

## LIST OF TABLES & CHARTS

FIG No.	TITLE	PAGE No.
2.1	REVENUE VILLAGES COMES UNDER TUTICORIN COASTAL ZONE	42
2.2	TUTICORIN COASTAL ZONE: GEOMORPHOLOGY AND THEIR AREAL EXTENT	45
2.3	TUTICORIN COAST LONG TERM MEAN MONTHLY (1965-2003) (MM)	47
3.1	TUTICORIN COASTAL ZONE: AREA UNDER VARIOUS LAND USE CLASSES	63
4.1	COMPARISON OF NOMENCLATURE: SOME ECOLOGICAL LAND CLASSIFICATION SYSTEMS OF HIERARCHICAL CHARACTER (AFTER BAILEY, 1981) COMPARABLE CONCEPTS HAVE BEEN PLACED ON THE SAME LEVEL	92
4.2	COMPARISON FOUR SERIES OF NOMENCLATURE FREQUENTLY USED FOR ECOLOGICAL AND LAND	92
4.3	NOMENCLATURE PROPOSAL FOR HIERARCHICAL CLASSIFICATION AT VARIOUS SPATIAL SCALES (KLIJIN, 1988)	92
4.4	HIERARCHICAL ECOLOGICAL LAND CLASSIFICATION OF THE TUTICORIN COASTAL ZONE	95
4.5	TUTICORIN COASTAL ZONE: COASTAL ECOSYSTEMS AND THEIR CHARACTERISTICS	97
4.6	ECOLOGICAL LAND CLASSIFICATION (ELC) OF TUTICORIN COASTAL ZONE WITH NUMBERS AND THEIR AREAL EXTENT	99
5.1	STRUCTURE OF LAND SUITABILITY CLASSIFICATION	124
5.2	CRITERIA AND RATINGS OF LAND QUALITIES FOR DIFFERENT CROPS IN TUTICORIN COASTAL ZONE	126
5.3	CRITERIA AND RATINGS OF LAND QUALITIES FOR DIFFERENT CROPS IN TUTICORIN COASTAL ECOSYSTEMS	129

<b>5.4</b>	<b>LAND SUITABILITY FOR CROPS BY SOIL SERIES OF TUTICORIN COASTAL ECOSYSTEMS</b>	<b>131</b>
<b>5.5</b>	<b>AREA (HA) UNDER VARIOUS CROP SUITABILITY OF TUTICORIN COASTAL ZONE</b>	<b>132</b>
<b>6.1</b>	<b>COASTAL ZONE STATISTICS BY COUNTRY</b>	<b>160</b>
<b>6.2</b>	<b>LIMITATIONS FOR VARIOUS COASTAL ECOSYSTEMS OF TUTICORIN COASTAL ZONE</b>	<b>168</b>
<b>6.3</b>	<b>TUTICORIN COASTAL ECOSYSTEMS COMES UNDER COASTAL REGULATION ZONES – EXISTING(1991 NOTIFICATIONS)</b>	<b>187</b>
<b>6.3A</b>	<b>TUTICORIN COASTAL ECOSYSTEMS FALLS UNDER COASTAL REGULATION ZONES – SUGGESTED</b>	<b>187</b>
<b>6.4</b>	<b>POTENTIAL SITES OF TUTICORIN COASTAL ZONE</b>	<b>195</b>

## **FLOW CHARTS**

<b>4.1</b>	<b>TUTICORIN COASTAL ZONE: SCHEMATIC REPRESENTATION OF ECOLOGICAL LAND CLASSIFICATION (ELC)</b>	<b>100</b>
<b>5.1</b>	<b>LAND SUITABILITY CLASSIFICATION</b>	<b>124</b>
<b>6.1</b>	<b>INTEGRATED COASTAL ZONE MANAGEMENT (ICZM) FRAMEWORK FOR CZM FOR TUTICORIN COAST</b>	<b>167</b>

## LIST OF FIGURES

FIG No.	TITLE	AFTER PAGE No.
2.1	STUDY AREA	38
2.1A	SOI TOPO SHEET INDEX	38
2.2	ADMINISTRATIVE DIVISIONS	41
2.3	RELIEF	41
2.4	GEOLOGY, LINEAMENTS & MINERALS	43
2.5	GEOMORPHOLOGY	44
2.6	DRAINAGE	44
2.7	MEAN ANNUAL RAINFALL	48
2.8	WINTER SEASON RAINFALL	48
2.9	SUMMER SEASON RAINFALL	48
2.10	SOUTHWEST MONSOON SEASON	49
2.11	NORTHEAST MONSOON SEASON	49
2.12	SOILS	50
2.13	LAND USE/LAND COVER	55
2.14	DISTRIBUTION OF POPULATION -2001	56
2.15	POPULATION DENSITY-2001	56
2.16	SEX RATIO-2001	57
2.17	LITERACY-2001	57
2.18	OCCUPATIONS-2001	58
2.19	TRANSPORTATION	58
3.1	LAND USE/LAND COVER	62
4.1	DIAGRAMMATIC REPRESENTATION OF ELC	96
4.2	COASTAL ECOSYSTEMS	100
4.3	TUTICORIN SECTOR – COASTAL ECOSYSTEMS	100
4.4	OTTAPIDARAM SECTOR – COASTAL ECOSYSTEMS	100
4.5	VILLATHIKULAM SECTOR – COASTAL ECOSYSTEMS	100
4.6	KADALADI SECTOR – COASTAL ECOSYSTEMS	100
4.7	MANDAPAM SECTOR – COASTAL ECOSYSTEMS	100
4.8	RAMESWARAM SECTOR – COASTAL ECOSYSTEMS	100
5.1	LAND (CROP) SUITABILITY	133
5.2	CROP SUITABILITY (PADDY, SUGARCANE, BANANA, MILLETS)	133
5.3	CROP SUITABILITY (COTTON, CHILLIES, GROUNDNUT, PULSES)	133
5.4	CROP SUITABILITY (COCONUT&CASURINA, CASHEWNUT, VEGETABLES, SUNFLOWER)	133
5.5	CROP SUITABILITY (GINGELLY, PALM, CHOLAM, RAGI)	133
6.1	COASTAL REGULATION ZONES – EXISTING	161
6.2	COASTAL REGULATION ZONES – SUGGESTED	162
6.3	COASTAL POTENTIALS SITES	193

## LIST OF PLATES

PLATE NO.	TITLE
4.1	DEEP BURIED PEDIMENT (VsDBP EMU)
4.2	VAIGAI RIVER (VRR EMU)
4.3	NATURAL LEVEE (VKNL)
4.4	ALLUVIAL PLAIN (RpAP EMU)
4.5	FLOOD PLAIN (PPFP EMU)
4.6	DELTAIC PLAIN (VVDP EMU)
4.7	DELTA (VKD EMU)
4.8	PALAR ESTUARY (PEs EMU)
4.8A	VAIPPAR ESTUARY (VPES EMU)
4.9	SHOAL LAND (EoSL EMU)
4.10	SANDY PLAIN (APSP EMU)
4.11	COASTAL PLAIN (RLCp EMU)
4.12	SWALE & RIDGE COMPLEX (TPSR)
4.13	STABILISED DUNE (KDS TD EMU)
4.14	COASTAL DUNE (PCSD EMU)
4.14A	COASTAL DUNE (VswCSD EMU)
4.15	SANDY BEACH (APSB EMU)
4.16	MARINE TERRACE (RMMT EMU)
4.17	SPIT (PSSp EMU)
4.18	MICRO CLIFF (TpCL EMU)
4.18A	MICRO CLIFF (VMCL EMU)
4.19	SAND BAR (DDNWSBR EMU)
4.20	CREEK (VVCr EMU)
4.21	SALT FLAT (ASSf EMU)
4.22	MUD FLAT (KMf EMU)
4.23	TIDAL FLAT (DATf EMU)
4.24	TOMBOLO (TTB EMU)
5.25	ISLAND (MuIs)
5.26	LAGOONS (GNLg EMU)
6.1	POOSANOOR VILLAGE (DRUM STICK PRACTICE)
6.2	RESTORATION OF DUNE OF RAMESWARAM
6.3	KUSI BEACH
6.4	A REGONISES THAT MANGROVES OF VAIGAI RIVER

## ACRONYMS AND ABBREVIATIONS

Ar	River in Vernacular
CMFRI	Central Marine Fisheries Research Institute
CRZ	Coastal Regulation Zone
CZM	Coastal Zone Management
EEZ	Exclusive Economic Zone
GIS	Geographical Information System
GPS	Global Positioning System
ICMAM	Integrated Coastal and Marine Area Management
ICZM	Integrated Coastal Zone Management
IRS	Indian Remote sensing Satellite
LISS	Linear Image Self Scanning system
LUT	Land Utilisation Type
NGO	Non Government Organisation
NNRMS	National Natural Resources Management Plan
Odai	Small Channel in Vernacular
RDBMS	Relational Database Management System
SPIC	Southern Petrochemical Industries Corporation
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USDA	United States Department of Agriculture

## TABLE OF CONTENTS

	Page No
DECLARATION	i
PREFACE	ii
ACKNOWLEDGEMENT	iv
LIST OF TABLES & FLOW CHARTS	vi
LIST OF FIGURES	viii
LIST OF PLATES	ix
ACRONYMS AND ABBREVIATIONS	x

## CHAPTER I

### THE PROBLEM AND PROCEDURE

<b>1.1 INTRODUCTION</b>	<b>1</b>
<b>1.1.1 The Coastal Zone</b>	<b>1</b>
<b>1.1.2 Coastal Uses</b>	<b>2</b>
<b>1.1.3 Value of Coastal areas</b>	<b>2</b>
<i>1.1.3.1 Environmental Value</i>	<b>2</b>
<i>1.1.3.2 Economic Value</i>	<b>2</b>
<b>1.1.4 Coastal risks</b>	<b>4</b>
<b>1.1.5 Interactions in the Coastal areas</b>	<b>4</b>
<b>1.1.6 Environmental problems</b>	<b>6</b>
<i>1.1.6.1 Coastal Pollution</i>	<b>6</b>
<i>1.1.6.2 Sea level rise</i>	<b>6</b>
<b>1.2 COASTAL ZONE AND ITS RELATIVE PHENOMENA</b>	<b>8</b>
<b>1.2.1 Coastal zone:</b>	
<b>An ecological, social and economic system</b>	<b>9</b>
<b>1.2.2 Need for coastal zone management</b>	<b>9</b>

1.2.3	Evolution of Coastal Zone Management practices	9
1.2.4	Inputs to CZM evolution	10
1.2.5	Integrated Coastal Zone Management (ICZM) - Definitions	11
1.2.6	Development of the Concept	11
1.2.7	General Principles of ICZM	12
	1.2.7.1 <i>The integration principle</i>	12
	1.2.7.2 <i>The Precautionary Principle</i>	13
1.2.8	Aim of the ICZM	13
1.2.9	Benefits of ICZM	13
1.2.10	ICZM Approaches	14
1.3	INTEGRATED COASTAL ZONE MANAGEMENT – GLOBAL LEVEL	14
1.4	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM FOR ICZM	15
1.5	COASTAL REGULATION ZONE	16
	1.5.1 Coastal Regulation Zones in India – An Overview	16
1.6	REVIEW OF LITERATURE	20
	1.6.1 International Scenario	20
	1.6.2 National Scenario	27
1.7	THE PROBLEM OF THE PRESENT STUDY	32
1.8	STUDY AREA: AN OVERVIEW	32
1.9	AIM AND OBJECTIVES	33
1.10	RESEARCH METHODOLOGY	34
1.11	LIMITATIONS AND RELIABILITY	36
1.12	ORGANISATION OF THE THESIS	37

## CHAPTER II

### STUDY AREA: A PROFILE OF TUTICORIN COAST

<b>2.1</b>	<b>INTRODUCTION</b>	<b>38</b>
<b>2.2</b>	<b>LOCATION</b>	<b>38</b>
<b>2.3</b>	<b>TUTICORIN COASTAL ZONE – AN OVERVIEW</b>	<b>38</b>
<b>2.4</b>	<b>ADMINISTRATIVE UNITS</b>	<b>41</b>
<b>2.5</b>	<b>RELIEF</b>	<b>41</b>
<b>2.6</b>	<b>GEOLOGY</b>	<b>43</b>
<b>2.7</b>	<b>GEOMORPHOLOGY</b>	<b>44</b>
<b>2.8</b>	<b>DRAINAGE</b>	<b>44</b>
<b>2.9</b>	<b>CLIMATE</b>	<b>46</b>
	<b>2.9.1 Rainfall</b>	<b>46</b>
	<i>2.9.1.1 Mean Annual</i>	<b>46</b>
	<i>2.9.1.2 Winter Season</i>	<b>48</b>
	<i>2.9.1.3 Summer Season</i>	<b>48</b>
	<i>2.9.1.4 Southwest Monsoon Season</i>	<b>49</b>
	<i>2.9.1.5 Northeast Monsoon Season</i>	<b>49</b>
	<b>2.9.2 Temperature</b>	<b>50</b>
<b>2.10</b>	<b>SOIL AND THEIR DISTRIBUTION</b>	<b>51</b>
	<b>2.10.1 Entisol (Recent soil)</b>	<b>51</b>
	<i>3.10.1.1 Aquic Ustorthents-Auot (Keelapavalam)</i>	<b>51</b>
	<i>3.10.1.2 Typic Ustipsamments - Tupt</i>	
	<i>(Mandapam and Tiruchendur)</i>	<b>51</b>
	<i>3.10.1.3 Calcio Ustipsamments - Caupt (Rameswaram)</i>	<b>51</b>
	<b>2.10.2 Vertisol (Black soil)</b>	<b>51</b>
	<i>2.10.2.1 Typic Chromusterts - Tcsv (Mudukulathur)</i>	<b>51</b>
	<i>2.10.2.2 Entic Chromusterts - Ecsv (Kovilpatti)</i>	<b>52</b>
	<b>2.10.3 Inceptisol (Immature soil)</b>	<b>52</b>



2.10.3.1	<i>Calcio-Ustochropts - Cauop (Vedalai)</i>	52
2.10.3.2	<i>Typic Fragiochrepts - Tfop (Tiruppullani)</i>	52
2.10.3.3	<i>Typic Fragiochrepts+Aquic Ustipsammments – Tfop+Aupt (Tiruppullani)</i>	53
2.10.3.4	<i>Fluentic Ustropepts - Futp (Sayalkudi)</i>	53
2.10.3.5	<i>Typic Ustropepts - Tutp (Paramakudi)</i>	53
2.10.4	<b>Alfisol (Reddish Brown soil)</b>	53
2.10.4.1	<i>Fluentic HaplustalFs - Fhsf (Mamallakkarai)</i>	53
2.10.4.2	<i>Psammentic PaleustalFs - Psuf (Kudakottai)</i>	53
2.10.4.3	<i>Rhodic PaleustalFs - Rupt (Kuthiraimozhi)</i>	54
2.10.4.4	<i>Vertic HaplustalFs - Vhsf (Kadaladi)</i>	54
2.10.4.5	<i>Vertic HaplusstalFs+Fluentic Ustrocherept – Vhsf+Futp (Pannerkulam)</i>	54
2.10.4.6	<i>Vertic Ustropepts+Typic Ustropepts +Vertic HaplustalFs - Vhsf+Tutp+Vutp (Villathikulam)</i>	54
2.11	<b>GENERAL LAND USE/ LAND COVER</b>	55
2.12	<b>SOURCES OF IRRIGATION</b>	55
2.13	<b>POPULATION DISTRIBUTION</b>	56
2.14	<b>POPULATION DENSITY</b>	56
2.15	<b>SEX RATIO</b>	57
2.16	<b>LITERACY</b>	57
2.17	<b>OCCUPATION</b>	58
2.18	<b>TRANSPORT NETWORK</b>	58
2.19	<b>TOURISM</b>	59

### CHAPTER III

## LAND USE AND LAND UTILIZATION TYPES

3.1	<b>INTRODUCTION</b>	60
3.2	<b>LAND USE CLASSIFICATION SYSTEM</b>	60
3.3	<b>ROLE OF GIS IN LAND COVER CLASSIFICATION</b>	61

<b>3.4</b>	<b>LAND USE MAPPING</b>	<b>61</b>
<b>3.5</b>	<b>SPATIAL DISTRIBUTION OF LAND COVER OF THE STUDY AREA</b>	<b>62</b>
<b>3.5.1</b>	<b>Built-up land</b>	<b>62</b>
	<i>3.5.1.1 Urban</i>	<b>62</b>
	<i>3.5.1.2 Rural</i>	<b>62</b>
	<i>3.5.1.3 Industrial</i>	<b>62</b>
<b>3.5.2</b>	<b>Agricultural lands</b>	<b>64</b>
	<i>3.5.2.1 Crop land</i>	<b>64</b>
	<i>3.5.2.1.1 Kharif</i>	<b>64</b>
	<i>3.5.2.1.2 Rabi</i>	<b>64</b>
	<i>3.5.2.1.3 Double crop</i>	<b>64</b>
	<i>3.5.2.2 Plantations</i>	<b>65</b>
	<i>3.5.2.3 Fallow land</i>	<b>65</b>
<b>3.5.3</b>	<b>Forests</b>	<b>65</b>
	<i>3.5.3.1 Scrub Forest</i>	<b>65</b>
	<i>3.5.3.2 Forest Blanks</i>	<b>65</b>
<b>3.5.4</b>	<b>Wastelands</b>	<b>66</b>
	<i>3.5.4.1 Land with or without scrub</i>	<b>66</b>
	<i>3.5.4.2 Salt affected land</i>	<b>66</b>
	<i>3.5.4.3 Sandy area</i>	<b>66</b>
	<i>3.5.4.4 Swampy/ Marshy</i>	<b>67</b>
	<i>3.5.4.5 Tidal Flat</i>	<b>67</b>
	<i>3.5.4.6 Reef area</i>	<b>67</b>
<b>3.5.5</b>	<b>Waterbodies</b>	<b>68</b>
	<i>3.5.5.1 Rivers/ Streams/ Tanks</i>	<b>68</b>
<b>3.5.6</b>	<b>Others</b>	<b>68</b>
	<i>3.5.6.1 Saltpan</i>	<b>68</b>
	<i>3.5.6.2 Roads/ Railways</i>	<b>68</b>

<b>3.6</b>	<b>LAND UTILIZATION TYPES (LUT'S)</b>	<b>68</b>
<b>3.6.1</b>	<b>Key Attributes of LUT'S</b>	<b>69</b>
<b>3.6.2</b>	<b>Requirements of LUT'S</b>	<b>70</b>
<b>3.6.3</b>	<b>Identification and Analysis of Land Utilization Types</b>	<b>70</b>
<b>3.7</b>	<b>LAND UTILIZATION TYPES IN TUTICORIN</b>	
	<b>COASTAL ZONE</b>	<b>71</b>
<b>3.7.1</b>	<b>Cropping System in Fluvial Land</b>	<b>71</b>
	<i>3.7.1.1 Irrigated Cereals Cropping System (LUT1: Paddy)</i>	<b>71</b>
<b>3.7.2</b>	<b>Cropping System in Fluvio-marine land</b>	<b>74</b>
	<i>3.7.2.1 Millets Cropping System (LUT2: Sorgham)</i>	<b>74</b>
	<i>3.7.2.2 Pulses Cropping System (LUT3: Grams)</i>	<b>75</b>
	<i>3.7.2.3 Oil Seeds Cropping System (LUT4: Ground nut, LUT5: Sunflower, LUT6: Gingelly)</i>	<b>76</b>
	<i>3.7.2.4 Fiber Cropping System (LUT7: Cotton)</i>	<b>80</b>
	<i>3.7.2.5 Commercial Cropping System (LUT8: Sugarcane)</i>	<b>80</b>
	<i>3.7.2.6 Condiments and Species Cropping System (LUT9: Chilly)</i>	<b>81</b>
	<i>3.7.2.7 Fruit Cropping System (LUT10: Banana)</i>	<b>82</b>
<b>3.7.3</b>	<b>Cropping System in Marine Land</b>	<b>83</b>
	<i>3.7.3.1 Horticultural Cropping System (LUT11: Cashewnut)</i>	<b>83</b>
	<i>3.7.3.2 Plantation Cropping System (LUT12: Coconut, LUT13: Palm, LUT14: Casurina)</i>	<b>84</b>

## CHAPTER IV

### ECOLOGICAL LAND CLASSIFICATION OF TUTICORIN COASTAL ZONE

<b>4.1</b>	<b>INTRODUCTION</b>	<b>87</b>
<b>4.2</b>	<b>A HIERARCHICAL MODEL OF AN ECOSYSTEM</b>	<b>89</b>
<b>4.3</b>	<b>SPATIAL AND TEMPORAL SCALES</b>	<b>90</b>

<b>4.3.1</b>	<b>Spatial Scales</b>	<b>90</b>
<b>4.3.2</b>	<b>Temporal Scales</b>	<b>90</b>
<b>4.4</b>	<b>MAPPING OF ELC UNITS</b>	<b>91</b>
<b>4.5</b>	<b>HIERARCHICAL ECOLOGICAL CLASSIFICATION</b>	<b>94</b>
<b>4.6</b>	<b>GIS AGGREGATION OF THE <i>TOCOSYS</i> LAYER</b>	<b>94</b>
<b>4.7</b>	<b>ECOLOGICAL LAND CLASSIFICATION OF THE TUTICORIN COAST</b>	<b>96</b>
<b>4.7.1</b>	<b>Fluvial Origin</b>	<b>100</b>
	<i>4.7.1.1 Deep Buried Pediment Ecosystem</i>	<b>100</b>
	<i>4.7.1.2 Riverine Ecosystem</i>	<b>101</b>
	<i>4.7.1.3 Natural Levee Ecosystem</i>	<b>101</b>
	<i>4.7.1.4 Alluvial Plain Ecosystem</i>	<b>102</b>
	<i>4.7.1.5 Flood Plain Ecosystem</i>	<b>102</b>
	<i>4.7.1.6 Deltaic Plain Ecosystem</i>	<b>102</b>
	<i>4.7.1.7 Delta Ecosystem</i>	<b>103</b>
<b>4.7.2</b>	<b>Fluvio-Marine Origin</b>	<b>103</b>
	<i>4.7.2.1 Estuary Ecosystem</i>	<b>103</b>
	<i>4.7.2.2 Shoal Ecosystem</i>	<b>104</b>
<b>4.7.3</b>	<b>Marine Origin</b>	<b>104</b>
	<i>4.7.3.1 Sandy Plain Ecosystem</i>	<b>105</b>
	<i>4.7.3.2 Coastal Plain Ecosystem</i>	<b>105</b>
	<i>4.7.3.3 Swale and Ridge Complex</i>	<b>106</b>
	<i>4.7.3.4 Stabilised Dune Ecosystem</i>	<b>107</b>
	<i>4.7.3.5 Coastal Sand Dune Ecosystem</i>	<b>107</b>

<i>4.7.3.6 Sandy Beach Ecosystem</i>	108
<i>4.7.3.7 Marine Terrace Ecosystem</i>	109
<i>4.7.3.8 Spit Ecosystem</i>	110
<i>4.7.3.9 Cliffs Ecosystem</i>	110
<i>4.7.3.10 Sand bar Ecosystem</i>	111
<i>4.7.3.11 Creek Ecosystem</i>	112
<i>4.7.3.12 Salt Flat Ecosystem</i>	112
<i>4.7.3.13 Mud Flat Ecosystem</i>	113
<i>4.7.3.14 Tidal Flat/Tidal Inlet Ecosystem</i>	114
<i>4.7.3.15 Tombolo Ecosystem</i>	115
<i>4.7.3.16 Island Ecosystem</i>	115
<i>4.7.3.17 Lagoon / Paleolagoon Ecosystem</i>	116
<i>4.7.3.18 Coral Reef Ecosystem</i>	116

## CHAPTER V

### LAND SUITABILITY CLASSIFICATION OF TUTICORIN COASTAL ZONE

<b>5.1 INTRODUCTION</b>	118
<b>5.2 CONCEPT OF LAND</b>	119
<b>5.3 CONCEPTS AND APPROACHES OF LAND EVALUTAION</b>	120
<b>5.4 LAND EVALUATION METHODS</b>	120
<b>5.5 LAND SUITABILITY</b>	121
<b>5.6 CONCEPTS LAND SUITABILITY</b>	122
<b>5.7 LAND SUITABILITY CLASSES</b>	122
<b>5.7.1 Class S1 Highly Suitable</b>	123
<b>5.7.2 Class S2 Moderately Suitable</b>	123

5.7.3	Class S3 Marginally Suitable	123
5.7.4	Class N Not Suitable	123
5.8	LAND SUITABILITY EVALUATION FOR TUTICORIN COAST	124
5.9	INTEGRATION FOR COASTAL RESOURCES ASSESSMENT AND LAND SUITABILITY CLASSES	125
5.10	LAND SUITABILITY FOR CROPS	128
5.10.1	Land Suitability for Paddy	133
5.10.1.1	<i>Highly Suitable Land for Paddy (S1)</i>	134
5.10.1.2	<i>Moderately Suitable Land for Paddy (S2)</i>	134
5.10.1.3	<i>Marginally Suitable Land for Paddy (S3)</i>	135
5.10.2	Land Suitability for Sugarcane	135
5.10.2.1	<i>Highly Suitable Land for Sugarcane (S1)</i>	136
5.10.2.2	<i>Moderately Suitable Land for Sugarcane (S2)</i>	137
5.10.2.3	<i>Marginally Suitable Land for Sugarcane (S3)</i>	137
5.10.3	Land Suitability for Banana	137
5.10.3.1	<i>Highly Suitable Land for Banana (S1)</i>	138
5.10.3.2	<i>Moderately Suitable Land for Banana (S2)</i>	138
5.10.3.3	<i>Marginally Suitable Land for Banana (S3)</i>	139
5.10.4	Land Suitability for Cotton	139
5.10.4.1	<i>Highly Suitable Land for Cotton (S1)</i>	139
5.10.4.2	<i>Moderately Suitable Land for Cotton (S2)</i>	140
5.10.4.3	<i>Marginally Suitable Land for Cotton (S3)</i>	140
5.10.5	Land Suitability for Groundnut	141
5.10.5.1	<i>Highly Suitable Land for Groundnut (S1)</i>	141
5.10.5.2	<i>Moderately Suitable Land for Groundnut (S2)</i>	142
5.10.5.3	<i>Marginally Suitable Land for Groundnut (S3)</i>	142
5.10.6	Land Suitability for Chillies	142
5.10.6.1	<i>Highly Suitable Land for Chillies (S1)</i>	143

5.10.6.2	<i>Moderately Suitable Land for Chillies (S2)</i>	143
5.10.6.3	<i>Marginally Suitable Land for Chillies (S3)</i>	144
5.10.7	<b>Land Suitability for Pulses, Millets, Cholam and Ragi</b>	144
5.10.7.1	<i>Highly Suitable Land (S1)</i>	145
5.10.7.2	<i>Moderately Suitable Land (S2)</i>	146
5.10.7.3	<i>Marginally Suitable Land (S3)</i>	146
5.10.8	<b>Land Suitability for Coconut/Casuarina</b>	146
5.10.8.1	<i>Highly Suitable Land (S1)</i>	147
5.10.8.2	<i>Moderately Suitable Land (S2)</i>	148
5.10.8.3	<i>Marginally Suitable Land (S3)</i>	148
5.10.9	<b>Land Suitability for Cashewnut</b>	148
5.10.9.1	<i>Moderately Suitable Land for Cashewnut (S2)</i>	148
5.10.9.2	<i>Marginally Suitable Land for Cashewnut (S3)</i>	149
5.10.10	<b>Land Suitability for Vegetables</b>	149
5.10.10.1	<i>Highly Suitable Land for Vegetables (S1)</i>	150
5.10.10.2	<i>Moderately Suitable Land for Vegetables (S2)</i>	150
5.10.10.3	<i>Marginally Suitable Land for Vegetables (S3)</i>	151
5.10.11	<b>Land Suitability for Gingelly and Sunflower</b>	151
5.10.11.1	<i>Moderately Suitable Land (S2)</i>	152
5.10.11.2	<i>Marginally Suitable Land (S3)</i>	153
5.10.12	<b>Land Suitability for Palm</b>	153
5.10.12.1	<i>Highly Suitable Land for Palm (S1)</i>	153
5.10.12.2	<i>Moderately Suitable Land for Palm (S2)</i>	154
5.10.12.3	<i>Marginally Suitable Land for Palm (S3)</i>	154
3.11	<b>LAND SUITABILITY OF TUTICORIN COAST</b>	154

**CHAPTER VI**  
**ECOSYSTEM BASED INTEGRATED COASTAL ZONE**  
**MANAGEMENT FOR TUTICORIN COAST**

<b>6.1</b>	<b>INTRODUCTION</b>	<b>156</b>
<b>6.2</b>	<b>HUMAN SOCIETIES AND COASTAL ECOSYSTEMS</b>	<b>156</b>
<b>6.3</b>	<b>THE NEED FOR AN INTEGRATED APPROACH</b>	<b>158</b>
<b>6.4</b>	<b>ESTIMATING AREA AND LENGTH OF COASTAL ZONE</b>	<b>159</b>
<b>6.5</b>	<b>ENVIRONMENT PROTECTION ACT OF INDIA</b>	<b>159</b>
<b>6.6</b>	<b>COASTAL REGULATION ZONES IN INDIA</b>	<b>161</b>
<b>6.7</b>	<b>COASTAL PLANNING AND MANAGEMENT ZONE</b>	<b>162</b>
<b>6.8</b>	<b>ORGANISATIONAL PROBLEMS</b>	<b>162</b>
<b>6.9</b>	<b>LACK OF RECOGNITION OF THE ISSUES</b>	<b>163</b>
<b>6.10</b>	<b>DIVERSION OF RESOURCES</b>	<b>163</b>
<b>6.11</b>	<b>INADEQUATE INFORMATION</b>	<b>163</b>
<b>6.12</b>	<b>PREPARATION OF INTEGRATED COASTAL ZONE MANAGEMENT PLAN (ICZMP)</b>	<b>164</b>
<b>6.13</b>	<b>FUTURE OPTIONS FOR ICZM</b>	<b>165</b>
<b>6.14</b>	<b>PRESENT STATUS OF TUTICORIN COAST</b>	<b>166</b>
<b>6.15</b>	<b>GEOSPATIAL TECHNOLOGY FOR ICZM</b>	<b>166</b>
<b>6.16</b>	<b>DELINEATION OF COASTAL MANAGEMENT ZONES</b>	<b>166</b>
<b>6.17</b>	<b>ECOSYSTEM BASED ICZM FOR TUTICORIN COAST</b>	<b>167</b>
<b>6.18</b>	<b>ECOSYSTEM UNDER COASTAL REGULATION ZONE IV</b>	<b>167</b>
	<b>6.18.1 Deep buried pediment Management</b>	<b>167</b>
	<b>6.18.2 Alluvial plain Management</b>	<b>169</b>
	<b>6.18.3 Natural levee Management</b>	<b>169</b>
<b>6.19</b>	<b>ECOSYSTEM UNDER CRZ III</b>	<b>170</b>
	<b>6.19.1 River Management</b>	<b>170</b>
	<b>6.19.2 Delta and Deltaic plain Management</b>	<b>170</b>
	<b>6.19.3 Flood plain Management</b>	<b>171</b>
<b>6.20</b>	<b>ECOSYSTEM UNDER CRZ II</b>	<b>172</b>



6.20.1	Sand dune and Stabilised dune Management	172
6.20.2	Swale and Ridge Complex Management	174
6.20.3	Coastal plain Management	174
6.20.4	Sandy plain Management	175
6.21	ECOSYSTEM UNDER CRZ I	175
6.21.1	Lagoons/Paleolagoons Management	175
6.21.2	Beach Management	176
6.21.3	Creek and Salt pan Management	177
6.21.4	Mud flat Management	178
6.21.5	Cliff Management	179
6.21.6	Estuarine and Shoal Management	179
6.21.7	Spit and Tombolo Management	181
6.21.8	Tidal Flat and Sand bar Management	182
6.21.10	Islands Management	182
6.21.11	Marine Terrace Management	183
6.21.12	Coral reef Management	184
6.22	SUGGESTION TO MANAGEMENT FOR TUTICORIN COAST	186
6.22.1	Management Zone I ( <i>CRZ I - Ecological sensitive areas</i> )	186
6.22.2	Management Zone II ( <i>CRZ II-Terrestrial Developed areas</i> )	190
6.22.3	Management Zone III ( <i>CRZ III – Undisturbed areas</i> )	191
6.22.4	Management Zone IV ( <i>CRZ IV – Agricultural areas</i> )	192
6.23	POTENTIAL SITES OF TUTICORIN COAST	193

## CHAPTER VII SUMMARY AND CONCLUSIONS

7.1	INTRODUCTION	195
7.2	SUMMARY AND FINDINGS	195
7.3	SUGGESTIONS AND RECOMMENDATIONS	201
7.3.1	Management Zone I ( <i>CRZ I - Ecological sensitive areas</i> )	202
7.3.2.1	<i>Management Program For CRZ I</i>	209

7.3.2.2	<i>Management of Threats and Endangered Species</i>	211
7.3.2	<b>Management Zone II</b> ( <i>CRZ II-Terrestrial Developed areas</i> )	211
7.3.3	<b>Management Zone III</b> ( <i>CRZ III - Undisturbed areas</i> )	213
7.3.4	<b>Management Zone IV</b> ( <i>CRZ IV - Agricultural areas</i> )	213
7.4	<b>POTENTIAL SITES OF TUTICORIN COAST</b>	214
7.5	<b>POLLUTIONS</b>	214
7.6	<b>GUIDELINES FOR ECOFRIENDLY COASTAL VEGETATION</b>	215
7.7	<b>ECODEVELOPMENT COMMITTEE</b>	215
7.8	<b>OTHER DEVELOPMENT ACTIVITIES</b>	215
7.9	<b>CONCLUSION</b>	216
	<b>REFERENCES</b>	
	<b>PLATES</b>	
	<b>APPENDIX</b>	