخزان.

شاكرين لكم تعاونكم وجهودكم الخلصة.

واقبلوا فائق الاحترام والتقدير

حماد الرقب
رئيس البلدية

Tel: 2021088 - Fax: 2021077
info@banisuhaila.org

Annex VIII-1.3

Aug 18 11 11:16a Cmwu Customer Service Midd +972 8 2555122 p.1

عناية المهندس/ أحمد شاكر .. المحترم

Palestinian National Authority Ministry Of Local Government Deir EL Balah Municipality		السلطة الوطنية الفلسطينية وزارة الحكم المحلي بلدية دير البلح

التاريخ: 16/8/2011
الرقم: ر ب/8/19

Annex VIII-2.1

السلطة الوطنية الفلسطينية
بلدية دير البلح
وارد 16. 08. 11
الرقم: ....

السيد / م. سفيان أبو سمرة المحترم

وكيل وزارة الحكم المحلي

تحية طيبة وبعد،،،

الموضوع/ استئجار قطعة أرض من وزارة الأوقاف لعمل خزان مياه للبلدية

بلدية تهديكم بلدية دير البلح عاطر تحياتها، وتشكر لكم جهودكم المميزة في خدمة الوطن والمواطن، ونبارك لكم بشهر رمضان المبارك تقبل الله منا ومنكم صالح الأعمال.

بالإشارة للموضوع أعلاه نرفع لسعادتكم كتابنا هذا من أجل مخاطبة وزارة الأوقاف والشئون الدينية لاستئجار قطعة أرض من أراضي وزارة الأوقاف الموجودة داخل نفوذ مدينة دير البلح، وذلك من اجل اقامة خزان للمياه سعة 4000 كوب تمت الموافقة على إقامته مبدئيا من البنك الدولي وذلك لضخ مياه محطة التحلية المنوي زيادة إنتاجها لما يزيد عن 2500 كوب يوميا، وكذلك مياه بئر الأقصى الموجود في أرض الأوقاف، وقطعة الأرض هذه موجودة بجوار البئر وفي منطقة مرتفعة في المدينة وتبلغ حوالي 4 دونمات، وهذا الخزان سيحل بمشيئة الله تعالى الكثير من مشاكل المياه في دير البلح.

والبلدية على أتم الاستعداد لدفع قيمة إيجار هذه الأرض لوزارة الأوقاف حسب الأنظمة والقوانين المعمول بها في الوزارة، آملين أن يتم الاستجابة لهذا الطلب بالسرعة الممكنة حتى نستطيع تنفيذ هذا المشروع الحيوي والهام للمدينة.

وتفضلوا بقبول فائق الاحترام والتقدير،،،

Costal Municipalities Water Utility

المهندس أحمد العطار
رئيس بلدية دير البلح

صورة//
- الملف

مرفقات//
- كتاب مصلحة مياه بلديات الساحل حول تخصيص أرض لإقامة خزان مياه دير البلح

تلفون: 2530021 - 2530085 - 08 فاكس: 2531153 - 8 - 972

Oct. 02 2011

السلطة الوطنية الفلسطينية
وزارة الأوقاف والشئون الدينية
مديرية أوقاف الوسطى

التاريخ: ٨ / ذو القعدة / 1432هـ
الموافق: ٦ / ١٠ / 2011م
الرقم: ٨٤٨ / ١٣٣

Annex VIII-2.2

الأخ الفاضل / أ. سعيد أحمد نصار **حفظه الله ...**
رئيس بلدية دير البلح

السلام عليكم ورحمة الله وبركاته

الموضوع/ استئجار أرض لإنشاء خزان مياه

بداية نهديكم تحياتنا بمديرية أوقاف الوسطى ونثمن جهودكم الطيبة في خدمة الإسلام والمسلمين، وبالإشارة لكتابكم رقم ر.ب/10/11 بتاريخ 2011/11/6م بخصوص تأجير قطعة أرض بمساحة 3 دونمات لإنشاء خزان مياه سعة 4000متر مربع وذلك من أرض القطعة رقم 128 قسيمة 18/17 نفيد بأنه لا مانع لدينا من تأجير هذه القطعة لبلدية دير البلح، وذلك بعد استيفاء جميع الشروط القانونية الخاصة بذلك.

وتفضلوا بقبول فائق الاحترام والتقدير

أخوكم
أ. عادل عبد القادر الهور
مدير مديرية أوقاف الوسطى المكلف

06 10 2011

Palestinian National Authority
Ministry Of Local Government
El- Moghraka Municipality

السلطة الوطنية الفلسطينية
وزارة الحكم المحلي
بلدية المغراقة

Ref .No: MM-TD/15 / 214
Date :6/2/3008

Annex VIII-C

السيد / مدير عام مصلحة مياه بلديات الساحل

عناية المهندس / منذر شبلاق

تحية طيبة،،،

الموضوع / قطعة الأرض المخصصة لبناء خزان و بئر المياه في المغراقة

بداية نثمن جهودكم الخيرة في دعم قطاع المياه و الله تعالى نسأل أن يوفقكم في مسيرتكم المعطاء لبناء و دعم الوطن و المواطنين

أما بالإشارة إلى الموضوع أعلاه نحيط سيادتكم علماً بان البلدية تملك قطعة من الأرض تبلغ مساحتها (2,800) دونم في القسيمة رقم (10) ضمن القطعة رقم (669) و قد تم تخصيص جزء من قطعة الأرض سابقة الذكر و التي آلت ملكيتها للبلدية عن طريق الاستقطاع بالأبعاد (32 *43) م2 لصالح إنشاء و تنفيذ خزان و بئر المياه لذا نرجو من سيادتكم التكرم و عمل اللازم لتصميم و لتنفيذ المشروع المذكور أعلاه لاعتباره مشروعاً حيوياً و ضرورياً يخدم كافة سكان المغراقة .

تقبلوا فائق الاحترام و التقدير

صورة / لمدير المنطقة الوسطى المهندس / حسن براك

رئيس بلدية المغراقة
يوسف أبو هويشل

غزة- المغراقة - شارع البئر -خلف أبراج الزهراء – هاتف 2839227 – فاكس – 8-2844820