

TABLE OF CONTENTS

	Page No
DECLARATION.....	I
CERTIFICATE.....	II
ANTI-PLAGIARISM REPORT.....	III
PREFACE.....	IV-VII
ABSTRACT.....	VIII-XIII
CONTENTS.....	XVI-XXI
LIST OF TABLES.....	XXII-XXV
LIST OF FIGURES.....	XXVI-XXVIII
LIST OF MAPS.....	XXIX-XXX
LIST OF PHOTO PLATES.....	XXX-XXXII
CHAPTER-I	
INTRODUCTION.....	1-36
1.1. Introduction.....	2
1.2. Statement of the Problem.....	3
1.3. Location of the Study Area.....	4
1.4. Objectives of the Study.....	5
1.5. Hypothesis.....	5
1.6. Database and Methodology.....	5
1.6.1. Primary Database.....	5
1.6.1.1. Criteria for Selecting the Representative Wetlands.....	6
1.6.1.2. Questionnaire and Interview.....	7
1.6.1.3. Soil Nutrient Data.....	8
1.6.1.3.1. Collection of Soil Sample.....	8
1.6.1.3.2. Soil Analysis Methods.....	8
1.6.1.4. Water Quality Data.....	9
1.6.1.4.1. Water Sample Collection.....	9
1.6.1.4.2. Water Analysis Methods.....	9
1.6.1.5. Floristic Survey.....	10

1.6.1.6. Faunal Survey.....	10
1.6.2. Secondary Database.....	11
1.6.3. Data Analysis and Interpretation.....	11
1.6.3.1. Wetland Mapping Technique.....	11
1.6.3.2. Karl Pearson’s Co-efficient of Correlation.....	12
1.6.3.3. Z test.....	12
1.6.3.4. ANOVA.....	12
1.6.3.5. Standard Deviation.....	12
1.6.3.6. Standard Error of Estimate.....	13
1.6.3.7. The chi-square (χ^2) Square Test.....	13
1.6.3.8. Water Quality Index.....	13
1.7. Significance of the Study.....	14
1.8. Review of the Related Literature:	15
1.9. Research Gap.....	28
1.10. Conclusion.....	29
Reference.....	29

CHAPTER-II

GEOGRAPHICAL BACKGROUND OF THE STUDY AREA.....37-68

2.1. Introduction.....	38
2.2. Historical Background.....	38
2.3. Administrative Background.....	39
2.3.1. Administrative Boundary of Koch Bihar.....	39
2.3.2. Administrative Set up of Koch Bihar.....	41
2.3.3. Location of the Study Area.....	41
2.4. Physical Background.....	41
2.4.1. Geology.....	42
2.4.2. Relief.....	43
2.4.3. Drainage.....	44
2.4.4. Climate.....	45
2.4.4.1. Temperature.....	45

2.4.4.2. Rainfall.....	49
2.4.5. Ground Water.....	50
2.4.6. Natural Vegetation.....	52
2.4.7. Soil.....	54
2.5. Socio- Economic Background.....	57
2.5.1. Demographic Characteristics.....	57
2.5.2. Literacy Status and Sex Composition.....	60
2.5.3. Religion and Caste Composition.....	62
2.5.4. Occupational Structure.....	62
2.5.5. Infrastructural Facilities.....	65
2.5.6. Conclusion.....	67
References.....	67

CHAPTER –III

CLASSIFICATION AND DISTRIBUTION OF WETLANDS.....69-119

3.1. Definition of Wetland.....	70
3.1.1. Definition of Wetland before Ramsar Convention.....	70
3.1.2. Definition of Wetland after Ramsar Convention.....	70
3.1.2.1. Article 1.1.....	70
3.1.2.2. Article 2.1.....	71
3.1.2.3. Other Notable Definitions.....	71
3.2. Classification of Wetland.....	73
3.2.1. Ramsar Classification of Wetland.....	73
3.2.2. Indian Classification of Wetland.....	75
3.2.2.1. Well-Known Classification.....	75
3.2.2.2. Modified National Wetland Classification System.....	75
3.2.3. Classification of Wetland in the Study Area.....	78
3.2.3.1. Natural Wetland.....	78
3.2.3.1.1. River/ Stream.....	79
3.2.3.1.2. Oxbow lake.....	79
3.2.3.1.3. Riverine Wetland.....	79

3.2.3.2. Quasi-Natural Wetland.....	79
3.2.3.2.1. Quasi-Natural Oxbow Lake.....	79
3.2.3.2.2. Quasi-Natural Riverine Wetland.....	79
3.2.3.3. Man Made Wetland.....	79
3.2.3.3.1. Brick/Clay/Sand Pit.....	80
3.2.3.3.2.. Pond/ Tanks.....	80
3.3. Distribution of Wetland.....	80
3.3.1. World Distribution of Ramsar Site.....	80
3.3.2. Wetland Distribution in India.....	80
3.3.2.1. Type-Wise Distribution of Wetland in India.....	81
3.3.2.2. State-Wise Wetland Distribution in India.....	86
3.3.3. Wetland Distribution in West Bengal.....	88
3.3.3.1. Type-Wise Distribution of Wetland in West Bengal.....	89
3.3.3.2. District-Wise Distribution of Wetland in West Bengal.....	93
3.3.4. Wetland Distribution in Koch Bihar.....	94
3.3.4.1. Type-Wise Distribution of Wetland in Koch Bihar.....	96
3.3.4.2. Block-Wise Distribution of Wetland in Koch Bihar.....	96
3.3.5. Wetland Distribution in Study Area.....	97
3.3.5.1. Block-Wise Distribution of Wetland in Study Area.....	98
3.3.5.2. Type-Wise Distribution of Wetland in Different Blocks of the Study Area.....	107
3.3.5.2.1. Type-Wise Distribution of Wetland in Koch Bihar-I.....	110
3.3.5.2.2. Type-Wise Distribution of Wetland in Koch Bihar-II.....	113
3.3.5.2.3. Type-Wise Distribution of Wetland in Tufanganj-I.....	113
3.3.5.2.4. Type-Wise Distribution of Wetland in Tufanganj-II.....	116
3.3.5.3. Distribution of Wetland of the Study Area according to Nearest River.....	116
3.4. Conclusion.....	118
References.....	118

CHAPTER- IV

PRESENT USE OF WETLANDS.....	120-157
4.1. Introduction.....	121
4.2. Common Use of Wetlands in the Study Area.....	121
4.2.1. Agriculture.....	121
4.2.2. Irrigation.....	122
4.2.3. Jute Retting.....	123
4.2.4. Fish Hunting.....	124
4.2.5. Pisciculture.....	124
4.2.6. Fodder Collection.....	126
4.2.7. Grazing.....	126
4.2.8. Edible Plant Collection.....	127
4.2.9. Duck- Keeping.....	128
4.2.10. Soil Quarrying.....	129
4.2.11. Bathing & Swimming.....	129
4.2.12. Dumping of Solid Waste.....	130
4.2.13. Fuel Wood.....	130
4.2.14. Ritual Activities.....	130
4.3. Specific Use of Some Selected Wetlands.....	131
4.3.1. Rasik Beel Wetland Complex.....	131
4.3.2. Dhangdhar Chhara.....	136
4.3.3. Rasomati Jheel.....	139
4.3.4. Baiganbari Chhara.....	139
4.3.5. Chandan Dighi.....	147
4.3.6. Sagar Dighi.....	151
4.4. Conclusion.....	156
References.....	156

CHAPTER-V

ENVIRONMENTAL STATUS OF WETLANDS.....158-208

5.1. Introduction.....	159
5.1.1. Abiotic Component.....	159
5.1.2. Biotic Component.....	159
5.1.2.1. Autotrophs or Producers.....	159
5.1.2.2. Consumers.....	159
5.1.2.3. Decomposers.....	160
5.2. Environmental Status of Wetlands of the Study Area.....	160
5.2.1. Water Quality.....	161
5.2.1.1. Physical Parameters.....	165
5.2.1.1.1. Water Temperature.....	165
5.2.1.1.2. pH.....	167
5.2.1.1.3. Total Dissolved Solid (TDS) and Electrical Conductivity (EC).....	169
5.2.1.2. Chemical Parameters.....	172
5.2.1.2.1. Dissolved Oxygen (DO).....	172
5.2.1.2.2. Biological Oxygen Demand (BOD).....	175
5.2.1.2.3. Total Alkalinity.....	177
5.2.1.2.4. Total Hardness.....	178
5.2.1.2.5. Carbonate and Bi-Carbonate.....	181
5.2.1.2.6. Free CO ₂	183.
5.2.1.2.7. Chloride (Cl).....	185
5.2.1.2.8. Iron (Fe ³⁺).....	185
5.2.2. Soil Properties.....	188
5.2.2.1. Soil pH.....	188
5.2.2.2. Soil Organic Matter.....	190
5.2.2.3. Electrical Conductivity (EC) of Soil.....	192
5.2.2.4. Available Nitrogen.....	193
5.2.2.5. Phosphorous.....	195
5.2.2.6. Potassium.....	196

5.2.3. Biotic Component.....	198
5.2.3.1. Flora.....	198
5.2.3.2. Fauna.....	201
5.3. Conclusion.....	207
References.....	207

CHAPTER-VI

CAUSES AND CONSEQUENCE OF DEGRADATION OF WETLAND.....209-264

6.1. Introduction.....	210
6.2. Causes of Degradation of Wetland.....	211
6.2.1. Sedimentation.....	211
6.2.2. Blockage of Feeder Channel.....	214
6.2.3. Construction of Engineering Structures and other Obstacles.....	215
6.2.4. Encroachment	217
6.2.5. Agriculture.....	220
6.2.6. Irrigation.....	221
6.2.7. Garbage Dumping.....	223
6.2.8. Pollutants Inflow.....	224
6.2.9. Eutrophication.....	226
6.2.10. Indiscriminate Fishing.....	234
6.2.11. Flood	235
6.2.12. Weed Clearance.....	236
6.2.13. Fragmentation of Wetlands.....	237
6.2.14. Jute Retting.....	238
6.2.15: Over Utilization of Wetland Resources	240
6.2.16: Socio-Cultural Causes.....	240
6.2.17. Lack of Awareness	240
6.3. Consequences of Wetland Degradation.....	241
6.3.1. Water Quality	242
6.3.2. Effect on the Water Cycle	249
6.3.3. Effect on the Soil Quality.....	251

6.3.4. Effect on Flora	252
6.3.5. Effect on Fauna.....	252
6.3.6. Shrinkage of Area	254
6.3.7. Effect on the Local and Regional Economy	261
6.4. Conclusion.....	262
References.....	263

CHAPTER-VII

FINDINGS, CONSERVATION POLICIES AND

MANAGEMENT STRATEGIES.....265-280

7.1 Introduction.....	266
7.2. Existing Conservation Policies and Legislations in India.....	266
7.2.1. Legislations.....	267
7.2.2. Policies.....	267
7.2.3. Plans.....	268
7.2.4. Project.....	268
7.2.5. Important Acts of West Bengal Government.....	268
7.2.6. Important Wetlands Conservation Acts.....	269
7.2.6.1. National Wetlands Conservation Programme,	269
7.2.6.2. National Environment Policy (NEP, 2006).....	269
7.2.6.3. Wetlands (Conservation and Management) Rules,.. ..	269
7.3. Major Findings of the Study.....	270
7.4. Recommendations and Management Strategies of the Wetlands.....	273
7.5. Conclusion.....	278
References.....	280
BIBLIOGRAPHY.....	281-301
APPENDICES.....	302-322
APPENDIX-A.....	302-318
APPENDIX-B.....	319
APPENDIX -C.....	320
APPENDIX –D.....	321
APPENDIX –E.....	322