IMPACT OF CLIMATE CHANGE ON GROUNDWATER IN NORTH EAST SINAI

Submitted By

Muna Hussein Ahmed Dahabiyeh

B.Sc. of Science (Soil Sciences & its Administration), Faculty of Science,

Yarmouk University, 1998

Master in Environmental Sciences, Institute of Environmental Studies and Research,

Ain Shams University, 2001

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

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

2018

APPROVAL SHEET

IMPACT OF CLIMATE CHANGE ON GROUNDWATER IN NORTH EAST SINAI

Submitted By

Muna Hussein Ahmed Dahabiyeh

B.Sc. of Science (Soil Sciences & its Administration), Faculty of Science,
Yarmouk University, 1998

Master in Environmental Sciences, Institute of Environmental Studies and Research,
Ain Shams University, 2001

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences
Department of Environmental Basic Sciences

This Thesis Towards a Doctor of Philosophy Degree in Environmental Sciences Has been Approved by:

Name | Signature

1-Prof. Dr. Ayman Farid Abo Hadid
Prof. of Vegetables
Faculty of Agriculture
Ain Shams University
Ex- Chairman of Climate Laboratory – Ministry of Agriculture

2-Dr. Eng. Eman Sayed Ahmed Soliman
Chairman of Planning Sector
Ministry of Water Resources and Irrigation

3-Prof. Dr. Sameh A. Sakr
Prof. of Hydraulics & Hydrology
National Water Research Center
Ministry of Water Resources & Irrigation

4-Prof. Dr. Mohamed Gharib El Malky
Prof. of Environmental Geophysics, Department of Environmental Basic Sciences - Institute of Environmental Studies & Research
Ain Shams University

2018

IMPACT OF CLIMATE CHANGE ON GROUNDWATER IN NORTH EAST SINAI

Submitted By

Muna Hussein Ahmed Dahabiyeh

B.Sc. of Science (Soil Sciences & its Administration), Faculty of Science,
Yarmouk University, 1998
Master in Environmental Sciences, Institute of Environmental Studies and Research,
Ain Shams University, 2001

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences
Department of Environmental Basic Sciences

Under The Supervision of:

1-Prof. Dr. Mohamed Gharib El Malky
Prof. of Environmental Geophysics, Department of Environmental Basic Sciences - Institute of Environmental Studies & Research
Ain Shams University

2-Prof. Dr. Sameh A. Sakr
Prof. of Hydraulics & Hydrology
Head of Groundwater Sector
National Water Research Center
Ministry of Water Resources & Irrigation

2018

TO

My Father, Mother,

Brother; Ali, Sisters; Dalia and

Huda, and My Friend;

Raneem

Acknowledgment

First of all praise be to Allah, the Lord of the creations who thought us what we didn't know, and peace and blessings be upon our beloved teacher Muhammad, who brought us out of the darkness of ignorance to the light of guidance

I would like to express my sincere gratitude to my advisors Prof. Mohamed El-Malky for his continuous support, patience, motivation, and immense knowledge. I appreciate all his contributions of time, ideas, and funding to make my Ph.D. experience productive and stimulating.

My appreciation to Prof. Dr. Sameh Sakr head of the groundwater sector in ministry of water resources and irrigation for his academic support and the facilities provided to carry out the research work despite the tremendous pressure in his work that coincides with the research period.

I am grateful to Dr. Ezz El-Din El-Tablawi, who provided me an opportunity to join his team as intern, and who gave access to the numerical laboratory and research facilities. Without his precious support it would not be possible to conduct this research.

ABSTRACT

Identifying and quantifying future climate impacts on water resources has major economic and societal important for water planners. This research has integrated the outputs of the three general global models (CNRM-CM5, GFDL-ESM2M and EC-EARTH) downscaled by regional climate model (RCA4) under representative concentration pathways RCPs scenarios 4.5 and 8.5, into two hydrological models to provide approximations of climate change impacts on water quantity and quality in El Sheikh Zuwaid-Rafah quaternary aquifer system which is the main source of water in the area.

The projected changes in precipitation of the rising scenario between the periods 1980-2005 and 2050-2075 have showed increasing by 28% by RCA4-CNRM-CM5 while both other models were estimated to decrease. A Simple Bias correction (SBC) technique was implemented to correct the simulated monthly precipitation series. A three dimensional finite difference flow model (Processing MODFLOW -PM5), and the implemented solute transport model (MT3D) were used to predict the groundwater and the total dissolved solids storage. Results from running the raising scenario RCP 8.5 estimated that by the hydrological year 2074 groundwater recharge would be decreased from year 1996 by 2.73 $M.m^3$, leading with the yearly exploitation to decrease groundwater storage to 11.83 $M.m^3$ and decrease in dissolve salt storage 33.1 M. Kg.

Table of Contents

Table of Tables

Table of Figures