

Chapters

Chapter 1	1
Introduction	1
1.1 Background	1
1.2 Statement	6
1.3 Objectives of the Study	8
1.4 Justification of the Study	9
1.5 Research Question	9
1.6 Scope of the Study	10
1.7 Limitations of the Study	10
1.8 Methodology	10
1.8.3 Research Design and Methods	11
1.9 Literature Review	12
1.10 Chapterisation	14
Chapter 2	16
Introduction to Disasters and Disaster Management System in India	16
2.2 Natural Hazards and Disaster Management	20
2.2.1 Disaster	20
2.2.2 Hazard	20
2.2.3 Disaster Management	21
2.4 Disaster Management, Prevention and Preparedness	21
2.4.1 Disaster Management Cycle	22

Chapter 3

25

Case study of two major cyclones in Odisha, India (Odisha Super Cyclone, 1999 and cyclone Phailin 2013)

3.2	Cyclones	25
3.2.3	Cyclone Formation	28
3.2.4	Cyclone warning	29
3.3	Socio Economic and Physical Profile of Odisha	30
3.3.1	Physical Characteristics	30
3.3.2	Socio Economic Profile	33
3.3.3	Profile of Coastal Odisha	33
3.4	Odisha Super Cyclone, 1999	34
3.4.1	Physical Characterisation of the Super Cyclone	34
3.4.2	Forecast and Intimation of the Super Cyclone	36
3.4.5	Physical Vulnerability	39
3.4.6	Social Vulnerability	41
3.5	Economic Vulnerability	42
3.5.2	Power and Communication Sector	43
3.6	Vulnerability Profile-Gopalpur	44
3.6.2	Ports	47
3.6.3	Population	47
3.6.4	Physical Characteristics of phailin	47
3.6.6	Physical Vulnerability	50
3.6.7	Social Vulnerability	52

3.6.9 Economic Vulnerability	54
3.6.10 Power Transmission	54
3.7 Profile Comparison-Jagatsinghpur and Gopalpur	55
3.8 Odisha State Disaster Management Authority	57
3.8.2 Aim and Objectives of OSDMA	57
3.8.3 Conclusion	58
Chapter 4	59
Study of Early Warning and Communication System	
4.1 Early Warning Systems (EWS)	59
4.2 Present Status and Future Strategies	60
4.3.3 Cyclone Warning Services	63
4.3.4 Radar and Satellite Facilities	64
Communication for Early Warning System	
4.3.5 Requirement of Communication System	70
4.3.6 Present Status	70
4.3.9 Prerequisites of Effective Communication System	72
4.3.9 Initiatives at National Level	76
4.4 Communication Network	77
4.5 Existing Backbone Communication Infrastructure	78
4.6 VSAT Based Satcom Network	83
4.6.3 Data Collection System	84
4.7 Abis Interface for Restoration of Cellular Communication	85
4.9 Summary	90

Chapter 5	91
Structural and Non Structural Mitigation for Cyclones	91
Structural Measures	
5.1 Introduction	91
5.2 Cyclone Shelter	93
5.2.3 Design Consideration of Structures	94
5.2.3.1 Design Consideration for Buildings	94
5.2.4 Design issues for Multipurpose Cyclone Shelters (MPCS)	97
5.2.5 Construction of new Building Structures	98
5.2.6 Maintenance of Cyclone Shelters	98
5.2.7 Amenities	99
5.2.8 Cattle Mounds	99
5.3 Road Links, Culverts and Bridges	99
5.4 Canals, Drains, Surface Water Tanks	100
5.5 Saline Embankments	101
5.6 Communication Towers and Power Transmission Networks	101
Non Structural Measures	
5.7 Introduction	102
5.8 Coastal Protection	103
5.8.2 Coastal Wet Land Conservation	104
5.9 National Coastal Zone Management Policy	105
5.9.2 Coastal Zone Management Plan	106
5.9.4 Landuse Zoning and siting Plan of Infrastructure	107
5.10 The Coastal Aquaculture Authority	108

5.11	Coastal Regulation Zone (CRZ)	109
5.12	Natural Bio Shields	116
5.13	Shelterbelts	117
5.14	Maintaining Natural Sand Dunes	118
5.15	Coastal Vulnerability Index(CVI)	119
5.16	National Cyclone Risk Management Programme (NCRMP)	123
5.16.2	Mission Statement	123
5.16.3	Key Objectives	123
5.16.4	Components of NCRMP	124
5.16.7	Conclusion	126
Chapter 6		128
Guidelines and Strategies to make EWS more Effective		
6.1	Introduction	128
6.2	Implementing the Guidelines	130
6.2.5	Implementation and Coordination at the National Level	131
6.3	Institutional Mechanism and coordination at State and District Levels	132
6.4	Financial Arrangements for Implementation	132
6.5	Implementation Model	132
6.6.1	Emerging Ecological Issues	133
6.6.2	Planning Issues	134
6.6.3	Implications for planning systems	135
6.6.4	Action Plans	136
6.7	Conclusion	139

Chapter 7	140
Summarising the Findings and Recommendations	
7.1 Disaster Management in India	140
7.2 The Core theme of Research	140
7.3 Case Study of Cyclones in Odisha	141
7.4 Importance of Early Warning System	141
7.5 Mitigation Measures for Cyclones	142
7.6 Revisiting the Research Questions	142
7.7 Early Warning System in India	143
7.8 Changes in EWS in the 15 years between Super Cyclone and Cyclone Phailin	144
7.9 Changes in the last 15 years in communication system for disseminating Early Warning	146
7.10 Can an improved EWS reduce the loss of life and property?	146
7.11 Conclusions	148
7.12 Disasters cost India \$10bn per year	148
References	151
Annexures	155