AFRICAN DEVELOPMENT BANK

EGYPT : GABAL EL ASFAR WASTEWATER TREATMENT PLANT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SUMMARY*

GABAL EL ASFAR WASTEWATER TREATMENT PLANT

ENVIRONMENAL AND SOCIAL IMPACT ASSESSMENT SUMMARY

Project Name: Gabal El Asfar Waste Water Treatment Plant – Stage II Phase 2

Country: Egypt

Project Number: **P-EG-E00-001**

Department: **OWAS**

1. Introduction

This ESIA summary is outlining the impacts, mitigation, monitoring and management of the impacts of the construction and operation of the second phase of stage II of the Gabal El Asfar Wastewater Treatment Plant (GAWTP). The purpose of this summary is to bring these information in a simple and brief language to the consideration of decision makers and other stakeholders.

2. Project Description and Justification

The project site lies in the North Eastern side of Cairo within the State Owned Gabal El Asfar Farm. The farm was established in the late 1800s on an area of about 1250 ha in Belbies Desert, which is a part of the Egyptian Eastern Desert. Currently the farm is bounded by residential areas from the west and south and the desert from north and east.

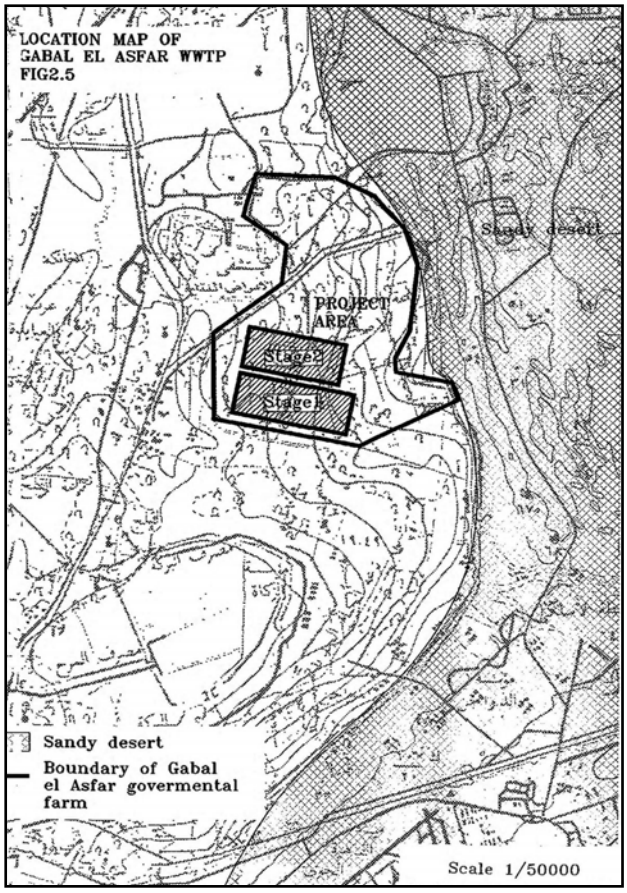


Figure 1: Location of the Project Site

GAWTP lies within the farm, which keeps proper buffer between the plant and residential areas (Figure 1). However, recently, a number of random housing activities were observed on the west side of the plant fences. The site is enclosed by a 2.5 m high brick and concrete wall and faced on the west side by a residential area, and on the other sides by agricultural property. The site has a legal survey and occupies an area of 630 ha. The first stage covered an area of 190 ha with an additional 230 ha used for sludge handling for all stages. The remaining 210 ha is enough area for Stages II and III.

The project plans to implement the second phase of Stage II of GAWTP. The plant will

remove the sludge from the wastewater and disinfect the remaining water using chlorination. The project will add a capacity of 500,000 m^3/day to the existing facility. The project will be implemented entirely within the premises of the GAWTP and will not entail involuntary resettlement or displacement of people and businesses.

GAWTP is one component of the East Bank of River Nile wastewater treatment scheme, designed to operate as a biological treatment process with activated sludge. It currently provides both primary and secondary treatment of approximately 1.7 million m^3/day serving 6 million people. Optimization is underway to the first phase and will increase the treatment capacity to 2 million m^3/day. With the construction of the Bank financed Stage II Phase II, treatment capacity will be raised to 2.5 million m^3/day, enough to serve about 12 million people.

The treatment process train established for the first phase is re-employed for each expansion to the plant. From where the sewage flow into the plant to where it discharges, the treatment consists of: i) screening of large solids, ii) removal of grit, iii) primary sedimentation, iv) aeration, v) final clarification, vi) chlorination of effluent, vii) thickening of sludge, viii) primary anaerobic digestion of sludge, ix) secondary digestion of sludge, x) mechanical dewatering of sludge, xi) storage of methane produced during the treatment process.

The water quality results for 2006 and January 2007 produced by the laboratory at the Stage I GAWTP showed a removal efficiency for BOD and SS of not less than 94%, which easily enabled the plant to meet the effluent standards of 100 mg/l, 40 mg/l, and 1000 FC/100mL for COD, BOD5 and pathogen respectively. The planned Stage II Phase 2 treatment plant is expected to achieve the same or better removal efficiency, which will easily meet the legislative requirements.

Methane produced by the treatment process (stage I) is currently used to provide approximately 18.5 megawatts (70%) of power out of a total requirement of 26.6 megawatts needed to operate the plant. On the other hand, the final effluent is used on site for watering forestry land. At the GAWTP site, over 1,800 trees have been planted as well as numerous medicinal plants, both of which are watered using effluent produced by the plant. Under the National Program for Safe Use of Treated Wastewater in Afforestation, 1.2 billion m^3 per year of wastewater are reused, much of which comes from GAWTP. New planned developments in the Western and Eastern Delta will also use treated wastewater from Greater Cairo and Alexandria on some 250,000 feddans (105,000 ha) of land.

3. Policy, Legal and Administrative Framework

Two main legislations are in command of the reservation of water and environment in Egypt. The first is the Law No. 48 for the year 1982 on the protection of the River Nile and its watercourses from pollution. The law and its executive regulation set standards for effluent discharge to the Nile and its watercourses. The second major legislation is the Law No. 4 for the year 1994 on Environmental Protection. Even though there is no formal procedure established in the law regarding Environmental and Social Impact Assessment (ESIA), there is an implicit requirement due to the need to issue a permit for establishment and the

Egyptian Environmental Affairs Authority is the responsible agency to review and approve the ESIA.

This ESIA has also been developed as a requirement of the African Development Bank Environmental and Social Assessment Procedures of 2001.

4. Description of the Project Environment

The area retained by Cairo and Alexandria Potable and Wastewater Agency (CAPW) to implement the second stage (phase 1 and 2) of Gabal El Asfar Wastewater Treatment plant is situated at the north of the site corresponding to Stage 1 (see figure 1). The total surface area of this land is around 420 ha, but only about 210 ha would be used by the treatment plant. The treatment plant site is completely fenced to avoid trespassing and for the protection of the premises. The treatment plant also contains an experimental farm with an area of approximately 16 ha entirely cultivated and irrigated by the treated water. The main crops that are cultivated are olive, lemon, flowers, jojoba, jetrova and cotton.

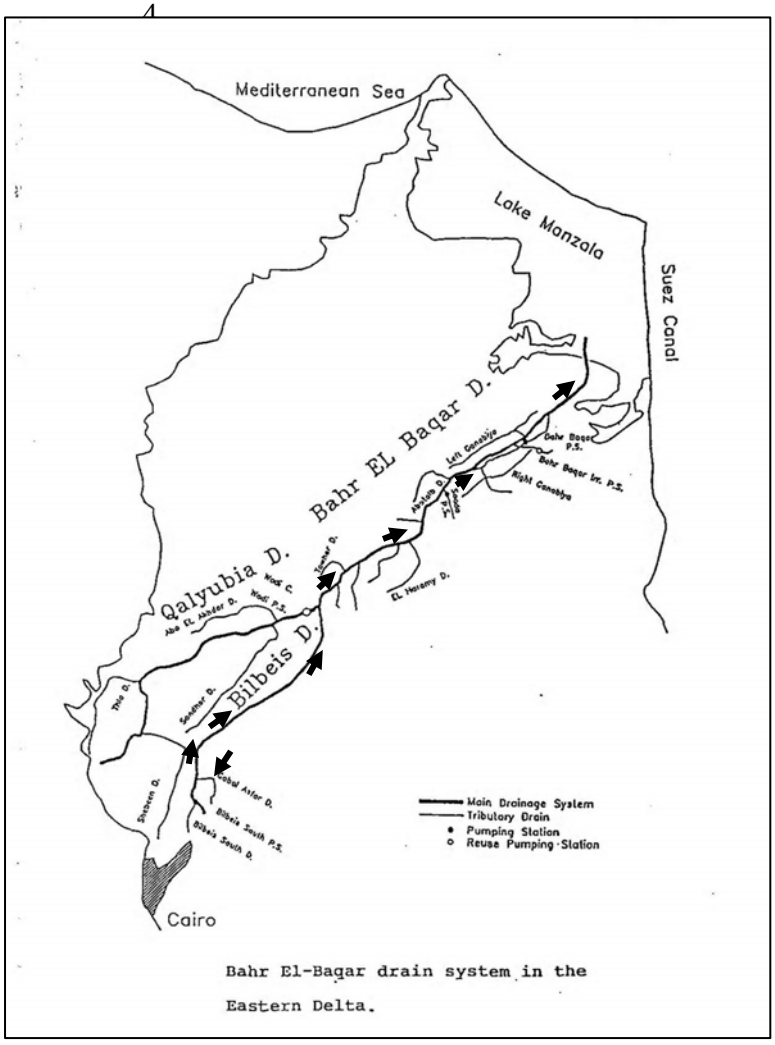
The climate of the area is the same desert climate of the Cairo area, which is moderated by the proximity of the Mediterranean Sea. The hot, dry climate is characterized by clear skies with high-intensity solar radiation, scarce and high rainfall and wide seasonal and diurnal temperature ranges.

The site is situated in the Nile delta, which is irrigated and used for agriculture. The area surrounding the site therefore consists of irrigated, cultivated land with the desert beyond (see Figure 1). Random housing activities were noticed few kilometers from the site.

Effluents from GAWTP is discharged to Gabal El Asfar Drain that flows to Belbeis Drain and then into Bahr EI Baqar Drain (BBD). The BBD system is located in the eastern part of the Nile delta and runs for some 170 km from Cairo to Lake Manzala. The agricultural area served by Bahr EI Baqar drain and its tributaries is about 317,000 ha. The BBD system is shown in Figures 2. It consists of a main drain that collects the effluent from two secondary drains: Bilbeis Drain and Qalyubya Drain. The two drains collect water from two other drains, respectively Gabal El Asfar and Shebeen.

The drain system is frequently used to convey raw industrial and municipal wastewater. The main industrial area, which has an impact on the quality of industrial water in the Bahr El Baqar drain system, is Shobra EI Kheima. From the interviews of the local industries and the irrigation and drainage engineers in the area, it was concluded that industrial activities pursued in this area have not been changed over the last 10 years. These industrial activities include metal production, food processing, detergent and soap manufacturing, textile finishing, and Paper production.

The BBD system is also used to convey raw municipal wastewater, in particular for the East Bank of Greater Cairo (see Figure 2). This has stopped since the construction of the first stage of the first stage of GAWTP. The treatment plant discharges the treated effluent into Gabal El Asfar Drain then to Bilbeis drain, which also receives wastewater from El Berka primary treatment plants and El Khossous wastewater lifting station. To the west, Qalyubia drain receives wastewater from a number of the main and small towns north of Cairo. In addition to this, the rural areas around the drains discharge their wastewater into the drains directly.



Bahr El-Baqar drain system in the Eastern Delta.

Figure 2: Baher El Baqar Drain System

The entire system is grossly polluted, mainly by sewage. It is anaerobic (septic, with dissolved O_2 being close to zero) and the water is black and smells strongly like rotten eggs. Iron salts are then converted to ferrous sulphide, which makes the water turn black.

The BBD system and lake Manzala were identified as “black spots” by the Egyptian Environmental Action Plan in 1992. Even though the quality of water at Gabal El Asfar Drain has improved substantially after the completion of the first stage and the first phase of the second stage of the New GAWTP, Bahr El Baqar Drain and Lake Manzala are still attracting attention for their environmental fragility.

Domestic wastewater represents most flow in the BBD system. Water in the drains thus contains a large number of bacteria, viruses and parasites, which may be dangerous to human, by contaminating drinking water and irrigation water. The data show an insignificant variation in bacterial pollution throughout the system.

Lake Manzala is situated in the northern corner of the Nile Delta, between Damietta and Port Said (Figure 2). It is a shallow brackish lake adjacent to the Mediterranean Sea and separated from the sea by a sandy ridge that has three gaps connecting the lake to the sea. The lake is very shallow, with an average depth of 1.25 m and maximum depth of 2.2 m. It

is the country's second largest lake, and one of the largest wetlands in the Mediterranean region. The area of the lake has been decreasing over the years as a result of land reclamation for agriculture. Several decades ago the lake occupied an area of 1700 km^2. In the late 1980s, the lake are decreased to 770 km^2. Currently, the lake covers only 530 km^2.

The lake is of national and international importance. Its fisheries are the most productive in Egypt. It is also considered as a remarkable spot for fauna and flora and a wintering site for many species of migrating birds. In order to protect this ecological heritage, the Egyptian Environmental Action Plan classified Lake Manzala as a priority area.

Situated between three of the most prosperous governorates in Egypt, namely Port Said, Damietta and Dakahlia, Lake Manzala's socio-economic aspects are important elements in the environmental equilibrium of the area. The current high population density is a key factor in the economic production around the lake. Consequently, any change in the ecosystem would have direct impacts on the population and the local economy and vise versa. The main activities carried out around the lake haven't changed for decades. Agriculture and artisanal fisheries are the main activities with small-scale marine gypsum extraction for local building activities. The lake also witness some limited touristic activities.

The lake water is generally brackish and varies from a low level of salinity in the South to a high level in the North. The lake receives untreated industrial and domestic effluent from the drains and from towns and industries around its shores. The BBD system alone accounts for 70% of the domestic pollution entering the lake, in addition to discharges from Port Said and Damietta cities and Matarya and Manzala towns. The lake also receives agricultural wastes from five drains. This water contains in particular organic compound and pesticides residues.

In theory, the lake does not have any polluting effect on the Mediterranean. The fact that pollution is confined to the vicinity of the BBD can be explained by the fact that the lake being so shallow acts as a stabilization pond. The anaerobic zone is confined to the area of pollution. Aerobic conditions are gradually restored as one move away from the BBD outfall. On the other hand, the drain is a major source of nutrients for fish. It therefore has a positive impact on fisheries. In contrast, the formation of ammonia (NH4) due to the anaerobic conditions has a toxic effect on fish. Unfortunately, the available literature doesn't have an assessment on fish contamination in the lake and its suitability for human consumption.

The lake's ecosystem has been modified over the years by the polluted discharge from the different drains. At the outset, the lake was entirely brackish and unpolluted. The fish were therefore mainly seawater types with a much higher market value than fresh water species. The ecosystem has been modified by fresh water carried by the drains, which have a high organic matter and nutrient content. A decrease in salinity of 83% in the north of the lake has been observed since 1921.

The south of the lake is characterized by water that is much less brackish than in the North. This is due to fresh water flowing in from the various drains. This has modified the stock of

fish. Fresh water species are currently found in the lake, consisting mainly of Tilapia. This fish has a high tolerance to pollution. Quite the opposite, valuable mullet and other salt water species declined from 31% of the annual catch in the 1960s to 9% in 2004, while Tilapia and other less valuable fresh water fish jumped from 20% of the total catch In the 1920s to 85% in 2004. In contrast, the productivity of fishing activity has increased considerably, given the massive amounts of nutrients carried by the drains. Fishing is therefore much more productive today, but the fish have a much lower market value than previously. This modification in the ecosystem has also had an effect on the species of water birds. There has been a decrease in species that consume aquatic vegetation and an increase in insectivorous species.

A number of projects have been identified around the lake including wetland reclamation of drainage water, construction of roads and construction of EI Salam Canal. The third one had the most impact as it diverted 50% of Bahr Hadus Drain, one of the main sources of fresh water to the lake to the newly reclaimed lands in Sinai leaving BBD as the main source of fresh water.

5. Project Alternatives

Project alternatives were not discussed in this updated ESIA as the objective was to update the information, conclusions and recommendations made prior to the construction of phase one of Stage II of the project. However, non construction of this second phase would leave 500,000 m^3/day of untreated sewage water to flow to Bahr El Baqar Drain then via Belbeis Drain to the BBD system. This will increase the negative impacts on the BBD and Lake Manzala System.

6. Potential Impacts and Mitigation/Enhancement Measures

Beneficial and Adverse Impacts

The treatment and disinfection of extra 500,000 m^3/day of sewage would contribute to the improvement of the environmental and social conditions in the Eastern Delta region. Currently, untreated wastewaters from Cairo East Bank area are disposed directly to the Gabel El Asfar Drain, and eventually to Lake Manzala through the Bahr El Baqar drainage system posing serious risks to the environment and public health. Treatment of more wastewater would reduce such a negative impact and improve the physical and social environment in the region.

The project is not likely to have major negative impacts as most of these impacts were dealt with during phase one of Stage Two of the GAWTP. However, a number of minor impacts could arise during the project implementation that will be dealt with as explained in the next section on "Enhancement and Mitigation Program".

Enhancement and Mitigation Program

Employment: Priority in the unskilled and semi-skilled jobs would be given to members of the local communities in the vicinity of the project. This mainly concerns those farmers

settled on the Gabal El Asfar State Farm. However, with regard to skilled jobs, it would be the contractor's responsibility to recruit those workers from within or outside the project area.

Site Construction Compounds: To control the risk of disease transmission and break out of epidaemia, laborers on site will be provided with proper sanitation facilities in addition to pre-employment health screening. Stringent safety regulations will be observed to avoid work accidents.

Water Pollution Load: To better understand the impacts of the completion and operation of the three stages of the GAWTP on Lake Manzala, an assessment of heavy metal accummulation in silts next to the outlet of Bahr El Baqar drain under aerobic conditions. The study should comprise the following tasks:

- Sampling of drainage water along the drains to assess the self purification capacity of the system;
- Sampling of sediment deposits along the last reach of the Bahr El Baqar drain and the Qalyubya drain to quantify the heavy metal contents and chemical type;
- In situ and laboratory measures to assess the rate of release under aerobic conditions;
- Laboratory analyses for fish and other species harvested from the lake to assess their suitability for human consumption; and
- Identification and feasibility study of the necessary remedial actions to protect the Lake Manzala against heavy metal pollution.

7. Monitoring Program

Surveillance activities

To confirm the enforcement of environmental protection measures by the Contractors, monitoring and supervision of activities during the construction should be closely undertaken by CAPW. This should involve at least one environmental engineer and one technician, with transportation facilities.

Monitoring activities

Monitoring activities should include regular sampling and analysis of the quality of surface and groundwater downstream the GAWTP. Frequency of sampling is estimated at 4 times/year for period 2008-2016 and only 2 times/year after 2016. The sampling program should be an integral part of the Drainage Research Institute (DRI) and the Research Institute of Ground Water (RIGW) monitoring programs, under the authority of the MWRI. Monitoring will take place as follows:

- The surface water monitoring will be carried out along the drain system and in Lake Manzala.
- Monitoring of underground water quality will be carried out in the vicinity of areas irrigated with treated effluents.

The following table proposes a recapitulation of responsibilities between agencies.

Component	**Executing agency**	**Remarks**
1. Monitoring of environmental protection during construction	CAPW/ EEAA	
2. Pollution load	DRI + Consultants	Potential funding from international assistance should be investigated
3. Monitoring of water quality	DRI + RIGW	

Implementation cost estimates and funding agencies are as follows:

Component	**Estimated cost (L.E)**	**Funding agency**
1. Monitoring of environmental protection during construction	Included in operation budget of CAPW	CAPW
2. Pollution load	2,000,000	MWRI
3. Monitoring of water quality	40,000/year	MWRI

8. Public Consultations and Public Disclosure

During the performance of the ESIA, adequate information sharing and consultations were carried out. Further consultations will be carried out during the implementation and monitoring of the mitigation/enhancement measures will require liaison and consultation with the communities living around the Bahar El Baqar Drain System and Lake Manzala. Consultation will be needed mainly during the groundwater sampling and survey for heavy metals impacts. One or two workshops would also be undertaken by DRI and RIGW prior to the implementation of the monitoring programs. Target groups include farmers, fishermen, local authorities and service providers in the area. Reports on the consultation and the monitoring outputs would be presented to EEAA, CAPW and the African Development Bank (through CAPW).

9. Conclusion

The project will have an overall positive impact on the Gabal El Asfar Drain environment in particular and on the BBD and Lake Manzala system in general. The project is widely accepted by all stakeholders and expected to indirectly improve the livelihood of the inhabitants of the Eastern Delta Region in general and those in direct use of the drains water in particular either for irrigation or fishing. The project also meets all the Bank’s environmental and social requirements.

10. References and Contacts

Documents consulted include:

Drainage Research Institute, Annual Drainage Water Quality Monitoring Handbook for the year 2005;

Law 48 for the year 1982 and the associated executive regulations number 8 of 1983.

Law 4 of the year 1994 and its update of 2007.

Contacts for comments or further information:

Eng. Samia Saleh	Undersecretary for Project Financing, CAPW	+202 2575 7062 sm_saleh@yahoo.com
Eng. M. Hafez El Bolok	Project Manager, Gabal El Asfar WTP Stage I	+202 44672827
Eng. Gaber Sous	Director, Gabal El Asfar WTP	+2010 141 5451
Prof. Dr. Hossam Fahmy	Director, Drainage Research Institute	+202 4218 9841 h_fahmy@dri-eg.org
Prof. Dr. Gamal Abdel Nasser	Deputy Director, Drainage Research Insitute	+202 4218 9383 G_abdelnasser@dri-eg.org
Eng. Ahmed Abul Saoud	Undersecretary, EEAA	+202 2525 6447 Aahmed_hm@yahoo.com