RESTORATION AND MANAGEMENT OF THE ECOSYSTEM SERVICES OF BURULLUS LAKE - EGYPT

Submitted by
Noha Samy Sayed Mahmoud

B.Sc. Civil Engineering, Faculty of Engineering, Ain Shams University, 2003
Diploma in Environmental Sciences, Institute of Environmental Studies & Research, Ain Shams University, 2013

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Engineering Sciences

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

2018

APPROVAL SHEET

RESTORATION AND MANAGEMENT OF THE ECOSYSTEM SERVICES OF BURULLUS LAKE - EGYPT

Submitted by

Noha Samy Sayed Mahmoud

B.Sc. Civil Engineering, Faculty of Engineering, Ain Shams University, 2003
Diploma in Environmental Sciences, Institute of Environmental Studies & Research, Ain Shams University, 2013

A thesis submitted in Partial Fulfillment

Of

The Requirement for the Master Degree

In

Environmental Engineering Sciences

Department of Environmental Engineering Sciences

This Thesis Towards a Master Degree in Environmental Science
Has been Approved by:

Name **Signature**

1. **Prof. Dr. Magdy Tawfik Khalil**
   Prof. of Aquatic Ecology – Department of Zoology
   Faculty of Science
   Ain Shams University
2. **Prof. Dr. Iman Mahmoud El-Azizy**
   Professor Hydraulics – Department of Hydraulics and Irrigation
   Faculty of Engineering
   Ain Shams University
3. **Prof. Dr. Aly Nabih El-Bahrawy**
   Prof. of Hydraulics – Department of Hydraulics and Irrigation
   Faculty of Engineering
   Ain Shams University
4. **Prof. Dr. Noha Samir Donia**
   Prof. and Head of Department of Environmental Engineering Sciences
   Institute of Environmental Studies and Research
   Ain Shams University
5. **Dr. Mohamed Abd El-Moneam Farouk**
   Head of the Central Department of Integrated Coastal Zone Management
   EEAA

RESTORATION AND MANAGEMENT OF THE ECOSYSTEM SERVICES OF BURULLUS LAKE - EGYPT

Submitted by
Noha Samy Sayed Mahmoud

B.Sc. Civil Engineering, Faculty of Engineering, Ain Shams University, 2003
Diploma in Environmental Sciences, Institute of Environmental Studies & Research, Ain Shams University, 2013

A thesis Submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences
Department of Environmental Engineering Sciences

Under The Supervision of:

1. Prof. Dr. Aly Nabih El-Bahrawy
Prof. of Hydraulics – Department of Hydraulics and Irrigation
Faculty of Engineering
Ain Shams University

2. Prof. Dr. Noha Samir Donia
Prof. and Head of Department of Environmental Engineering Sciences
Institute of Environmental Studies and Research
Ain Shams University

3. Dr. Mohamed Abd El-Moneam Farouk
Head of the Central Department of Integrated Coastal Zone Management
EEAA

2018

ACKNOWLEDGMENT

First of all, I would like to thank almighty Allah for his endless Grace and Blessing on me to fulfill this study.

I am greatly indebted to **Prof. Dr. Aly El-Bahrawy – Professor of Hydraulics – Faculty of Engineering – Ain Shams University**. He has been a tremendous mentor for me. I would like to thank him not only for his keen interest and fruitful support, but also for his continuous encouragement.

I am deeply grateful to **Prof. Dr. Noha Donia - Professor and Head of Environmental Engineering Department – Institute of Environmental Research and Science**, for her kind supervision on this thesis, patience, helpful, valuable support and time, tolerance and the facilities provided throughout the different stages of the work.

Special thanks to **Dr. Mohamed Abd El-Moneam Farouk - Head of The Environmental Management Sector - EEAA**, for his valuable supervision, patience, excellent advice and guidance, support and continuous encouragement toward successful completion of this thesis.

I like to express my warmest gratitude to **Prof. Dr. Iman Mahmoud El-Azizy – Professor of Hydraulic - Faculty of Engineering – Ain Shams University**, for her continuous support and encouragement.

I wish to express my deepest appreciation to **Prof. Dr. Magdy T. Khalil** – **Professor of Aquatic Ecology - Faculty of Science – Ain Shams University**, for his generous and continuous professional assistance.

This work could not have been completed without the keen interest and support provided by **Dr. Hanan Farag - Associate Professor**.

I would like to thank **Chm. Fayed El Shamly**, **Burullus Protectorate Director – EEAA**, for his kind support and advice during this work.

Special thanks for my boss **Chm. Ahmed Sheta – Head of The Central Department of ICZM – EEAA,** for his continues advice.

I would like to send deep appreciation to my dearest friends **Eng. Amira Iprahim, Chm. Maha Moawed, Dr. Shimaa Abbas** and **Eng. Yosra Abd El-Aziz,** for their kind support and continuous encouragement.

ACKNOWLEDGMENT

Finally, there are no words could express my thanks to my beloved family for their support and encouragement and I would like to dedicate this work to all of them and specially my lovely daughter **Nour**.

ABSTRACT

Burullus wetland is the second-largest Egyptian Northern lagoons, located in the central part of the Nile Delta. It comprises one of the most unique and productive habitats in the Mediterranean region and plays an important breeding and sheltering role for many wildlife, water birds and plant species, including number of rare and threatened species. Thus, the wetland was declared as a nature reserve under the international Ramsar convention, important bird area (IBA). Besides, the wetland is considered a part of a national protectorate that was declared in 1998.

This study focuses on the wetland and its five districts, as it offers various ecosystem services including provisional, regulating, supporting and recreational, supporting income and livelihood of local communities surrounding the wetland.

However, the wetland is recently under pressure of several socio-economic drivers including rapid population growth, unplanned urbanization and a conflict of various economic activities around the wetland as; fishing, aquaculture, agriculture, salt extraction, bird hunting and reed harvesting, in addition to climate change threats. Such drivers are posing serious implication on the wetland ecosystem, affecting directly and/ or indirectly its health and productivity. Thus, distressing local communities who rely on its services to support their income and livelihood.

This thesis aims to develop and test integrated tools for assessment, valuation and management of Burullus wetland, applying recent international approaches for valuation and wise use of wetlands ecosystem services. Several field visits was conducted to a number of selected villages of the districts surrounding Burullus wetland for direct communicating with relevant stakeholders, local communities and different targeted groups. Socio-economic and gender analysis data were collected using designed questionnaires, to identify main ecosystem services and goods provided by Burullus wetland that have direct and indirect influence on the household income of local communities. Direct and indirect economic valuation of provisioning ecosystem services (fishing – agriculture – reed harvesting – salt extraction - bird hunting), through estimation of the total cost for each activity (capital - operational – labors fees) and their direct return through a specified questionnaires for each services.

Gender equity was one of the main target of this thesis, where interviews have been conducted with women and children in selected villages with a detail

analysis of the main reasons of weak participation of women in economic activities.

Allocation model has been prepared for maximizing the total return of selected provisional activities and main crops in the agricultural area. DPSIR framework was applied for identifying main pressures resulted from the current drivers and its impact on the efficiency of the wetland ecosystem services. Finally, management and restoration plan was prepared as responses needed to mitigate negative impacts exerted on the wetland ecosystem services from current anthropogenic drivers.

The results of this thesis are recommended to be adopted by relevant stakeholders as a model to guide decision makers in managing and restoring other Egyptian Northern wetlands.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

LIST OF EQUATIONS