

بسم الله الرحمن الرحيم



SALWA AKL



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم



SALWA AKL

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
على هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



SALWA AKL



بعض الوثائق الأصلية تالفة



SALWA AKL



بالرسالة صفحات

لم ترد بالأصل



SALWA AKL

A.KJ

**MODELING OF THE MORPHOLOGICAL PROCESSES
IN THE NILE RIVER FOR NAVIGATION USES**

by

Hossam El-Din Mohammed El-Sersawy

**A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
CIVIL ENGINEERING**

B 17446

**FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2001**

MODELING OF THE MORPHOLOGICAL PROCESSES IN THE NILE RIVER FOR NAVIGATION USES

by

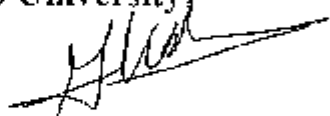
Hossam El-Din Mohammed El-Sersawy

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
CIVIL ENGINEERING

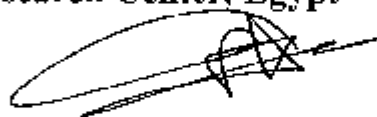
M. M. Abou-Seida
Under the Supervision of

Prof. Dr. M. M. Abou-Seida
Professor of Hydraulics and
Ex-Head of Irrigation & Hydraulics Department
Cairo University

Prof. Dr. M. Fawzy Hellwa
Professor of Hydraulics
Cairo University



Prof. Dr. M. Rafik Abdel Barry
Vice President of the National Water
Research Center, Egypt



**FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2001**

MODELING OF THE MORPHOLOGICAL PROCESSES IN THE NILE RIVER FOR NAVIGATION USES

by

Hossam El-Din Mohammed El-Sersawy

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
CIVIL ENGINEERING

Approved by the
Examining Committee:

..... *M. M. Abou-Seida*
Prof. Dr. M. M. Abou-Seida,
Ex- Head of Irrigation and Hydraulics Department
Faculty of Engineering - Cairo University

Main Advisor

..... *M. Fawzy Hellwa*
Prof. Dr. M. Fawzy Hellwa
Professor of Hydraulics - Faculty of Engineering
Cairo University

Advisor

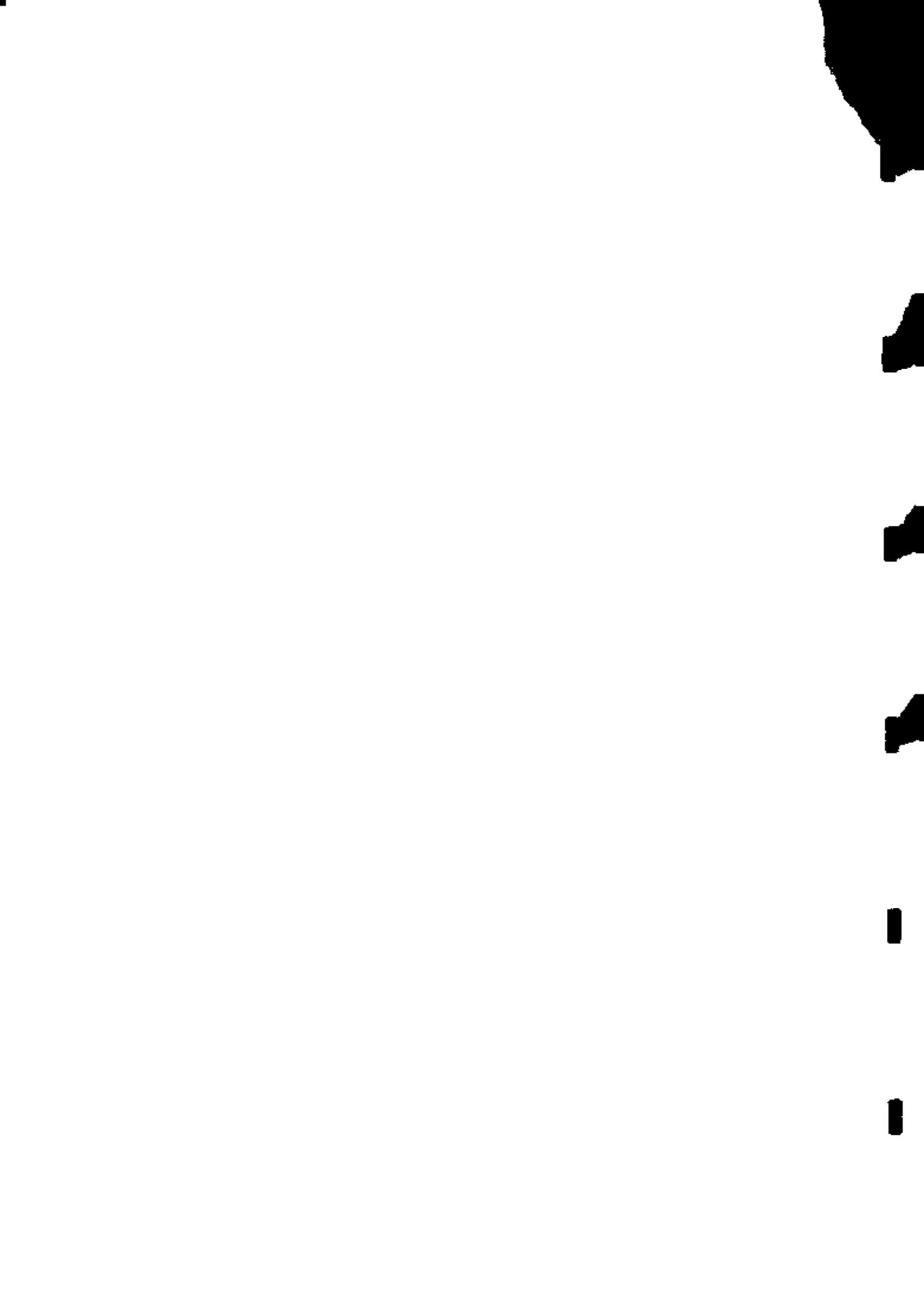
.....
Prof. Dr. Ahmed Moustafa El-Khashab
Head of Irrigation and Hydraulics Department
Faculty of Engineering - Cairo University

Member

..... *Mahmoud Abou-Zeid*
Prof. Dr. Mahmoud Abou-Zeid
Minister of Water Resources and Irrigation
Egypt

Member

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2001



ACKNOWLEDGMENT

The author wishes to express his deepest gratitude and sincerest appreciation to his supervisor **Prof. Dr. M. M. Abou-Seida**, Irrigation and Hydraulics Department, Faculty of Engineering, Cairo University for his valuable advice, enthusiastic guidance and continuous encouragement that lead to the successful completion of this study.

Special thanks to **Prof. Dr. M. Fawzy Hellwa**, Faculty of Engineering, Cairo University and **Prof. Dr. M. Rafik Abdel Barry**, Vice President of the National Water Research Center (NWRC), for their advice and support throughout the study.

Deepest gratitude and thanks to his excellency **Prof. Dr. Mahmoud Abou-Zeid**, Minister of Water Resources and Irrigation, for his unforgettable participation in evaluating the contents of the thesis and for his comments and advice as a member of the examining committee.

Special thanks to **Prof. Dr. Ahmed Al-Khashab**, Head of Irrigation and Hydraulics Department, Faculty of Engineering, Cairo University for his valuable comments and discussions.

The author would also like to thank **Prof. Dr. Mohamed El Moattassem**, ex. Vice president of the National Water Research (NWRC), **Prof. Dr. Ahmed Fahmy** Director of Nile Research Institute (NRI), National Water Research Center (NWRC), **Dr. Tarek Abdel Aziz** and **Dr. Medhat Aziz** for their support and valuable discussions.

Finally, I wish to express my deepest thanks, gratitude, and appreciation to my mother and my wife for being so supportive, understanding, patient, and kind throughout the time of the study.

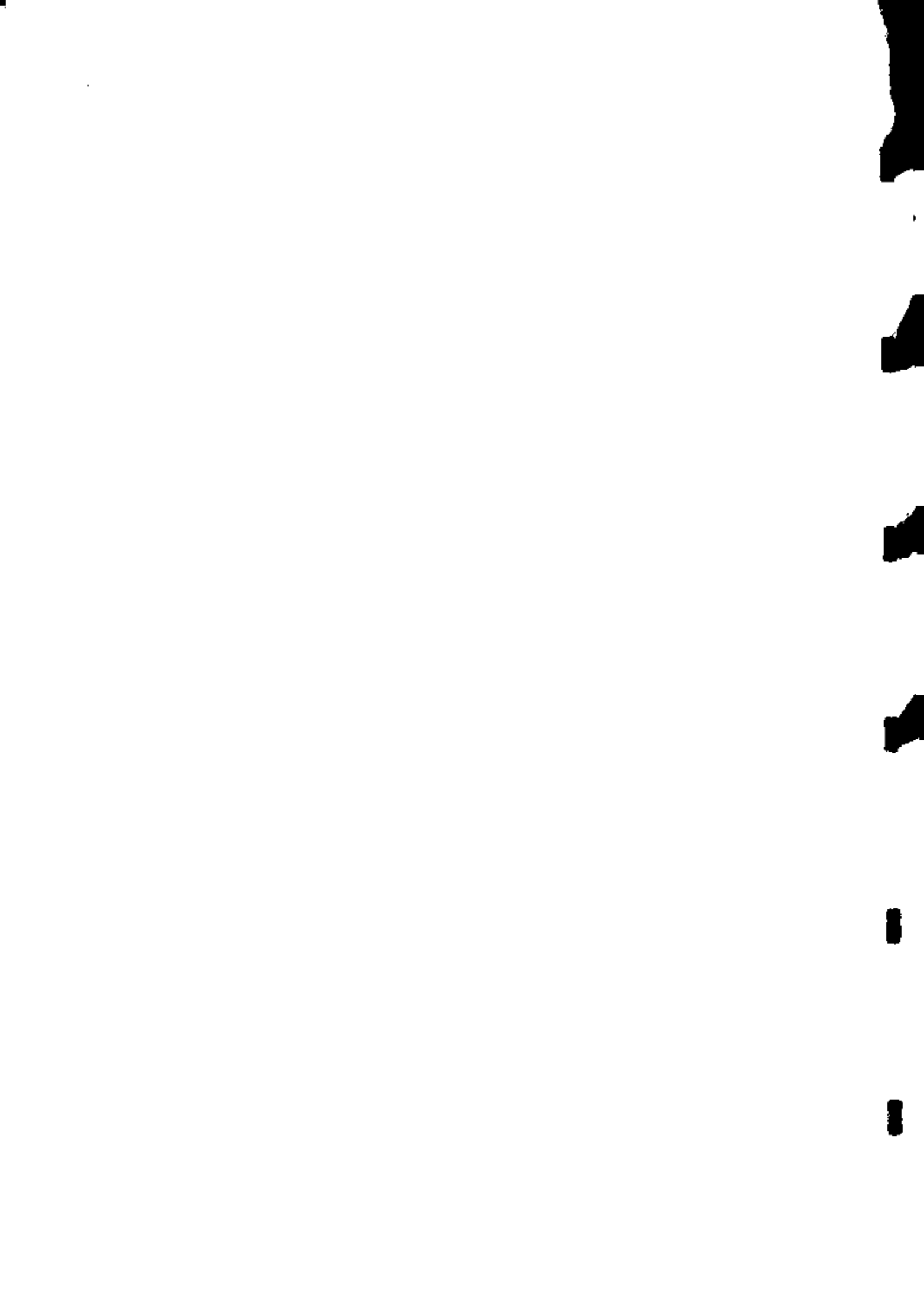


TABLE OF CONTENTS

ACKNOWLEDGMENT	i
TABLE OF CONTENTS	ii
LIST OF FIGURES	vii
LIST OF TABLES	xi
LIST OF SYMBOLS	xii
LIST OF ABBREVIATION	xiii
ABSTRACT	xiv

CHAPTER 1 INTRODUCTION

1.1 General	1
1.2 Problem Identification	3
1.3 Study Objectives	4
1.4 Outline of the Study and Work Plan	5

CHAPTER 2 LITERATURE REVIEW

2.1 General	7
2.2 River Navigation	7
2.2.1 Factors Influencing River Navigation	7
2.2.2 Design of Navigable Channels	9
2.2.2.1 Channel Depth	9
2.2.2.2 Channel Width	10
2.2.2.3 Channel Alignment	10
2.3 Sedimentation Analysis of Navigable Channels	12
2.3.1 Shoaling of Navigation Channel	12
2.3.2 Description of Shoaling Problems	13
2.3.3 Estimation of Sediment Transport in Streams	16
2.3.3.1 Special Studies Using Field Data	16
2.3.3.2 Analytical Analysis	16
2.3.3.3 Physical Models	16
2.3.3.4 Numerical Models	20

2.4	Overview of Numerical Models	20
2.4.1	Application of Two Dimensional Models	23
2.5	Geographic Information System (GIS) and Hydraulic Modeling ..	23
2.5.1	Definition of Geographic Information System (GIS) ..	23
2.5.2	Integration of GIS with Hydraulic Modeling	25
2.6	Analysis Sedimentation Problems in Navigable Channels	27
2.6.1	General	27
2.6.2	Dredging	28
2.6.3	Training Structures	32
2.6.3.1	Dikes	32
2.6.3.2	Revetment	35
2.6.3.3	Cutoffs	36
2.6.3.4	Sediment Traps	36
2.7	Overview of Navigation Problems in the Nile River	36
2.7.1	River Morphology Studies	36
2.7.2	Navigation Bottlenecks Studies in the Nile River	38
2.7.3	GIS Sample Application in the Nile River	40
2.8	Summery	41

CHAPTER 3 METHODOLOGY

3.1	Scope of the Work	42
3.2	Development and Formulation of the Model	44
3.2.1	Model Selection	44
3.2.2	Model Description	44
3.2.2.1	Overview of FESWMS Model	45
3.2.2.2	Overview of SED2D Model	47
3.2.3	Numerical Techniques	49
3.2.4	Limitation of the Model	50
3.3	Modification of the Numerical Model	50
3.3.1	Development of the BED_ELEV Program	50
3.3.2	Development the Computer Program RUN-1	53
3.4	Modeling System Operation	53
3.5	Geographic Information System (GIS)	55
3.5.1	Data Models	56
3.5.1.1	Vector	56
3.5.1.2	Restar	57