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Environmental Impact assessment (EIA) for Drainage Water in Rural Areas of Egypt (Case Study)

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Abstract —In the last two decades Egypt has taken the lead in applying the environmental monitoring systems for all sorts of developments. Several executive steps towards environmental protection were made, starting from the presidential decree 1982 of establishing the Egyptian Environmental Affairs Agency, affiliated to Cabinet of Ministers, reorganization process of the EEAA in 1991, issuing the environmental action plan in 1992 and issuing law number 4 for the year 1994.
This research presents Environmental Impact Assessment (EIA) In Egypt, EIA and public participation, impact assessment methods, EIA for El Bahwo drain catchments area and gives the final results for this study.

Key words —Environmental Impact Assessment ,wastewater treatment, Natural wetland, water quality, Egypt drains, drainage water treatment, water in rural areas.

1 Introduction (EIA in Egypt)

The main aim now in Egypt is the Applying the environmental monitoring systems for all sorts of developments. Several executive steps towards environmental protection were made, starting from the presidential decree 1982 the Egyptian Environmental Affairs Agency, affiliated to Cabinet of Ministers, reorganization process of the EEAA in 1991, issuing the environmental action plan in 1992 and issuing law number 4 for the year 1994 . The objective of the law was not only addressing pollution measures and control from existing establishment, but also involved new developments and projects including expansions of the existing ones. The new establishment is required to carry out Environmental impact Assessment study before construction or implementation of the project or the relevant expansion. Most of the projects if not all are experiencing more than one alternative to compare with and select from. The selection criteria are usually based on the minimum negative and maximum positive impacts for each alternative. The degree of both negative and positive impacts can be changed by adopting mitigation measures to prevent and/or reduce the negative, and increase the positive impacts[2].

This site is located adjacent to a small agricultural community near Nawasa El-Ghait village, Aga Markaz in Dakahlia governorate. It is located about 7.0 km from Mansoura and about 110.0 km from Cairo .Figure 1 shows a schematic diagram of the site, including the Faraa Al Bahwo Drain. Population of the Nawasa El-Ghait village is about 3,000 capita. Houses are concentrated in a single residential site. There is a sewage wastewater network installed at the Nawasa El-Ghait village streets, which is constructed of heavy-duty PVC pipes and concrete manholes. The sewerage network collects wastewater and transports it to discharge at the beginning of an agricultural drain called Faraa Al Bahwo Drain. The wastewater is not treated. However, deep wastewater collecting tanks are under construction, which will act as a primary treatment facility before the wastewater is dumped into the drain.

Tap drinking water is available at houses, and domestic water use is estimated as 120 liters/capita/day. Within the area bordering El Bahwo Drain, a number of wetland engineering designs was considered for treating the wastewater entering the Drain. Including :

- Engineered wetland within the Drain[1].

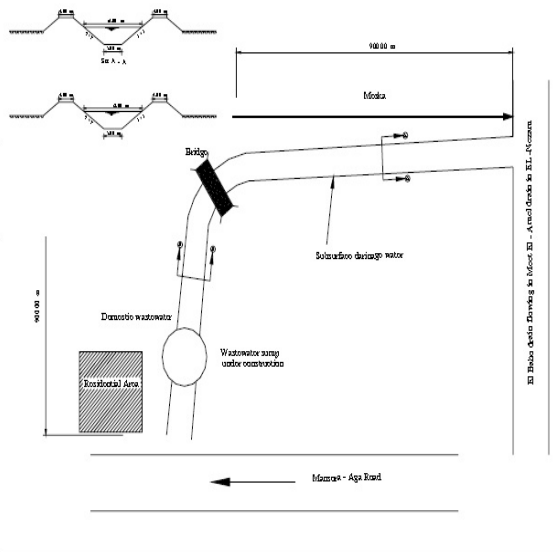

Fig 1. Layout of Faraa Al-Bahwo and Al-Bahwo drains

For the project two matrices are prepared for the impacts: During construction which is a short term matrix limited to the construction period , After construction, during the operation, this has a long-term impact.
Additional two matrices are prepared for the same but after considering the mitigation measures.

2 Engineered wetlands within the drain

This system includes moving the drainage water through a series of stages until the engineered wetland as shown in fig(2) and fig (3). Table 1 provides the degree and nature of wastewater treatment expected in the various stages.

Fig 2. Bahwo stream wetland

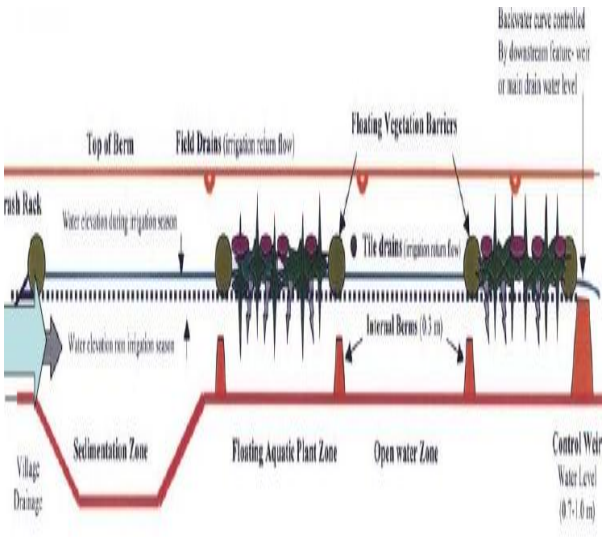

Fig 3. Typical section in-stream wetland

TABLE 1
Stage of Wastewater Treatment

Parameter	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Sediment	XXX	X	XX	-	-
BOD/COD	X	XXX	X	XXX	-
Heavy Metals	XX	XXX	X	X	-
Chemicals	XX	XXX	X	X	-
Nutrients	X	XXX	XX	XXX	-
Increased DO	-	XX	X	XXX	-

Stage 1 is proposed to create a series of settling ponds at the entrance of the wetland treatment facility to produce a drop in the flow velocity resulting in a deposition of the sediment load. The ponds would have to be dredged and cleaned out periodically.

Stage 2 is using Emergent aquatic plants such as cattails, bulrushes and reeds in stream. The submerged stems and leaves of these plants slow the velocity and trap suspended solids removing them from the water column. These plants remove heavy metals and chemicals very efficiently from the water and sequester them in and around the rhizomes the emergent also introduces further renovation of the water in terms of removing nutrients and chemicals.

Stage 3 is using *Chare* spp. a submerged macrophyte to further trap suspended solids and heavy metals from the water. Charaspp has been shown very effective in producing a sharp decrease in the flow velocity near the

bottom of to be the water column to create efficient deposition of suspended solids.

Stage 4 is using water hyacinth to produce a broad-spectrum treatment of the flowing water. Water hyacinth has been thoroughly investigated in hundreds of full-scale operations, to reduce BOD and COD to very low levels (less than 10 mg/l), absorb heavy metals and a wide variety of priority chemicals including hydrocarbons, phenols, aliphatic and aromatic compounds. Water hyacinth also exhibits a high rate of photosynthesis, which increases the dissolved oxygen concentration to levels where the fish can survive and grow.

Stage 5 is the final component the system is designed to function as a facility to produce fingerlings for stocking the drain or for the local market.

3 Environmental management plan for El Bahwo in stream wetland for a fife year period

The Management plan will include water, sediment, fish and plant. *The monitoring of water includes* In Situ measurement such as temperature ,Salinity, PH, and Do . This measurement should be done twice daily. Lab Analysis such as TSS, TVS, BOD, COD, total nitrogen and fecal chloroform. These measurements should be done once week considering the QA/QC steps. Water Quantity should be measured considering the in and out quantities. The quality of sediment should be checked each three months considering Soil texture , organic maters ,total phosphors ,total nitrogen and heavy metals.

The monitoring of plant should include length of plant, heavy metals, Phosphors and nitrogen content .The monitoring of fish should include weigh of selective sample considering different weight.and heavy metal content.

TABLE 2
Project Impacts for El Bahwo Drain In-Stream Wetland

Impact	Monitoring, Assessment & Management	Sampling	Responsible	Location
Hydrological Factors:				
1.1 Water Quality	Comprehensive monitoring program, including: * Mapping * Sampling * Testing	Weakly measurements for 3 year period	MWRI, NWRC, DRI Central Laboratory for Environmental Quality Monitoring	*B1 *B2 * B3 *B4
1.2 Water Quantity	* Discharge Water measurements	Twice / Month	MWRI,NWRC	At inlet and outlet of the system
1.3 Species Bio-diversity	Species composition identification	Monthly		Project area
	and standing crops			
2. Socio-economic Factors				
2.1 Human Health	* Monitoring of social impacts (Public hearing awareness * Data analysis	Random samples twice / year	MWRI, NWRC, DRI	Project area + neighboring area
2.2 Social Aspect	* Monitoring of social impacts * Data analysis	Periodically	MWRI, NWRC, DRI Min. of Info	Project area
3. Capacity Building	*Training courses * Awareness campaigns	Monthly	MWRI, NWRC, DRI	Project area
4. Marketing	Experienced and technical assessment	Periodical	Joint venture MWRI,NWRC, DRI	Joint venture MWRI,NWRC

4 Impacts Assessment methods

Several activities are required in an environmental impact study, including impact identification, preparation of a description of the affected environment, impact prediction and assessment, selection of the proposed action from the alternatives evaluated to meet identified needs, and summarization and communication of information. The objectives of the various activities differ, as do the pertinent methodologies for accomplishing the activities. The term " methodologies " as used herein refers to structured approaches for accomplishing one or more of the basic activities. EIA main methodologies are matrix (simple, and stepped), Checklists and networks[4].

TABLE 3
Matrix for Distribution among environmental issues before construction

Group Issue	positive impact	zero impact	negative impact
Hydrology	%0	%9	%6
pollution	%0	%20	%0
soils	%0	%11.25	%3.75
sediment	%0	%1.65	%3.35
Ecology	%0	%8.70	%1.30
Socio-economic	%2	%6	%2
Health	%2.10	%8.70	%4.50
Imbalance	%0	%5	%0
Political	%0	%5	%0
Sum.	%4	%75	%21

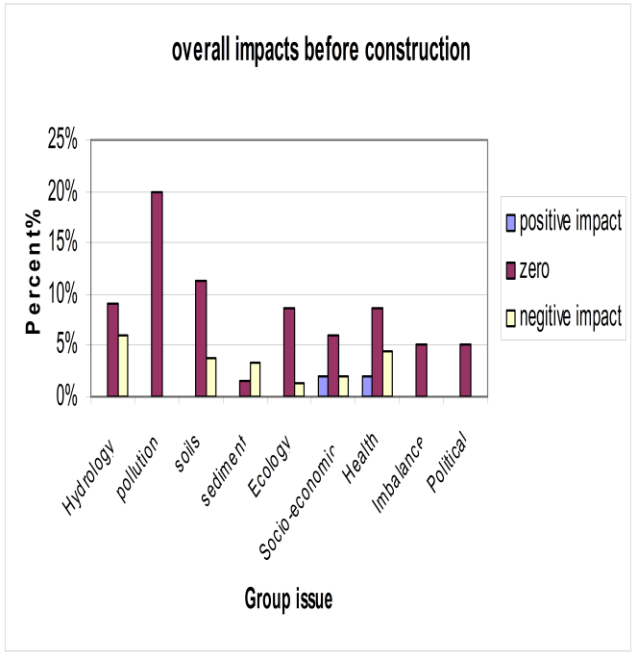

Fig 4. Overall Impacts before Construction.

TABLE 4
Matrix for Distribution among environmental issues after construction

Group Issue	Positive Impact	Zero Impact	Negative Impact
Hydrology	3.75	7.5	3.75
Pollution	6.6	0	13.4
Soils	7.5	0	7.5
Sediment	0	2.5	2.5
Ecology	8.4	0	1.6
Socio-economic	10	0	0
Health	10.8	0	4.2
Imbalance	2.5	0	2.5
Political	5	0	0
Sum	54.55	10	35.45

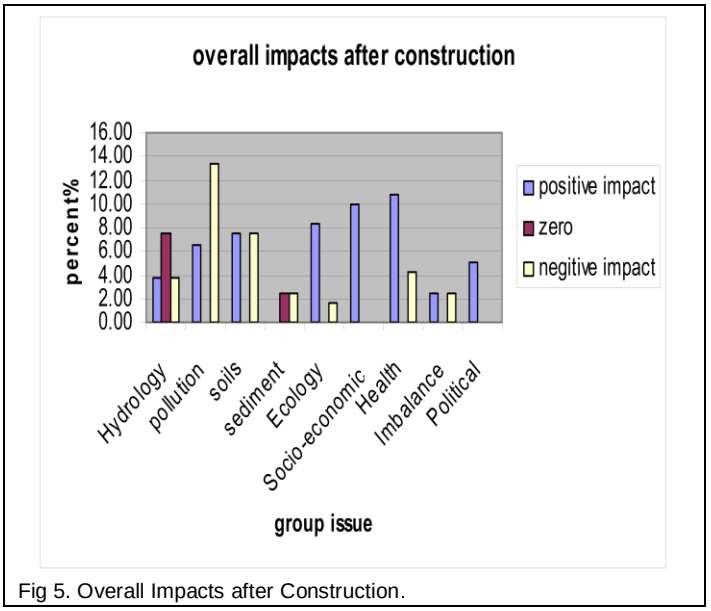

Fig 5. Overall Impacts after Construction.

5 Conclusions and recommendations

1. The use of in stream wetland for treatment domestic waste water is very important.
2. EIA should be conducted before starting the project considering the mitigations during the different faces of the project.
3. EMP should be applied during the operation of the wetland project considering the monitoring program.
4. The institutional framework (MWRI, MALR, NGOs, etc…) for the project is very important for sustainability.
5. The project has **54.55**% positive impacts, **10.00**% no impacts and **35.45**% negative impacts.
6. The negative impacts are due to location, ground Water deterioration, need For Public awareness a campaigns.
7. The project is environmentally feasible. But a comprehensive and very accurate monitoring and assessment program, during a period of five years, is a pre-requisite to enable the adoption of the results on large scale.
8.Quality Control / Quality Assurance is a must for monitoring and assessment.

9.Awareness campaign is highly recommended.

6 Acknowledgment

I dedicate this paper to my family inside and outside Egypt.

7 Refrences

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