

**COMPARATIVE ECOLOGICAL STUDIES ON  
SOUTH-EASTERN AREA OF LAKE MANZALA AND WATER OF  
BAHR EL-BAQUR DRAIN BEFORE AND AFTER TREATMENT OF  
WASTEWATER BY ENGINEERED WETLAND**

**Submitted By**

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Diploma in Environmental Sciences, Institute of Environmental Studies & Research,  
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A thesis submitted in Partial Fulfillment  
Of  
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In  
Environmental Sciences

Department of Environmental Basic Sciences  
Institute of Environmental Studies and Research  
Ain Shams University

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## **ABSTRACT**

Lake Manzala is one of the most important Delta wetlands in Egypt, because it is the largest one and due to its high productivity. The southern region of the Lake receives agriculture, industrial and sewage wastewaters without treatment from several drains; the most polluted one is Bahr El-Baqar drain. Pollution in the southern part of the Lake led to high levels of contamination and high organic load affecting consequently all aquatic organisms including fishes.

Therefore, a five-year Global Environmental Facility (GEF) project was implemented last decade by United Nations Development Program (UNDP) and Ministry of water Resources Irrigation to tackle the problem of polluted drainage water that enters the Lake from Bahr El-Baqar drain, using Engineered wetland for biological treatment.

Physico-chemical parameters have been analyzed in water samples collected seasonally along to lake, drain; before and after Engineered Wetland station during the period from winter 2012 to autumn 2013.

Also, some heavy metals were measured in the water and Nile Tilapia organs (gills and muscles). The total and fecal coliforms were also studied. Water quality index (WQI) was used as a useful tool to assess the quality of water in both Lake Manzala and Bahr El-Baqar drain. Results showed that the concentrations of some water quality parameters exceeded the permissible limits of Low 48/1982, Ministerial decision 92/ 2013. The heavy metals Al and Ni levels in water were higher than the international permissible limits of Australia and New Zealand. The levels of the heavy metals in gills and muscles of the Nile Tilapia also exceeded the maximum permissible limits in all fish muscles. So, it can be conclude that the southern area of Lake Manzala is contaminated by high levels of heavy metals and the consumption of its fish not save and could cause health hazard to the local inhabitants as their diet depends mainly of fish.

In conclusion, the quality of Bahr El Baqar drain is the main factor controlling the pollutants in Lake Manzala, and the main solution is the reduction of pollutants discharging by using different treatment techniques, such as Constructed wetland in large scales which considered the most economically treatment and alternative compared with other ways of improvement of water quality.

# List of Contents

Acknowledgement	<i>Page</i>
Abstract	
Contents	<i>i</i>
List of Tables	ii
List of Figures	
<b>1. INTRODUCTION</b>	<b>1</b>
<b>2- REVIEW of LITERATURE</b>	<b>6</b>
2.1 Water Pollution	6
2.1.1 Chemical Pollution	7
2.1.1.1 Suspended Solids	8
2.1.1.2 Nutrients	9
2.1.1.3 Heavy Metals	10
2.1.2 Microbial Pollution	11
2.2 Physical-chemical parameters of water	13
2.3 Heavy metals in water	16
2.4 metals in fish	19
2.5 Benthic Invertebrates	24
2.6 Wetlands	27
2.6.1 Engineered Wetlands	28
2.6.2 Wetlands for Domestic pollutants	32
2.6.3 Wetlands for Agricultural pollutants	32
<b>3- MATERIAL and METHODS</b>	<b>35</b>
3.1 Location and field work	35
3.2 Lake Manzala Engineered Wetland Project	38
3.3 water analysis:	43
3.3.1 Collection of water samples:	43

3.3.2 Physical and Chemical parameters:	43
3.3.2.1 Water temperature	43
3.3.2.2 Transparency	44
3.3.2.3 Hydrogen ion concentration (pH):	44
3.3.2.4 Total solid	45
3.3.2.5 Carbonate and Bicarbonate (Alkalinity) in water:	45
3.3.2.6 Electrical conductivity (EC) in water:	45
3.3.2.7 Total Dissolved Solids (TDS in water):	45
3.3.2.8 Ammonia in water:	46
3.3.2.9 Dissolved Oxygen (DO) in water:	46
3.3.2.10 Biological Oxygen Demand (BOD) in water:	46
3.3.2.11 Chemical Oxygen Demand (COD) in water:	46
3.2.2.12 Major Anions in water:	47
3.2.2.13 Major Cations and heavy metal in water:	47
3.2.2.14 Total phosphorus in water:	47
3.2.2.15 Fecal coliforms count	48
3.2.2.16 Total coliforms count	48
3.4 Fish Sampling	49
3.4.1 Heavy metal residues in fish tissues	49
3.5 Macrobenthic samples:	49
3.6 Statistical Analysis	50
3.7 Water Quality Index (WQI):	50
<b>4- RESULTS and DISCUSSION</b>	<b>53</b>
4.1 Water analysis:-	53
4.1.1 Physical and chemical parameter	53
4.1.1.1 Water temperature	53
4.1.1.2 Transparency	55
4.1.1.3 Electric conductivity (EC)	57

4.1.1.4 Total dissolved solids (TDS)	59
4.1.1.5 Hydrogen ion concentration (pH)	61
4.1.1.6 Dissolved oxygen (Do) (mg/l)	63
4.1.1.7 Chemical oxygen demand (COD):	65
4.1.1.8 Biological oxygen demand (BOD)	68
4.1.3 Major anions	69
4.1.3.1 Alkalinity	69
4.1.3.2 Chloride:	72
4.1.3.3 Sulphate:	74
4.1.4 Nutrient salts:	76
4.1.4.1 Ammonia	76
4.1.4.2 Nitrite	78
4.1.4.3 Nitrate	81
1.3.3.4 Orthophosphate:	83
1.3.3.5 Total Phosphorus	85
4.1.5 Major cations	87
4.1.5.1 Sodium:	87
4.1.5.2 Potassium:	89
4.1.5.3 Magnesium	91
4.1.5.4 Calcium	94
4.1.6 Biological Analysis	95
4.1.6.1 Total Coliform	95
4.1.6.2 Fecal Coliform	97
4.1.7 Heavy Metals Concentration in Water Samples	100
3.1.7.1 Aluminum (Al)	100
3.1.7.2. Chromium (Cr)	101
3.1.7.3 Nickel (Ni)	102
4.1.7.4 Arsenic (As)	104



4.1.7.5 Cobalt (Co)	104
4.1.7.6 Selenium (Se)	104
4.1.8 Heavy metals in fish tissues	105
4.1.8.1 Aluminum (Al)	105
4.1.8. 2 Arsenic (As)	107
4.1.8.3 Chromium (Cr)	109
4.1.8.4 Cobalt (Co)	110
4.1.8.5 Nickel (Ni)	111
4.1.8.6 Selenium (Se)	113
4.3 Benthic invertebrates	115
4.3.1 Community composition of benthic fauna	116
4.3.2.1.1 Distribution and seasonal variation of total benthos	117
4.3.2.1 Arthropoda	118
4.3.2.1.1 Distribution and seasonal variation of Arthropoda	118
4.3.2.1.2 Distribution and seasonal variation of Arthropoda taxa:	119
4.3.2.2 Annelida	121
4.3.2.2.1 Distribution and seasonal variation of total Annelida	121
4.3.2.2.2 Distribution and seasonal variation of Annelida taxa	122
4.3.2.3 Mollusca	124
4.3.2.3.1 Distribution and seasonal variation of total Mollusca	124
4.3.2.3.2 Distribution and seasonal variation of total Mollusca	124
taxa	
4.3.2.3.2.1 Gastropoda	124
4.3.2.3.2.1 Bivalvia	126
4.4 Water Quality Index (WQI)	129
4.5 Impact of drainage water on tilapia production	130
<b>5. CONCLUSION</b>	133
<b>6. RECOMMENDATION</b>	134

<b>7. summary</b>	135
<b>7. REFERENCES</b>	144
<b>Arabic summary</b>	-

## List of Tables

Table No.	Page
Table (3. 1). Location of the sampling stations.	37
Table (4.1). Seasonal variations of temperature ( Mean $\pm$ S.E) ( $^{\circ}$ C) in water during the study in the different stations.	54
Table (4.2). Seasonal variations of tranparance (Cm) ( Mean $\pm$ S.E) in water during the study in the different stations.	55
Table (4.3). Seasonal variations of conductivity (EC) ( ms/cm) ( Mean $\pm$ S.E) in water during the study in the different stations.	58
Table (4.4). Seasonal variations of Total Dissolved Solids Concentration (mg/l) (Mean $\pm$ S.E) in water during the study in the different stations.	60
Table (4.5). Seasonal variations of pH values (Mean $\pm$ S.E) in water during the study in the different stations.	62
Table (4.6). Seasonal variations of dissolved Oxygen (DO) concentration (mg/l) (Mean $\pm$ S.E) in water during the study in the different stations.	64
Table (4.7). Seasonal variations of Chemical Oxygen Demand COD (mg/l) (Mean $\pm$ S.E) in water during the study in the different stations.	66
Table (4.8). Seasonal variations of Biological Oxygen Demand (BOD) (Mean $\pm$ S.E) (mg/l) in water during the study in the different stations.	68
Table (4.9). Seasonal variations of Bicarbonate concentration (mg/l) (Mean $\pm$ S.E) in water during the study in the different stations.	70
Table (4.10). Seasonal variations of chloride concentration (mg/l) (Mean $\pm$ S.E) in water during the study in the different stations.	73
Table (4.11). Seasonal variations of sulphate concentration (mg/l) (Mean $\pm$ S.E) in water during the study in the different stations.	75
Table (4.12). Seasonal variations of ammonia (NH <sub>3</sub> ) concentration (mg/l) (Mean $\pm$ S.E) in water during the study in the different stations.	77
Table (4.13). Seasonal variations of nitrite (NO <sub>2</sub> ) concentration (mg/l) (Mean	79

± S.E) in water during the study in the different stations.	
Table (4.14). Seasonal variations of nitrate (NO <sub>3</sub> ) concentration (mg/l), (Mean ± S.E) in water during the study in the different stations.	81
Table (4.15). Seasonal variations of ortho phosphate (PO <sub>4</sub> ) concentration (mg/l) (Mean ± S.E) in water during the study in the different stations.	83
Table (4.16). Seasonal variations of total Phosphate concentration (mg/l) (Mean ± S.E) in water during the study in the different stations.	86
Table (4.17). Seasonal variations of sodium concentration (Na) (mg/l) Mean ± S.E in water during the study in the different stations.	88
Table (4.18). Seasonal variations of potassium (K) concentration (mg/l) in water during the study in the different stations.	90
Table (4.19). Seasonal variations of magnesium concentration (mg/l) Mean ± S.E. in water during the study in the different stations.	92
Table (4.20). Seasonal variations of calcium concentration (mg/l) Mean± S.E in water during the study in the different stations.	95
Table (4.21). Seasonal variations of total coliform cont CFU/100 ml in water during the study during the study in the different stations.	96
Table (4.22). Seasonal variations of Fecal Coliform count CFU/100ml in water during the study during the study in the different stations.	98
Table (4.23). Seasonal Variations of aluminum (Al) concentration (mg/l) in water samples from Lake Manzala	100
Table (4.24). Seasonal variations of chromium (Cr) concentration (mg/L) in water samples from Lake Manzala	101
Table (4.25). Seasonal Variation of nickel (Ni) concentration (mg/L) in water samples from Lake Manzala	103
Table (4.26). Seasonal variations of Aluminum (Al) concentrations (µg/g dry wt.) in tissues of <i>O. niloticus</i> fish during the study in from different sites of Lake Manzala.	107
Table (4.27). Seasonal variations of arsenic (As) concentrations (µg/gdry wt.) in tissues of <i>O. niloticus</i> fish during the study in from different sites of Lake Manzala.	108
Table (4.28). Seasonal variations of <i>Chromium (Cr)</i> concentrations (µg/g dry wt.) in tissues of <i>O. niloticus</i> fish during the study in from different sites of Lake Manzala.	110
Table (4.29). Seasonal variations of <i>cobalt (Co)</i> concentration (µg/gdry wt.) in tissues of <i>O. niloticus</i> fish during the study in from different sites of	111

Lake Manzala.	
Table (4.30). Seasonal variations of <i>nickel</i> (Ni) concentrations (µg/gdry wt.) in tissues of <i>O. niloticus</i> fish during the study in from different sites of Lake Manzala.	113
Table (4.31). Seasonal variations of <i>selenium</i> (Se) concentration (µg/g dry wt.) in tissues of <i>O. niloticus</i> fish during the study in from different sites of Lake Manzala.	114
Table (4.32). Seasonal variation of total zoobenthos at the different stations of the study at the different stations.	117
Table (4.33). Biodiversity of macrobenthic invertebrates in the study area at the different stations.	129
Table (4.34). Seasonal variations of WQI in Water during the study in the different stations.	130
Table (4.35). Relationship of drainage water in flow and riats to tilapia producton during the periods. (1920-2013) in lake Manzala	130

## **List of Figures**

Fig. No.	Page
Figure (3.1). A map of Lake Manzala showing the sampling stations.	36
Figure (3. 2). Lake Manzala Engineered Wetland Project	41
Figure (3.3).Weland Elements of Lake Manzala Engineered Project	42
Figure (4.1). Seasonal variations of temperature( Mean $\pm$ S.E) (oC) in water during the study in the different stations.	54
Figure (4.2). Seasonal variations of tranparance (Cm) in water during the study in the different stations.	56
Figure (4.3). Seasonal variations of conductivity (EC) ( ms/cm) in water during the study in the different stations.	58
Figure (4.4): Seasonal variations of Total Dissolved Solids concentration (mg/l) in water during the study in the different stations.	60
Figure (4.5). Seasonal variations of pH values in water in water during the study in the different stations.	62
Figure (4.6). Seasonal variations of dissolved Oxygen (DO) concentration (mg/l ) in water during the study in the different stations.	65
Figure (4.7): Seasonal variations of Chemical Oxygen Demand (COD) (mg/l)	67

in water during the study in the different stations.	
Figure (4.8). Seasonal variations of Biological Oxygen Demand (BOD) (mg/l) in water during the study in the different stations.	69
Seasonal variations of bicarbonate levels (mg/l) (Mean $\pm$ S.E) in Figure (4.9). water during the study in the different stations.	71
Figure (4.10). Seasonal variations of chloride concentration (mg/l) in water in water during the study in the different stations.	74
Figure (4.11). Seasonal variations of sulphate concentration (mg/l) in water during the study in the different stations.	76
Figure (4.12). Seasonal variations of ammonia (NH <sub>3</sub> ) concentration (mg/l) in water during the study in the different stations.	78
Figure (4.13). Seasonal variations of Nitrite (NO <sub>2</sub> ) concentration (mg/l) in water during the study in the different stations.	80
Figure (4.14). Seasonal variations of Nitrate (NO <sub>3</sub> ) concentrations (mg/l) in water during the study in the different stations.	82
Figure (4.15). Seasonal variations of orthoPhosphate (PO <sub>4</sub> ) concentration (mg/l) in water during the study in the different stations.	84
Figure (4.16). Seasonal variations of total Phosphate concentration (mg/l) in water in water during the study in the different stations.	87
Figure (4.17). Seasonal variations of sodium concentration (mg/l) in water during the study in the different stations.	89
Figure (4.18). Seasonal variations of potassium (K) concentration (mg/l) in water during the study in the different stations.	91
Figure (4.19). Seasonal variations of magnesium (Mg) concentration (mg/l) in water during the study in the different stations.	93
Figure (4.20). Seasonal variations of calcium (Ca) concentration (mg/l) in water during the study in the different stations.	95
Figure (4.21). Seasonal variations of total coliform concentration CFU/100 ml in water during the study in the different stations.	97
Figure (4.22). Seasonal variations of fecal coliform count CFU/100ml in water during the study in water during the study in the different stations.	99
Figure (4.23). Percentage occurrence of the average number of total benthic fauna in Lake Manzala and the drain.	116
Figure (4.24). Seasonal variation of total zoobenthos at the different stations of the area study.	118
Figure (4.25). Seasonal variation of average total Arthropoda recorded at the	119

drain and Lake Manzala.	
Figure (4.26). Seasonal variation of the average number of <i>Corophium orientale</i> at the drain and the lake during the different seasons.	120
Figure (4.27). Seasonal variation of total average of Annelida recorded at the drain and Lake Manzala.	122
Figure (4.28). Seasonal variation of the average number of <i>Allolobophora</i> sp. at the drain and the lake during the different seasons.	123
Figure (4.29). Seasonal variation of total average of Mollusca recorded at the drain and Lake Manzala.	124
Figure (4.30). Seasonal variation of total average of Gastropoda recorded at the drain and Lake Manzala.	125
Figure (4.31). Seasonal variation of the average number of <i>Melanoides tuberculata</i> at the drain and the lake Manzala.	126
Figure (4.32). Seasonal variation of total average of Bivalvia recorded at the drain and Lake Manzala.	127
Figure (4.33). Seasonal variation of the average number of <i>Corbicula consobrina</i> at the drain and Lake Manzala. \	128
Figure (4.34). Relations between tilapia Yield, Nitrate and Total Phosphate during the periods. (1920-2013) in lake Manzala.	131

## CHAPTER I

### INTRODUCTION

#### 1.1 BACKGROUND

Lake Manzala is situated in the north-eastern extremity of the Nile Delta. It lies between 31°45', 32°15'E and 31°00', 31°35'N. It involves an area of about 52,611 hectares. The lake is bounded by the Mediterranean Sea to the North, Suez Canal to the East, and Damietta Branch to the West. The southern shores of the lake form the north boundary of Dakahiliya and Sharkiya Governorates. It is the largest and one of natural the essential sources of fisheries in Egypt (**Zahran et al., 2015**).

It was contributed about 50 % of the total country yield during early 1970 and about 35 % during 1980 (**Khalil and Salib, 1986**), and now only 3% of total yield (**GAFRD, 2014**).

The lake is considered as one of the most important wintering and nesting sites for many species of the migratory birds. About 2785 fishing boats and 15975 fishermen are licensed in the lake water. Cattle raising are present in lake islands, but no agricultural production can be considered (**Shehata, 1982 ; El-Bokhty, 1996 ; El- Enany, 2004**).

The lake is connected with the Mediterranean Sea by a narrow sandy fringes (**Fishar *et al*, 2015**) namely; El-Gamil, New El-Gamil, El - Boughdady and New Damietta Boughases. The lake is also connected with Suez Canal at El-Kabouti; few kilometers to the South of Port Said. The north-western side of the lake is connected with Damietta Branch of the River Nile by El- Souffra and El-Ratma Canals, North Damitta City. The lake is presumed to have resulted from the accumulation of the Nile flood water into the low lying lands where it now occupies. The Nile water then becomes mixed with the sea water, which was entering into the lake after the effect of prevailing northerly winds. This confirmed by brackishness of the lake water and the lake deposits, which formed mainly of mud mixed with sands (**Shehata 1982; El-Mansy and Shalloof 2015**)

Concerning water quality, the Lake can be divided into two regions: The southern eastern region which receives mainly drainage water through different drains and the second region at the north eastern region affected by sea water (**Ali, 2008**).

The lake is subjected to continuous and steadily flows of pollutants through numerous drains; (as drainage water contributes about 98% of the