

MHVRA

INFORMED DISASTER MANAGEMENT PLAN

2023-2032

DISTRICT THATTA



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PREFACE

Multi-Hazard Vulnerability Risk Assessment (MHVRA) and resultant database are the foundation for evidence-based disaster management plan. Such databases are also an integral part of the implementation of disaster risk reduction and disaster risk management strategies. The MHVRA study of the Thatta district has been conducted successfully using high-resolution satellite imagery and its products like digital elevation models, historical disaster datasets, hydro-meteorological data, pertinent socio-economic data, and various other essential datasets. The hazard, vulnerability, and risk maps at Union Council (UC) level have been prepared and compiled as atlases. Using disaster risk information obtained through MHVRA, the disaster management plan of district Thatta is prepared and being presented to disaster management practitioners, executors, and prominent stakeholders. Before the MHVRA study, the district-level disaster and contingency plans were prepared using conventional methods and human knowledge. In contrast, the MHVRA based disaster management plans are realistic, based on modern techniques and multiple data sources, therefore, are more authentic and reliable for planning and management of disasters in the district.

The disaster management plans are based on MHVRA study carried out to understand the hazard vulnerability and risk at UC levels. The multi-criteria approach used in this disaster management plan offers comprehensive understanding of vulnerable communities at UC levels, while offering concerned authorities with viable and best practices to minimize the hazard impacts to the communities. Also, cost-benefit analysis for recommended mitigation efforts provides clear actionable insights for relevant authorities to take necessary measures.

District-wise disaster management plans will be revised after 10 years on updation of the MHVRA study. The disaster management plan of Thatta is comprehensive and covers guidelines on the complete spectrum of disaster management and standard operating procedures to efficiently cope with disasters and emergencies in the district.

The disaster management plan is duly approved by Provincial Disaster Management Board and demands its proactive implementation in true letter and spirit. The proactive implementation of the plan will ensure reduced disaster losses and damages in the district.

ACKNOWLEDGEMENTS

Multi-Hazard Vulnerability Risk Assessment (MHVRA) based Informed Disaster Management Plan (IDMP) for Sindh Province will help to strengthen the institutional and community level capacity to plan and implement natural hazard risk preparedness, recovery, and reduction in the province through capacity building, public education, and awareness by undertaking steps to reinforce physical, environmental and economic elements, as well as psychosocial wellbeing of communities.

SUPARCO appreciates and acknowledges the efforts of the project officials and professionals' team in preparing this comprehensive IDMP. We would also like to extend special thanks to the Project Director and Project Coordinator, Sindh Resilience Project (SRP), for their valuable inputs and necessary support required during the execution of different project activities.

- - Disclaimer - -

The Informed Disaster Management Plan (IDMP), the product of “Multi-Hazard Vulnerability Risk Assessment (MHVRA) Study” developed for Provincial Disaster Management Authority (PDMA) Sindh under Sindh Resilience Project (PDMA Component) by Pakistan Space and Upper Atmosphere Research Commission (SUPARCO) is based on results of MHVRA 2022 study, satellite imagery, data and information obtained from concerned departments and verifiable online sources. Every effort has been made to make this plan practical and free of errors, however, PDMA Sindh or SUPARCO are not liable for any discrepancy in data obtained from various departments. The Informed Disaster Management Plan or any part of it is not to be used for legal or litigation matters and commercial use. However, the information contained in the IDMP or any part of the IDMP can be used without prior permission of PDMA Sindh with proper citation and acknowledgements.

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INTRODUCTION TO DISASTER MANAGEMENT PLAN OF DISTRICT THATTA

INTRODUCTION

As per the declaration of National Disaster Management Act 2010, the districts are required to develop disaster management plans to effectively cope with disasters and emergencies at district level. The objective of district wise disaster management plan is to adopt a proactive approach in managing disaster risk by building capacity and strengthening institutional mechanisms. The plan is aimed to provide direction and guidelines to district governments and other stakeholders, in a paradigm shift from reactive to a proactive approach, and to layout the standard operating procedures to be followed in the complete cycle of disaster management.

Multi-Hazard Vulnerability Risk Assessment (MHVRA) is integral for proactive risk management, hence under Sindh Resilience Project (PDMA Component), MHVRA has been conducted at the Provincial level. MHVRA is a multi-disciplinary process involving the quantification of the frequency and intensity of possible hazard(s), the assessment of the elements that can be destroyed or damaged from possible disasters, and the degree of the damage each element can sustain when affected by certain disasters of various intensities. The assessment of hazard, exposure, vulnerability and capacity leads to the risk assessment, which indicates the anticipated damages in case of a possible disaster. Disaster risk assessment is normally the first step in planning for disaster management activities. It provides an evidence-based estimation of the risk so that effective risk reduction measures can be employed appropriately and cost-effectively.

The development of MHVRA informed disaster management plan is based on diversified information sources including satellite remote sensing, Digital Elevation Model (DEM), and pertinent information collected from concerned departments. The outcomes for MHVRA study are depicted in atlas including; landuse / landcover, critical infrastructure, hazard, exposure, vulnerability, and risk maps of cyclone and storm surge, drought, earthquake, flood, heatwave, and tsunami at UC level.

The MHVRA Informed Disaster Management Plan is a significant step towards disaster resilient Sindh because the foundation of disaster management plan is laid on realistic disaster risk identification and efficient need-based disaster preparedness and response measures. UC-level multi-disaster risk identification will not only enable active and effective disaster preparedness but also help in disaster risk reduction at the grass-root level. In addition, the plan is intended to strengthen the district disaster management system and provide guidance on pre-disaster preparedness, coordinated response and recovery through implementable agenda.

VISION

Vision of MHVRA Informed Disaster Management Plan is;

- To identify underlying UC level multi-disaster risks in administrative districts of Sindh province.
- To develop realistic Disaster Management Plan for proactive disaster management.
- To ensure prioritization of disaster risk reduction measures at UC level.
- To enforce better coordination for disaster response.
- To improve rehabilitation plans for restoration of livelihood, and organizational capacities of affected communities.

OBJECTIVES

The plan is intended to meet following objectives in 10 years;

1. Building disaster resilience capacity at UC level to minimize the loss of lives, livelihood, assets and environment.
2. Improved understanding of disaster risk, hazard and vulnerabilities to strengthen disaster governance from local level to provincial level.
3. Enhanced preparedness to improve disaster response at grass-root level.
4. Promote and facilitate Disaster Risk Reduction (DRR) in planning and implementation of development projects to increase resilience.
5. Provide clarity on roles and responsibilities of various departments and stakeholders involved in different aspects of disaster management.
6. Promote “Build Back Better” principle in recovery, rehabilitation and reconstruction.
7. Promote social inclusion and communities as partners to reduce and manage disaster risk.
8. Promote disaster prevention and mitigation culture at local level.

REVIEW OF MHVRA INFORMED DISASTER MANAGEMENT PLAN

The MHVRA Informed Disaster Management Plan is planned to be effective for 10 years starting from January 2023 to December 2032 and requires review before completion of 10 years. Periodic review is essential because of following reasons;

1. During 10 years, there will be likely chances of new development in the district hence, vulnerability, exposure, and risk assessment will require updation.

2. Planning is a dynamic process, therefore, disaster management plan must be reviewed periodically to incorporate changes according to the emergence of new eminent disasters and situations.
3. Climate is a dynamic driver of changing hazard risks, therefore, it is important to review disaster management plan in changing disaster scenarios.

Additionally, it is also recommended to review the plan after the occurrence of each disaster event to measure its effectiveness. Necessary adjustment may be carried out in the plan accordingly.

Foregoing in view, it is recommended to formulate a committee to review the disaster management plan. A review of the plan shall be carried out by the concerned DDMA under the supervisory role of PDMA Sindh. Recommended composition of the plan review committee is as follows;

Table 1: Recommended Committee for Reviewing Disaster Management Plan

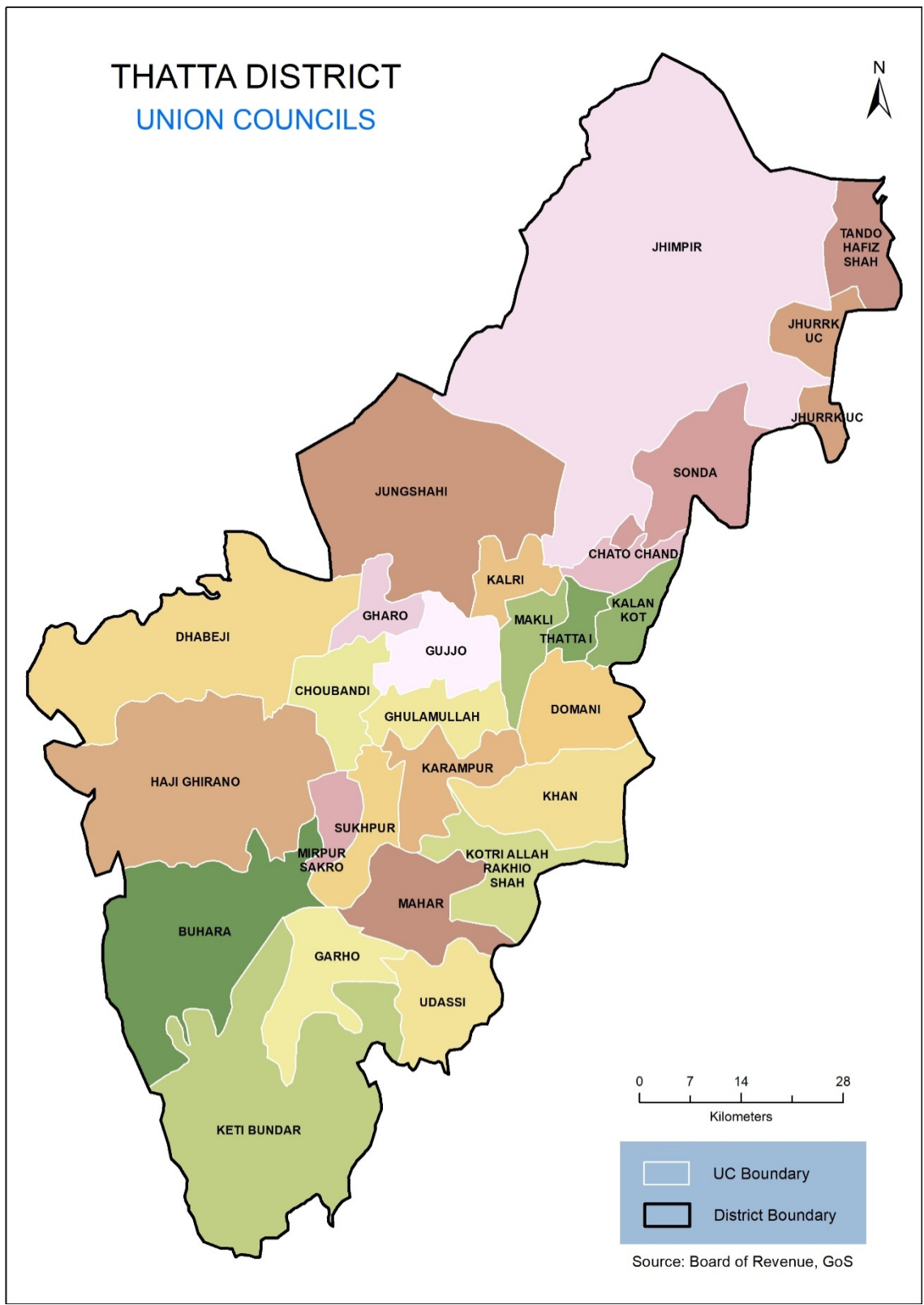
Committee Representative	Role
DG, PDMA Sindh / Dir Ops PDMA	Chairman
Concerned DC or representative officer	Member
Concerned officer from local government	Member
Elected representative of the concerned district	Member
Representatives from disaster affected communities	Member (s)
Representative from SUPARCO	Member
Representative from research / academia experienced in disaster management field	Member (s)
Representative from UN Organization on disaster related domains in Pakistan, especially in Sindh	Member
Representative from reputed NGO working on disaster related domains especially in Sindh	Member
Representatives from Business Committee	Member
Representatives from Chamber of Agriculture	Member
Any other member as deemed appropriate (need basis)	Member

MODES OF REVIEW

Preferred modes of review of plan are;

- a. For a post-disaster review of the plan, PDMA shall conduct a questionnaire-based survey covering pertinent questions to identify gaps or issues in the plan. A questionnaire-based survey can be conducted through online survey services or organizing online meetings. Once issues have been identified by the committee, necessary changes be incorporated in the plan and the revised plan be approved by review committee.
- b. For review before the expiry of the validity of the plan, necessary updation in baseline mapping i.e., hazard, exposure, vulnerability, and risk assessment be carried out to incorporate new developments and disaster situations. Once, baseline mapping is updated, plan is to be updated accordingly. The review committee shall vet the updation of the plan in the light of experience and recommendations. Upon approval from the review committee, the plan shall be effective for next 10-years.

DISASTER RISK PROFILE OF DISTRICT THATTA



GEOGRAPHY

District area in Sq. Km	8,200	
Coordinates	23° 43' N to 25° 26' N 67° 05' E to 68° 45' E	
Surrounding Districts	Jamshoro in North Hyderabad in North East Sujawal in East Malir in West	
Climate Conditions	Moderate	
Coldest Month	December	
Hottest Month	June	
Seasonal Temperatures	Max Mean (°C)	Min Mean (°C)
Spring (March and April)	33.54	21.16
Dry Summer (May and June)	38.32	27.21
Wet Summer (July to September)	35.17	26.54
Autumn (October to November)	34.24	20.79
Winter (December to February)	27.54	13.90
Average Rainfall	151.85	
Physiographic Features	Indus River in East Indus Delta in South West Arabian Sea in South	

DEMOGRAPHY

	Year-1998	Year-2017
Population	599,492	979,817
Urban	91,278	176,058
Rural	508,214	803,759
No. of Household	-	184,868
Average Annual Growth Rate 1998-2017	2.61%	

ECONOMY

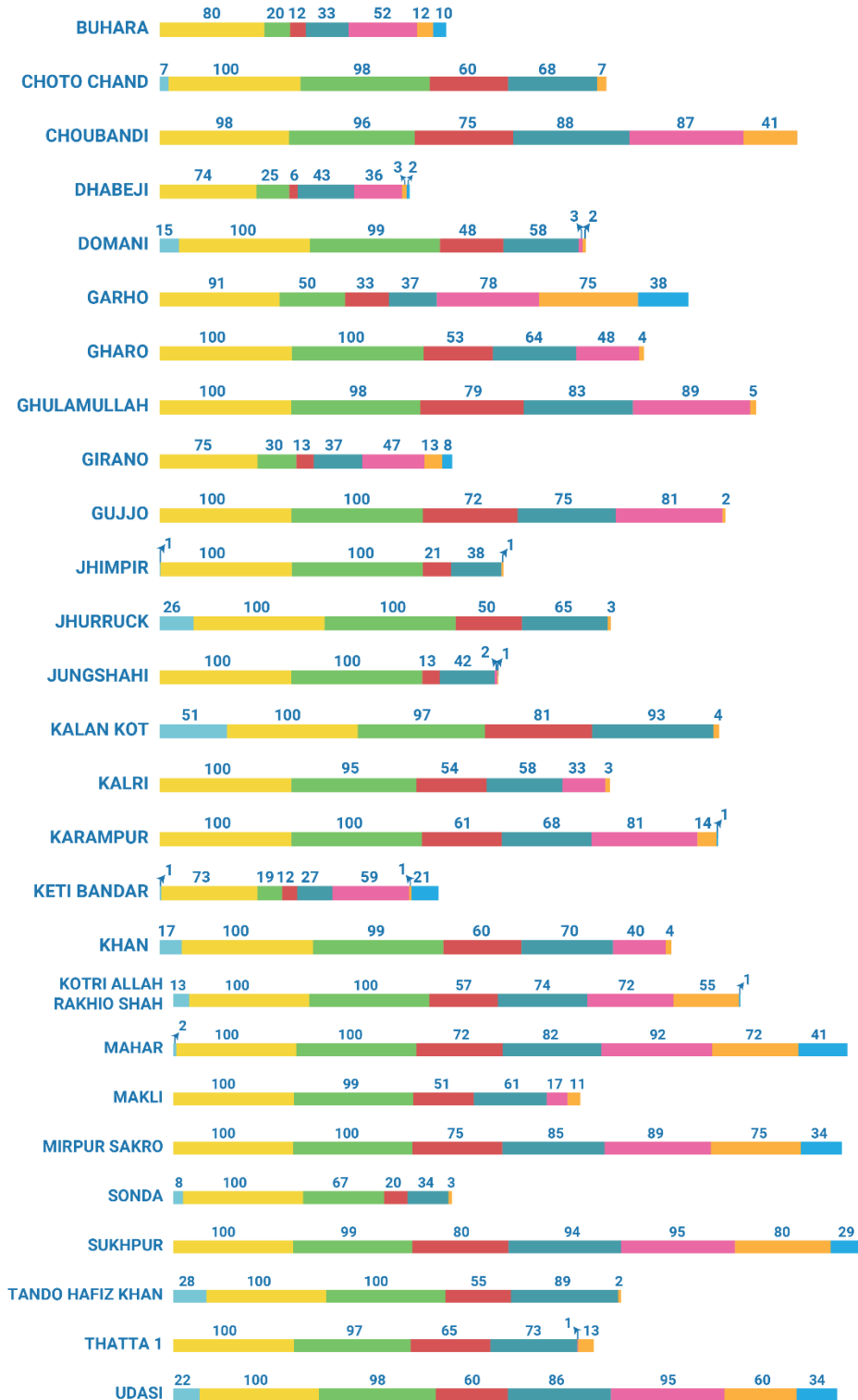
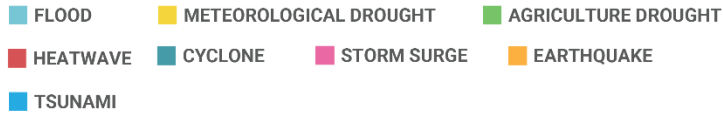
Industries	Fisheries Agriculture
Agriculture	Production in M.tons as per (2016-17)
Major Crops	
Wheat	233,979
Cotton	54,185
Rice	2,002,364
Sugarcane	23,608
Minor Crops	
Barley	1,279
Bajra	56
Jowar	123
Maize	1,108

Taluka Name	UC Name
<ol style="list-style-type: none"> 1. Keti Bandar 2. Mirpur Sakro 3. Thatta 4. Ghora Bari 	<ol style="list-style-type: none"> 1. Keti Bandar 2. Buhara 3. Choubandi 4. Dhabeji 5. Girano 6. Ghulamullah 7. Gharo 8. Gujjo 9. Mirpur Sakro 10. Karampur 11. Sukhpur 12. Domani 13. Choto Chand 14. Kalan Kot 15. Kalri 16. Makli 17. Jungshahi 18. Jhurruck 19. Jhampir 20. Tando Hafiz Khan 21. Thatta 1 22. Sonda 23. Garho 24. Mahar 25. Khan 26. Kotri Allah Rakhio Shah 27. Udasi

THATTADISTRICT MULTI-HAZARD RISK PROFILES

LEGEND

PERCENTAGE OF AREA AT RISK



UC WISE RISK PROFILE

BUHARA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	27.9 sq km
		Kachcha Area	0.308 sq km
		Natural Vegetation in Wet Areas	0.01 sq km
		Pakka Unplanned Area	0.168 sq km
		Range Land	0.02 sq km
		Settlements	11
		Irrigation and Drainage Network	17.715 km
		Road Network	26.394 km
		Population	12277
		Household	2344
Meteorological Drought	Low – Extreme	Settlements	11
		Agriculture Area	28.053 sq km
		Forest Area	126.716 sq km
		Range Land	0.468 sq km
		Wet Area	229.715 sq km
		Natural Vegetation in Wet Areas	0.842 sq km
		Water Body	0.179 sq km
		Population	10254
		Household	1957
Heatwave	Low – Extreme	Settlements	11
		Population	10211
		Household	1949
		Agriculture Area	27.864 sq km
		Kachcha Area	0.309 sq km
		Pakka Unplanned Area	0.168 sq km
Agricultural Drought	Low	Agriculture Area	0.885 sq km
		Range Land	0.047 sq km
		Wet Area	0.008 sq km
Riverine Flood	Low	Forest Area	10.175 sq km
Storm Surge	Low – Extreme	Agriculture Area	4.808 sq km
		Forest Area	118.665 sq km
		Kachcha Area	0.051 sq km
		Natural Vegetation in Wet Areas	0.539 sq km
		Settlements	3
		Irrigation and Drainage Network	2.17 km
		Road Network	2.836 km

		Population	1316
		Household	252
Cyclone	Low	Agriculture Area	27.895 sq km
		Forest Area	12.628 sq km
		Kachcha Area	0.308 sq km
		Natural Vegetation in Wet Areas	0.001 sq km
		Pakka Unplanned Area	0.011 sq km
		Range Land	0.011 sq km
		Settlements	11
		Irrigation and Drainage Network	16.175 km
		Road Network	23.544 km
		Population	8226
		Household	1570
Tsunami	Nil	Agriculture Area	13.231 sq km
		Forest Area	20.993 sq km
		Kachcha Area	0.129 sq km
		Natural Vegetation in Wet Areas	0.693 sq km
		Pakka Unplanned Area	0.085 sq km
		Range Land	0.391 sq km
		Settlements	2
		Irrigation and Drainage Network	1.567 km
		Road Network	7.087 km
		Population	5529
		Household	1053

CHATO CHAND			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	34.537 sq km
		Forest Area	0.004 sq km
		Kachcha Area	0.745 sq km
		Natural Vegetation in Wet Areas	0.027 sq km
		Pakka Planned Area	0.064 sq km
		Pakka Unplanned Area	1.503 sq km
		Range Land	0.043 sq km
		Bridges	7
		Education Facilities	1
		Health Facilities	3
		Settlements	41
		Irrigation and Drainage Network	66.207 km
		Road Network	90.818 km
		Population	13683
		Household	2567
		Bus Stops	1
Industries	1		
Mobile Towers	2		
Petrol Pumps	2		

Meteorological Drought	Low – Extreme	Settlements	41
		Agriculture Area	34.82 sq km
		Forest Area	0.032 sq km
		Bare Area with sparse Natural Vegetation	2.987 sq km
		Natural Vegetation in Wet Areas	11.87 sq km
		Range Land	2.529 sq km
		Water Body	16.998 sq km
		Wet Area	0.508 sq km
		Population	11922
		Household	2238
Agricultural Drought	Low – High	Agriculture Area	2.785 sq km
		Natural Vegetation in Wet Areas	8.804 sq km
		Water Body	1.476 sq km
		Range Land	1.185 sq km
		Population	360
		Household	68
		Settlements	3
		Bare Area with sparse Natural Vegetation	0.607 sq km
Heatwave	Low – Extreme	Settlements	41
		Population	11300
		Household	2118
		Agriculture Area	34.46 sq km
		Kachcha Area	0.745 sq km
		Pakka Planned Area	0.064 sq km
		Pakka Unplanned Area	1.507 sq km
Riverine Flood	Low – Extreme	Agriculture Area	4.267 sq km
		Kachcha Area	0.056 sq km
		Natural Vegetation in Wet Areas	7.103 sq km
		Pakka Unplanned Area	0.03 sq km
		Settlements	1
		Population	863
		Household	162
Storm Surge	Low – Extreme	Agriculture Area	0.517 sq km
		Range Land	0.089 sq km
Cyclone	Low	Agriculture Area	34.498 sq km
		Forest Area	0.004 sq km
		Kachcha Area	0.744 sq km
		Natural Vegetation in Wet Areas	0.02 sq km
		Pakka Planned Area	0.01 sq km
		Pakka Unplanned Area	0.181 sq km

		Range Land	0.031 sq km
		Bridges	4
		Bus Stops	1
		Education Facilities	1
		Health Facilities	2
		Industries	1
		Mobile Towers	1
		Petrol Pumps	2
		Settlements	41
		Irrigation and Drainage Network	40.299 km
		Road Network	59.053 km
		Population	5969
		Household	1121
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

CHOUBANDI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	117.518 sq km
		Forest Area	0.041 sq km
		Kachcha Area	0.275 sq km
		Natural Vegetation in Wet Areas	0.026 sq km
		Pakka Unplanned Area	1.06 sq km
		Range Land	0.381 sq km
		Education Facilities	1
		Petrol Pumps	2
		Settlements	54
		Bridges	7
		Irrigation and Drainage Network	65.538 km
		Road Network	116.741 km
		Population	34143
		Household	6517
Meteorological Drought	Low – Extreme	Agriculture Area	117.938 sq km
		Forest Area	0.651 sq km
		Range Land	10.33 sq km
		Water Body	1.607 sq km
		Wet Area	10.046 sq km
		Population	28440
		Household	5430
		Natural Vegetation in Wet Areas	2.936 sq km
Heatwave	Low – Extreme	Settlements	47
		Population	28284
		Household	5399
		Agriculture Area	117.385 sq km
		Kachcha Area	0.275 sq km

		Pakka Unplanned Area	1.062 sq km
Agricultural Drought	Low – Medium	Settlements	4
		Agriculture Area	14.866 sq km
		Forest Area	0.483 sq km
		Natural Vegetation in Wet Areas	1.411 sq km
		Range Land	8.576 sq km
		Water Body	0.825 sq km
		Wet Area	0.065 sq km
		Population	88
		Household	17
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Low – Extreme	Agriculture Area	0.517 sq km
		Range Land	0.089 sq km
Cyclone	Low	Agriculture Area	117.484 sq km
		Forest Area	0.018 sq km
		Kachcha Area	0.275 sq km
		Natural Vegetation in Wet Areas	0.013 sq km
		Pakka Unplanned Area	0.161 sq km
		Range Land	0.238 sq km
		Bridges	7
		Mobile Towers	2
		Petrol Pumps	2
		Settlements	54
		Irrigation and Drainage Network	59.126 km
		Road Network	104.305 km
		Population	10950
		Household	2090
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

DHABEJI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	33.814 sq km
		Kachcha Area	0.116 sq km
		Pakka Unplanned Area	6.607 sq km
		Pakka Planned Area	4.264 sq km
		Range Land	1.098 sq km
		Bridges	6
		Education Facilities	16
		Health Facilities	10
		Police Stations	2
		Settlements	73
		Irrigation and Drainage Network	16.055 km
		Railway Line	15.664 km
		Road Network	128.092 km

		Population	83068
		Household	15611
		Forest Area	0.174 sq km
		Bus Stops	3
		Grain Mandi	1
		Grid Stations	1
		Industries	12
		Mobile Towers	12
		Petrol Pumps	15
		Post Offices	2
		Power Plant	2
		Tourist Places	1
Meteorological Drought	Low – Extreme	Settlements	71
		Agriculture Area	34.226 sq km
		Bare Area with sparse Natural Vegetation	8.248 sq km
		Forest Area	201.804 sq km
		Natural Vegetation in Wet Areas	0.569 sq km
		Range Land	31.043 sq km
		Water Body	0.046 sq km
		Wet Area	162.244 sq km
		Population	70801
		Household	13307
Agricultural Drought	Low – Extreme	Settlements	46
		Agriculture Area	24.446 sq km
		Bare Area with sparse Natural Vegetation	9.826 sq km
		Forest Area	6.969 sq km
		Natural Vegetation in Wet Areas	0.238 sq km
		Range Land	34.204 sq km
		Water Body	0.056 sq km
		Wet Area	6.897 sq km
		Population	31856
		Household	6065
Heatwave	Low – Extreme	Settlements	64
		Population	68511
		Household	12877
		Agriculture Area	33.749 sq km
		Kachcha Area	0.117 sq km
		Pakka Planned Area	4.258 sq km
		Pakka Unplanned Area	6.599 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Low – Extreme	Agriculture Area	7.76 sq km

		Forest Area	185.498 sq km
		Natural Vegetation in Wet Areas	0.391 sq km
		Pakka Unplanned Area	0.069 sq km
		Range Land	1.738 sq km
		Industries	1
		Petrol Pumps	1
		Power Plants	1
		Settlements	5
		Irrigation and Drainage Network	2.868 km
		Road Network	20.809 km
		Population	1777
		Household	340
Cyclone	Low	Agriculture Area	33.763 sq km
		Forest Area	0.083 sq km
		Kachcha Area	0.116 sq km
		Pakka Planned Area	0.061 sq km
		Pakka Unplanned Area	0.395 sq km
		Range Land	0.234 sq km
		Bus Stops	1
		Industries	2
		Petrol Pumps	1
		Power Plants	1
		Settlements	73
		Tourist Places	1
		Irrigation and Drainage Network	9.865 km
		Railway Line	2.944 km
Road Network	16.487 km		
Population	3697		
Household	703		
Tsunami	Low – Medium	Agriculture Area	0.197 sq km
		Forest Area	40.634 sq km
		Natural Vegetation in Wet Areas	0.272 sq km
		Pakka Unplanned Area	0.056 sq km
		Range Land	0.535 sq km
		Industries	2
		Power Plants	2
		Settlements	2
		Irrigation and Drainage Network	0.05 km
		Road Network	9.693 km
		Population	1434
Household	275		

DOMANI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	82.229 sq km
		Kachcha Area	0.127 sq km
		Natural Vegetation in Wet Areas	0.116 sq km
		Range Land	0.06 sq km
		Pakka Unplanned Area	1.115 sq km

		Education Facilities	1
		Health Facilities	1
		Settlements	45
		Irrigation and Drainage Network	71.949 km
		Road Network	118.5 km
		Population	13926
		Household	2620
Meteorological Drought	Low – Extreme	Settlements	45
		Agriculture Area	82.697 sq km
		Bare Area with sparse Natural Vegetation	19.511 sq km
		Natural Vegetation in Wet Areas	20.856 sq km
		Water Body	45.131 sq km
		Range Land	7.271 sq km
		Wet Area	0.996 sq km
		Population	11746
		Household	2210
Agricultural Drought	Low – High	Settlements	3
		Agriculture Area	3.531 sq km
		Bare Area with sparse Natural Vegetation	5.87 sq km
		Natural Vegetation in Wet Areas	14.804 sq km
		Range Land	4.939 sq km
		Water Body	1.457 sq km
		Wet Area	0.013 sq km
		Population	1456
		Household	272
Heatwave	Low – Extreme	Population	11557
		Household	2177
		Agriculture Area	82.065 sq km
		Kachcha Area	0.127 sq km
		Pakka Unplanned Area	1.12 sq km
Riverine Flood	Low – Extreme	Agriculture Area	30.225 sq km
		Kachcha Area	0.019 sq km
		Natural Vegetation in Wet Areas	11.066 sq km
		Pakka Unplanned Area	0.139 sq km
		Health Facilities	1
		Settlements	7
		Irrigation and Drainage Network	0.834 km
		Road Network	4.088 km
		Population	1341
Household	253		

Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	82.196 sq km
		Kachcha Area	0.127 sq km
		Natural Vegetation in Wet Areas	0.111 sq km
		Pakka Unplanned Area	0.24 sq km
		Range Land	0.057 sq km
		Settlements	45
		Irrigation and Drainage Network	55.691 km
		Road Network	92.982 km
		Population	4252
Household	799		
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

GARHO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	75.005 sq km
		Forest Area	0.051 sq km
		Kachcha Area	0.023 sq km
		Pakka Planned Area	0.457 sq km
		Pakka Unplanned Area	1.149 sq km
		Range Land	0.095 sq km
		Bridges	4
		Education Facilities	5
		Mobile Towers	8
		Petrol Pumps	5
		Settlements	35
		Post Offices	1
		Irrigation and Drainage Network	58.796 km
		Police Stations	1
		Road Network	114.371 km
Population	36317		
Household	7023		
Meteorological Drought	Low – Extreme	Settlements	35
		Agriculture Area	75.386 sq km
		Forest Area	0.539 sq km
		Natural Vegetation in Wet Areas	6.901 sq km
		Range Land	3.838 sq km
		Water Body	3.552 sq km
		Wet Area	94.663 sq km
		Population	30467
Household	5892		
Agricultural Drought	Low – Medium	Settlements	1
		Agriculture Area	5.509 sq km
		Forest Area	0.421 sq km
		Natural Vegetation in Wet Areas	0.341 sq km
		Range Land	2.076 sq km
Water Body	0.684 sq km		

		Wet Area	0.025 sq km
		Population	47
		Household	9
Riverine Flood	Low – Extreme	Forest Area	0.046 sq km
		Pakka Planned Area	0.029 sq km
		Settlements	2
		Irrigation and Drainage Network	1.418 km
		Road Network	0.891 km
		Population	694
		Household	136
Heatwave	Low – Extreme	Settlements	33
		Population	30234
		Household	5846
		Agriculture Area	74.904 sq km
		Kachcha Area	0.023 sq km
		Pakka Planned Area	0.457 sq km
		Pakka Unplanned Area	1.151 sq km
Storm Surge	Low – Extreme	Agriculture Area	37.575 sq km
		Forest Area	0.42 sq km
		Kachcha Area	0.012 sq km
		Pakka Planned Area	0.105 sq km
		Pakka Unplanned Area	0.187 sq km
		Range Land	1.63 sq km
		Bridges	1
		Education Facilities	1
		Mobile Towers	2
		Petrol Pumps	1
		Settlements	13
		Natural Vegetation in Wet Areas	5.093 sq km
		Irrigation and Drainage Network	22.807 km
		Police Stations	
		Road Network	47.462 km
Population	7985		
Household	1550		
Cyclone	Low - Medium	Agriculture Area	74.999 sq km
		Forest Area	0.015 sq km
		Kachcha Area	0.023 sq km
		Pakka Planned Area	0.164 sq km
		Pakka Unplanned Area	0.183 sq km
		Range Land	0.054 sq km
		Bridges	2
		Education Facilities	1
		Police Stations	1
		Petrol Pumps	2
		Settlements	35
		Natural Vegetation in Wet Areas	5.417 sq km
		Irrigation and Drainage Network	40.829 km
		Road Network	88.282 km

		Population	9603
		Household	1860
Tsunami	Low – High	Agriculture Area	58.314 sq km
		Forest Area	0.418 sq km
		Kachcha Area	0.022 sq km
		Pakka Planned Area	0.034 sq km
		Pakka Unplanned Area	0.872 sq km
		Range Land	3.747 sq km
		Bridges	4
		Education Facilities	3
		Police Stations	1
		Petrol Pumps	2
		Settlements	21
		Natural Vegetation in Wet Areas	6.666 sq km
		Irrigation and Drainage Network	30.166 km
		Road Network	77.949 km
		Population	15523
		Household	3009
Health Facilities	2		
Mobile Towers	3		

GHARO			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	39.335 sq km
		Forest Area	0.011 sq km
		Kachcha Area	0.094 sq km
		Natural Vegetation in Wet Areas	0.012 sq km
		Pakka Unplanned Area	1.148 sq km
		Range Land	0.331 sq km
		Bridges	4
		Bus Stops	2
		Education Facilities	2
		Grid Stations	1
		Health Facilities	3
		Industries	3
		Mobile Towers	1
		Petrol Pumps	2
		Settlements	19
		Tourist Places	2
		Irrigation and Drainage Network	53.13 km
		Railway Line	3.814 km
Road Network	84.433 km		
Population	14665		
Household	2800		

Heatwave	Low - Extreme	Settlements	19
		Population	12102
		Household	2311
		Agriculture Area	39.281 sq km
		Kachcha Area	0.094 sq km
		Pakka Unplanned Area	1.146 sq km
Meteorological Drought	Low - Extreme	Settlements	19
		Agriculture Area	39.569 sq km
		Bare Area with sparse Natural Vegetation	5.881 sq km
		Forest Area	0.874 sq km
		Natural Vegetation in Wet Areas	0.477 sq km
		Range Land	7.264 sq km
		Water Body	1.873 sq km
		Wet Area	10.879 sq km
		Population	12229
		Household	2336
Agricultural Drought	Low - Extreme	Settlements	7
		Agriculture Area	24.977 sq km
		Bare Area with sparse Natural Vegetation	7.129 sq km
		Forest Area	1.06 sq km
		Natural Vegetation in Wet Areas	0.57 sq km
		Range Land	7.842 sq km
		Water Body	1.885 sq km
		Wet Area	8.766 sq km
		Population	6426
		Household	1228
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	39.306 sq km
		Forest Area	0.011 sq km
		Kachcha Area	0.094 sq km
		Pakka Unplanned Area	0.114 sq km
		Range Land	0.091 sq km
		Bridges	2
		Bus Stops	2
		Education Facilities	1
		Petrol Pumps	2
		Settlements	19
		Tourist Places	2
		Irrigation and Drainage Network	44.586 km
		Railway Line	0.007 km
		Road Network	64.662 km
Population	2924		

		Household	559
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

GHULAMULLAH			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	102.276 sq km
		Kachcha Area	0.381 sq km
		Natural Vegetation in Wet Areas	0.023 sq km
		Pakka Planned Area	0.08 sq km
		Pakka Unplanned Area	1.098 sq km
		Range Land	0.251 sq km
		Health Facilities	1
		Mobile Towers	2
		Settlements	52
		Irrigation and Drainage Network	77.437 km
		Road Network	156.922 km
		Population	40241
		Household	7681
Heatwave	Low - Extreme	Settlements	47
		Population	33329
		Household	6363
		Agriculture Area	102.11 sq km
		Kachcha Area	0.381 sq km
		Pakka Planned Area	0.08 sq km
		Pakka Unplanned Area	1.1 sq km
Meteorological Drought	Medium – Extreme	Settlements	52
		Agriculture Area	102.713 sq km
		Natural Vegetation in Wet Areas	1.707 sq km
		Range Land	5.174 sq km
		Water Body	12.496 sq km
		Wet Area	10.431 sq km
		Population	33558
		Household	6404
Agricultural Drought	Low – High	Settlements	4
		Agriculture Area	9.189 sq km
		Natural Vegetation in Wet Areas	0.011 sq km
		Range Land	2.545 sq km
		Water Body	2.798 sq km
		Wet Area	0.474 sq km
		Population	120

		Household	23
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	102.221 sq km
		Kachcha Area	0.381 sq km
		Natural Vegetation in Wet Areas	0.022 sq km
		Pakka Planned Area	0.012 sq km
		Pakka Unplanned Area	0.161 sq km
		Range Land	0.146 sq km
		Settlements	52
		Irrigation and Drainage Network	61.619 km
		Road Network	130.146 km
		Population	14287
		Household	2725
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

GUJJO			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	113.256 sq km
		Forest Area	0.053 sq km
		Kachcha Area	0.552 sq km
		Pakka Planned Area	0.009 sq km
		Pakka Unplanned Area	0.636 sq km
		Range Land	0.176 sq km
		Bridges	1
		Education Facilities	2
		Petrol Pumps	2
		Settlements	50
		Irrigation and Drainage Network	127.779 km
		Road Network	134.95 km
		Population	30237
		Household	5768
Heatwave	Low - Extreme	Settlements	45
		Population	25053
		Household	4782
		Agriculture Area	113.057 sq km
		Kachcha Area	0.554 sq km
		Pakka Planned Area	0.009 sq km
		Pakka Unplanned Area	0.638 sq km
Meteorological	Low - Extreme	Settlements	50

Drought		Agriculture Area	113.92 sq km
		Bare Area with sparse Natural Vegetation	0.847 sq km
		Forest Area	0.47 sq km
		Natural Vegetation in Wet Areas	0.314 sq km
		Range Land	2.913 sq km
		Water Body	15.076 sq km
		Wet Area	24.908 sq km
		Population	25242
		Household	4814
Agricultural Drought	Low - High	Settlements	1
		Agriculture Area	37.269 sq km
		Forest Area	0.385 sq km
		Natural Vegetation in Wet Areas	0.38 sq km
		Range Land	1.27 sq km
		Water Body	5.14 sq km
		Wet Area	14.909 sq km
		Population	1070
		Household	205
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	113.199 sq km
		Forest Area	0.016 sq km
		Kachcha Area	0.552 sq km
		Pakka Planned Area	0.006 sq km
		Pakka Unplanned Area	0.157 sq km
		Range Land	0.099 sq km
		Bridges	1
		Education Facilities	2
		Petrol Pumps	2
		Settlements	50
		Irrigation and Drainage Network	101.702 km
		Road Network	110.954 km
		Population	17781
		Household	3395
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

HAJI GHIRANO			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	87.941 sq km
		Forest Area	0.008 sq km
		Kachcha Area	0.008 sq km

		Natural Vegetation in Wet Areas	0.017 sq km
		Pakka Unplanned Area	1.453 sq km
		Range Land	0.544 sq km
		Bridges	1
		Health Facilities	1
		Industries	2
		Power Plant	3
		Settlements	37
		Irrigation and Drainage Network	66.469 km
		Road Network	139.886 km
		Population	37729
		Household	7203
Heatwave	Low – Extreme	Settlements	31
		Population	31294
		Household	5972
		Agriculture Area	87.805 sq km
		Kachcha Area	0.008 sq km
		Pakka Unplanned Area	1.456 sq km
Meteorological Drought	Low – Extreme	Settlements	37
		Agriculture Area	88.431 sq km
		Forest Area	133.77 sq km
		Natural Vegetation in Wet Areas	6.692 sq km
		Range Land	17.575 sq km
		Water Body	0.265 sq km
		Wet Area	262.909 sq km
		Population	31537
Household	6017		
Agricultural Drought	Low – Medium	Settlements	8
		Agriculture Area	27.748 sq km
		Forest Area	0.504 sq km
		Natural Vegetation in Wet Areas	2.03 sq km
		Range Land	16.221 sq km
		Wet Area	22.627 sq km
		Population	2460
		Household	468
Storm Surge	Storm Surge	Agriculture Area	26.029 sq km
		Forest Area	109.269 sq km
		Natural Vegetation in Wet Areas	4.872 sq km
		Pakka Unplanned Area	0.074 sq km
		Range Land	1.358 sq km
		Bridges	1
		Industries	2

		Power Plants	2
		Settlements	7
		Irrigation and Drainage Network	13.838 km
		Road Network	22.027 km
		Population	1898
		Household	360
Cyclone	Low	Agriculture Area	87.911 sq km
		Forest Area	0.007 sq km
		Kachcha Area	0.008 sq km
		Natural Vegetation in Wet Areas	0.007 sq km
		Pakka Unplanned Area	0.165 sq km
		Range Land	0.254 sq km
		Health Facilities	1
		Industries	1
		Power Plants	2
		Settlements	37
		Irrigation and Drainage Network	46.121 km
		Road Network	72.109 km
		Population	4474
Household	851		
Tsunami	Low – High	Agriculture Area	36.287 sq km
		Forest Area	31.278 sq km
		Natural Vegetation in Wet Areas	4.386 sq km
		Pakka Unplanned Area	0.388 sq km
		Range Land	10.604 sq km
		Industries	2
		Power Plants	3
		Settlements	16
		Irrigation and Drainage Network	15.542 km
		Road Network	27.216 km
		Population	10010
		Household	1912

JHIMPIR			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low - Extreme	Agriculture Area	9.45 sq km
		Forest Area	0.078 sq km
		Natural Vegetation in Wet Areas	3.736 sq km
		Pakka Unplanned Area	0.016 sq km
		Range Lands	0.003 sq km
		Road Network	0.885 km
		Population	181
		Household	34

Earthquake	Low	Agriculture Area	402.19 sq km
		Forest Area	0.085 sq km
		Kachcha Area	3.2 sq km
		Natural Vegetation in Wet Areas	0.173 sq km
		Pakka Planned Area	0.286 sq km
		Pakka Unplanned Area	19.853 sq km
		Range Land	3.849 sq km
		Bridges	13
		Education Facilities	1
		Grid Stations	19
		Health Facilities	2
		Mobile Towers	25
		Petrol Pumps	12
		Post Offices	1
		Power Plant	16
		Settlements	190
		Irrigation and Drainage Network	13.775 km
		Railway Line	54.455 km
		Road Network	482.113 km
Population	104198		
Household	19532		
Heatwave	Low – Extreme	Settlements	147
		Population	85523
		Household	16033
		Agriculture Area	401.052 sq km
		Kachcha Area	3.203 sq km
		Pakka Planned Area	0.286 sq km
		Pakka Unplanned Area	19.859 sq km
Meteorological Drought	Low – Extreme	Settlements	181
		Agriculture Area	406.963 sq km
		Bare Area with sparse Natural Vegetation	644.708 sq km
		Forest Area	4.134 sq km
		Natural Vegetation in Wet Areas	36.91 sq km
		Range Land	254.974 sq km
		Water Body	25.751 sq km
		Wet Area	7.297 sq km
		Population	85872
Household	16092		
Agricultural Drought	Low – Extreme	Settlements	161
		Agriculture Area	461.062 sq km
		Bare Area with sparse Natural Vegetation	761.684 sq km
		Forest Area	4.506 sq km

		Natural Vegetation in Wet Areas	20.039 sq km
		Range Land	301.919 sq km
		Water Body	1.902 sq km
		Wet Area	7.938 sq km
		Population	69276
		Household	12989
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	116.023 sq km
		Forest Area	0.069 sq km
		Kachcha Area	1.295 sq km
		Natural Vegetation in Wet Areas	0.07 sq km
		Pakka Planned Area	0.014 sq km
		Pakka Unplanned Area	0.214 sq km
		Range Land	0.991 sq km
		Bridges	3
		Petrol Pumps	2
		Power Plants	1
		Settlements	92
		Irrigation and Drainage Network	4.982 km
		Railway Line	3.644 km
		Road Network	23.455 km
		Population	16395
		Household	3072
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

JHURRUCK			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low - Extreme	Agriculture Area	37.456 sq km
		Forest Area	0.006 sq km
		Kachcha Area	0.077 sq km
		Natural Vegetation in Wet Areas	15.645 sq km
		Pakka Planned Area	0.067 sq km
		Pakka Unplanned Area	0.194 sq km
		Settlements	15
		Irrigation and Drainage Network	0.543 km
		Road Network	1.552 km
		Population	3841
		Household	719
Earthquake	Low	Agriculture Area	64.873 sq km
		Forest Area	0.005 sq km
		Kachcha Area	0.798 sq km
		Natural Vegetation in Wet Areas	0.181 sq km

		Pakka Planned Area	0.417 sq km
		Pakka Unplanned Area	0.909 sq km
		Range Land	0.086 sq km
		Bridges	6
		Education Facilities	3
		Grid Stations	1
		Health Facilities	2
		Mobile Towers	3
		Petrol Pumps	1
		Police Stations	1
		Settlements	39
		Irrigation and Drainage Network	11.656 km
		Road Network	38.396 km
		Population	24135
		Household	4529
Heatwave	Low – Extreme	Settlements	38
		Population	19880
		Household	3731
		Agriculture Area	64.75 sq km
		Kachcha Area	0.798 sq km
		Pakka Planned Area	0.418 sq km
		Pakka Unplanned Area	0.915 sq km
Meteorological Drought	Low – Extreme	Settlements	38
		Agriculture Area	65.148 sq km
		Bare Area with sparse Natural Vegetation	5.689 sq km
		Forest Area	0.165 sq km
		Natural Vegetation in Wet Areas	18.304 sq km
		Range Land	1.796 sq km
		Water Body	1.388 sq km
		Wet Area	0.106 sq km
		Population	19941
Household	3739		
Agricultural Drought	Low – Extreme	Settlements	12
		Agriculture Area	41.338 sq km
		Bare Area with sparse Natural Vegetation	6.621 sq km
		Forest Area	0.201 sq km
		Natural Vegetation in Wet Areas	19.991 sq km
		Range Land	2.142 sq km
		Water Body	1.561 sq km
		Wet Area	0.068 sq km
		Population	10547
Household	1975		

Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	24.924 sq km
		Forest Area	0.005 sq km
		Kachcha Area	0.077 sq km
		Natural Vegetation in Wet Areas	0.137 sq km
		Pakka Planned Area	0.015 sq km
		Pakka Unplanned Area	0.009 sq km
		Range Land	0.001 sq km
		Bridges	1
		Settlements	3
		Irrigation and Drainage Network	0.062 km
		Road Network	0.053 km
		Population	1144
		Household	213
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

JUNGSHAHI			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	92.161 sq km
		Forest Area	0.224 sq km
		Kachcha Area	0.95 sq km
		Natural Vegetation in Wet Areas	0.11 sq km
		Pakka Planned Area	0.142 sq km
		Pakka Unplanned Area	2.161 sq km
		Range Land	2.296 sq km
		Bridges	2
		Bus Stops	3
		Education Facilities	5
		Health Facilities	3
		Mobile Towers	3
		Police Stations	1
		Post Offices	1
		Power Plant	3
		Settlements	56
		Tourist Places	1
		Irrigation and Drainage Network	25.611 km
		Railway Line	31.854 km
		Road Network	120.404 km
Population	40208		
Household	7552		

Heatwave	Low – Extreme	Settlements	44
		Population	33153
		Household	6231
		Agriculture Area	91.942 sq km
		Kachcha Area	0.95 sq km
		Pakka Planned Area	0.142 sq km
		Pakka Unplanned Area	2.162 sq km
Meteorological Drought	Low – Extreme	Settlements	55
		Agriculture Area	94.073 sq km
		Bare Area with sparse Natural Vegetation	233.329 sq km
		Forest Area	11.533 sq km
		Natural Vegetation in Wet Areas	3.504 sq km
		Range Land	181.582 sq km
		Water Body	15.715 sq km
		Wet Area	1.05 sq km
		Population	33597
		Household	6314
Agricultural Drought	Low – Extreme	Settlements	48
		Agriculture Area	106.474 sq km
		Bare Area with sparse Natural Vegetation	282.623 sq km
		Forest Area	14.001 sq km
		Natural Vegetation in Wet Areas	2.934 sq km
		Range Land	220.043 sq km
		Water Body	5.578 sq km
		Wet Area	1.074 sq km
		Population	29186
		Household	5470
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	92.125 sq km
		Forest Area	0.09 sq km
		Kachcha Area	0.95 sq km
		Natural Vegetation in Wet Areas	0.003 sq km
		Pakka Planned Area	0.018 sq km
		Pakka Unplanned Area	0.122 sq km
		Range Land	1.359 sq km
		Bus Stops	1
		Mobile Towers	2
		Settlements	56
		Tourist Places	1
		Irrigation and Drainage Network	11.7 km
Railway Line	3.444 km		

		Road Network	25.473 km
		Population	13105
		Household	2454
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KALAN KOT			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low – Extreme	Agriculture Area	39.431 sq km
		Forest Area	0.05 sq km
		Kachcha Area	0.016 sq km
		Natural Vegetation in Wet Areas	17.558 sq km
		Pakka Unplanned Area	0.413 sq km
		Bridges	1
		Settlements	11
		Irrigation and Drainage Network	2.383 km
		Road Network	5.074 km
		Population	4871
		Household	912
Earthquake	Low	Agriculture Area	59.214 sq km
		Forest Area	0.045 sq km
		Kachcha Area	0.016 sq km
		Natural Vegetation in Wet Areas	0.232 sq km
		Pakka Planned Area	0.147 sq km
		Pakka Unplanned Area	1.139 sq km
		Range Land	0.102 sq km
		Bridges	2
		Industries	1
		Petrol Pumps	1
		Settlements	41
		Irrigation and Drainage Network	33.792 km
		Road Network	38.899 km
		Population	12141
Household	2276		
Heatwave	Low – Extreme	Settlements	39
		Population	10064
		Household	1886
		Agriculture Area	59.091 sq km
		Kachcha Area	0.016 sq km
		Pakka Planned Area	0.148 sq km
		Pakka Unplanned Area	1.144 sq km
Meteorological Drought	Low – Extreme	Settlements	41
		Agriculture Area	59.506 sq km

		Forest Area	0.219 sq km
		Natural Vegetation in Wet Areas	21.422 sq km
		Range Land	1.392 sq km
		Water Body	3.147 sq km
		Wet Area	0.774 sq km
		Population	10154
		Household	1904
Agricultural Drought	Low – Medium	Agriculture Area	11.229 sq km
		Natural Vegetation in Wet Areas	13.431 sq km
		Water Body	0.629 sq km
		Wet Area	0.005 sq km
		Population	10
		Household	2
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	59.178 sq km
		Forest Area	0.018 sq km
		Kachcha Area	0.016 sq km
		Natural Vegetation in Wet Areas	0.15 sq km
		Pakka Planned Area	0.021 sq km
		Pakka Unplanned Area	0.27 sq km
		Range Land	0.045 sq km
		Bridges	1
		Petrol Pumps	1
		Settlements	41
		Irrigation and Drainage Network	30.134 km
		Road Network	31.179 km
		Population	3155
		Household	592
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KALRI			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	49.445 sq km
		Forest Area	0.046 sq km
		Kachcha Area	0.405 sq km
		Natural Vegetation in Wet Areas	0.015 sq km
		Pakka Unplanned Area	0.9 sq km
		Range Land	0.107 sq km
		Bridges	4
		Bus Stops	1

		Education Facilities	2
		Health Facilities	1
		Mobile Towers	1
		Petrol Pumps	1
		Police Stations	1
		Settlements	56
		Tourist Places	1
		Irrigation and Drainage Network	80.093 km
		Road Network	87.502 km
		Population	14804
		Household	2777
Heatwave	Low – Extreme	Settlements	55
		Population	12210
		Household	2289
		Agriculture Area	49.397 sq km
		Kachcha Area	0.405 sq km
		Pakka Unplanned Area	0.9 sq km
Meteorological Drought	Low – Extreme	Settlements	56
		Agriculture Area	49.78 sq km
		Bare Area with sparse Natural Vegetation	1.056 sq km
		Forest Area	0.234 sq km
		Natural Vegetation in Wet Areas	0.525 sq km
		Range Land	4.742 sq km
		Water Body	27.068 sq km
		Wet Area	3.119 sq km
		Population	12403
		Household	2325
Agricultural Drought	Low – Extreme	Settlements	1
		Agriculture Area	1.625 sq km
		Bare Area with sparse Natural Vegetation	0.318 sq km
		Forest Area	0.003 sq km
		Natural Vegetation in Wet Areas	0.093 sq km
		Range Land	3.664 sq km
		Water Body	0.867 sq km
		Wet Area	1.389 sq km
		Population	767
		Household	143
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	49.397 sq km
		Forest Area	0.019 sq km

		Kachcha Area	0.404 sq km
		Natural Vegetation in Wet Areas	0.001 sq km
		Pakka Unplanned Area	0.311 sq km
		Range Land	0.07 sq km
		Bridges	3
		Bus Stops	1
		Mobile Towers	1
		Petrol Pumps	1
		Police Stations	1
		Settlements	56
		Tourist Places	1
		Irrigation and Drainage Network	61.085 km
		Road Network	75.932 km
		Population	8139
		Household	1524
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KARAMPUR			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	103.532 sq km
		Kachcha Area	0.068 sq km
		Natural Vegetation in Wet Areas	0.048 sq km
		Pakka Planned Area	0.156 sq km
		Pakka Unplanned Area	0.667 sq km
		Range Land	0.13 sq km
		Health Facilities	2
		Settlements	38
		Irrigation and Drainage Network	108.873 km
		Road Network	166.65 km
		Population	23074
Household	4407		
Heatwave	Low – Extreme	Settlements	33
		Population	19102
		Household	3647
		Agriculture Area	103.386 sq km
		Kachcha Area	0.068 sq km
		Pakka Planned Area	0.156 sq km
		Pakka Unplanned Area	0.667 sq km
Meteorological Drought	Medium – Extreme	Settlements	38
		Agriculture Area	103.96 sq km
		Natural Vegetation in Wet Areas	1.946 sq km

		Range Land	2.461 sq km
		Water Body	7.299 sq km
		Wet Area	44.737 sq km
		Population	19287
		Household	3682
Agricultural Drought	Low – Medium	Agriculture Area	13.869 sq km
		Natural Vegetation in Wet Areas	1.029 sq km
		Range Land	0.37 sq km
		Water Body	4.761 sq km
		Wet Area	20.506 sq km
		Population	52
		Household	10
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	103.488 sq km
		Kachcha Area	0.068 sq km
		Natural Vegetation in Wet Areas	0.012 sq km
		Pakka Planned Area	0.01 sq km
		Pakka Unplanned Area	0.132 sq km
		Range Land	0.078 sq km
		Health Facilities	1
		Settlements	38
		Irrigation and Drainage Network	86.178 km
		Road Network	136.746 km
		Population	5454
		Household	1043
Tsunami	Low – High	Agriculture Area	1.482 sq km
		Natural Vegetation in Wet Areas	0.52 sq km
		Range Land	0.005 sq km
		Irrigation and Drainage Network	2.358 km
		Road Network	4.094 km

KETI BUNDAR			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low - Extreme	Agriculture Area	40.608 sq km
		Forest Area	28.243 sq km
		Kachcha Area	0.157 sq km
		Natural Vegetation in Wet Areas	22.071 sq km
		Pakka Planned Area	0.192 sq km
		Pakka Unplanned Area	0.866 sq km
		Range Lands	0.012 sq km
		Education Facilities	1
Health Facilities	2		

		Mobile Towers	6
		Settlements	32
		Tourist Places	1
		Irrigation and Drainage Network	12.579 km
		Road Network	34.7 km
		Population	20448
		Household	4083
Earthquake	Low	Agriculture Area	141.121 sq km
		Forest Area	0.051 sq km
		Kachcha Area	0.165 sq km
		Natural Vegetation in Wet Areas	0.256 sq km
		Pakka Planned Area	0.432 sq km
		Pakka Unplanned Area	1.785 sq km
		Range Land	0.905 sq km
		Bridges	2
		Education Facilities	6
		Health Facilities	3
		Mobile Towers	6
		Settlements	70
		Tourist Places	1
		Irrigation and Drainage Network	93.133 km
		Road Network	138.281 km
Population	47199		
Household	9326		
Heatwave	Low – Extreme	Settlements	64
		Population	39379
		Household	7778
		Agriculture Area	140.896 sq km
		Kachcha Area	0.165 sq km
		Pakka Planned Area	0.432 sq km
		Pakka Unplanned Area	1.788 sq km
Meteorological Drought	Low – Extreme	Settlements	70
		Agriculture Area	141.948 sq km
		Forest Area	38.466 sq km
		Natural Vegetation in Wet Areas	26.102 sq km
		Range Land	26.767 sq km
		Water Body	3.5 sq km
		Wet Area	403.728 sq km
		Population	40131
		Household	7931
Agricultural Drought	Low – High	Settlements	1
		Agriculture Area	45.217 sq km

		Forest Area	1.983 sq km
		Natural Vegetation in Wet Areas	5.92 sq km
		Range Land	25.923 sq km
		Water Body	0.716 sq km
		Wet Area	6.363 sq km
		Population	721
		Household	142
Storm Surge	Low – Extreme	Agriculture Area	117.458 sq km
		Forest Area	36.798 sq km
		Kachcha Area	0.137 sq km
		Natural Vegetation in Wet Areas	23.076 sq km
		Pakka Planned Area	0.309 sq km
		Pakka Unplanned Area	1.167 sq km
		Range Land	19.065 sq km
		Bridges	2
		Education Facilities	4
		Health Facilities	2
		Mobile Towers	6
		Settlements	52
		Tourist Places	1
		Irrigation and Drainage Network	64.485 km
		Road Network	90.467 km
Population	32278		
Household	6393		
Cyclone	Low – Medium	Agriculture Area	141.22 sq km
		Forest Area	13.79 sq km
		Kachcha Area	0.166 sq km
		Natural Vegetation in Wet Areas	12.166 sq km
		Pakka Planned Area	0.431 sq km
		Pakka Unplanned Area	1.224 sq km
		Range Land	5.536 sq km
		Education Facilities	6
		Health Facilities	3
		Mobile Towers	6
		Settlements	70
		Tourist Places	1
		Irrigation and Drainage Network	59.54 km
		Road Network	97.561 km
		Population	34290
Household	6794		
Tsunami	Low – High	Agriculture Area	129.7 sq km
		Forest Area	17.912 sq km
		Kachcha Area	0.121 sq km

		Natural Vegetation in Wet Areas	24.034 sq km
		Pakka Planned Area	0.205 sq km
		Pakka Unplanned Area	1.524 sq km
		Range Land	26.301 sq km
		Bridges	1
		Education Facilities	5
		Health Facilities	3
		Mobile Towers	6
		Settlements	48
		Tourist Places	1
		Irrigation and Drainage Network	74.524 km
		Road Network	118.835 km
		Population	36039
		Household	7105

KHAN			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low – Extreme	Agriculture Area	45.814 sq km
		Kachcha Area	0.23 sq km
		Natural Vegetation in Wet Areas	18.712 sq km
		Range Lands	0.001 sq km
		Settlements	3
		Road Network	0.196 km
		Population	3686
		Household	708
Earthquake	Low	Agriculture Area	132.646 sq km
		Kachcha Area	0.303 sq km
		Natural Vegetation in Wet Areas	0.273 sq km
		Pakka Planned Area	0.599 sq km
		Pakka Unplanned Area	1.149 sq km
		Range Land	0.089 sq km
		Bus Stops	1
		Grid Stations	1
		Health Facilities	5
		Post Offices	1
		Settlements	55
		Irrigation and Drainage Network	89.104 km
		Road Network	182.653 km
		Population	53065
Household	10183		
Heatwave	Low – Extreme	Settlements	51
		Population	44083
		Household	8462
		Agriculture Area	132.383 sq km

		Kachcha Area	0.304 sq km
		Pakka Planned Area	0.601 sq km
		Pakka Unplanned Area	1.153 sq km
Meteorological Drought	Low – Extreme	Settlements	54
		Agriculture Area	133.416 sq km
		Natural Vegetation in Wet Areas	36.208 sq km
		Range Land	1.792 sq km
		Water Body	45.479 sq km
		Wet Area	13.437 sq km
		Population	44326
		Household	8509
Agricultural Drought	Low – High	Settlements	4
		Agriculture Area	23.576 sq km
		Natural Vegetation in Wet Areas	14.209 sq km
		Range Land	1.421 sq km
		Water Body	19.885 sq km
		Wet Area	3.613 sq km
		Population	72
		Household	13
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	132.592 sq km
		Kachcha Area	0.303 sq km
		Natural Vegetation in Wet Areas	0.266 sq km
		Pakka Planned Area	0.027 sq km
		Pakka Unplanned Area	0.205 sq km
		Range Land	0.052 sq km
		Grid Stations	1
		Settlements	55
		Irrigation and Drainage Network	57.274 km
		Road Network	129.034 km
		Population	11066
		Household	2121
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KOTRI ALLAH RAKHIO SHAH			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low – Extreme	Agriculture Area	38.871 sq km
		Natural Vegetation in Wet Areas	17.25 sq km
		Pakka Unplanned Area	0.474 sq km
		Settlements	10

		Road Network	2.693 km
		Population	12284
		Household	2359
Earthquake	Low	Agriculture Area	104.391 sq km
		Kachcha Area	0.04 sq km
		Natural Vegetation in Wet Areas	0.337 sq km
		Pakka Unplanned Area	1.217 sq km
		Range Land	0.181 sq km
		Bridges	2
		Health Facilities	1
		Mobile Towers	1
		Settlements	22
		Irrigation and Drainage Network	65.12 km
		Road Network	121.007 km
		Population	36523
Household	7027		
Heatwave	Low – Extreme	Settlements	22
		Population	30417
		Household	5853
		Agriculture Area	104.085 sq km
		Kachcha Area	0.04 sq km
		Pakka Unplanned Area	1.222 sq km
Meteorological Drought	Low – Extreme	Settlements	22
		Agriculture Area	105.186 sq km
		Natural Vegetation in Wet Areas	32.809 sq km
		Range Land	6.982 sq km
		Water Body	26.225 sq km
		Wet Area	14.992 sq km
		Population	30629
		Household	5893
Agricultural Drought	Low – High	Agriculture Area	14.66 sq km
		Natural Vegetation in Wet Areas	10.302 sq km
		Range Land	1.707 sq km
		Water Body	21.633 sq km
		Wet Area	1.421 sq km
		Population	87
		Household	16
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	104.34 sq km
		Kachcha Area	0.04 sq km

		Natural Vegetation in Wet Areas	0.25 sq km
		Pakka Unplanned Area	0.14 sq km
		Range Land	0.116 sq km
		Bridges	2
		Settlements	22
		Irrigation and Drainage Network	51.598 km
		Road Network	94.457 km
		Population	4928
		Household	947

Tsunami	Low – Medium	Agriculture Area	1.822 sq km
		Natural Vegetation in Wet Areas	0.003 sq km
		Pakka Unplanned Area	0.073 sq km
		Range Land	0.08 sq km
		Settlements	1
		Irrigation and Drainage Network	0.968 km
		Road Network	2.08 km
		Population	2060
		Household	395

MAHAR

Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low – Extreme	Agriculture Area	5.266 sq km
		Natural Vegetation in Wet Areas	8.847 sq km
		Pakka Unplanned Area	0.03 sq km
		Settlements	3
		Road Network	2.565 km
		Population	858
		Household	165

Earthquake	Low	Agriculture Area	146.738 sq km
		Forest Area	0.002 sq km
		Kachcha Area	0.354 sq km
		Natural Vegetation in Wet Areas	0.281 sq km
		Pakka Planned Area	0.046 sq km
		Pakka Unplanned Area	0.595 sq km
		Range Land	0.415 sq km
		Health Facilities	1
		Petrol Pumps	1
		Settlements	27
		Irrigation and Drainage Network	80.706 km
		Road Network	181.225 km
		Population	28072
		Household	5392

Heatwave	Low – Extreme	Settlements	20
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		Population	23381
		Household	4488
		Agriculture Area	146.498 sq km
		Kachcha Area	0.355 sq km
		Pakka Planned Area	0.046 sq km
		Pakka Unplanned Area	0.598 sq km
Meteorological Drought	Low – Extreme	Settlements	27
		Agriculture Area	147.359 sq km
		Forest Area	0.048 sq km
		Natural Vegetation in Wet Areas	19.195 sq km
		Range Land	8.952 sq km
		Water Body	6.124 sq km
		Wet Area	20.716 sq km
		Population	23528
		Household	4516
Agricultural Drought	Low – Medium	Agriculture Area	11.687 sq km
		Natural Vegetation in Wet Areas	2.618 sq km
		Range Land	4.106 sq km
		Water Body	2.661 sq km
		Wet Area	0.061 sq km
		Population	21
		Household	4
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	146.701 sq km
		Forest Area	0.002 sq km
		Kachcha Area	0.354 sq km
		Natural Vegetation in Wet Areas	0.103 sq km
		Pakka Planned Area	0.008 sq km
		Pakka Unplanned Area	0.088 sq km
		Range Land	0.216 sq km
		Health Facilities	1
		Settlements	27
		Irrigation and Drainage Network	58.983 km
		Road Network	140.309 km
		Population	12682
		Household	2433
Tsunami	Low – High	Agriculture Area	84.725 sq km
		Kachcha Area	0.282 sq km
		Natural Vegetation in Wet Areas	5.021 sq km
		Pakka Unplanned Area	0.172 sq km
		Range Land	4.928 sq km

		Petrol Pumps	1
		Settlements	6
		Irrigation and Drainage Network	40.07 km
		Road Network	90.525 km
		Population	12790
		Household	2457

MAKLI			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	39.068 sq km
		Forest Area	0.053 sq km
		Kachcha Area	0.787 sq km
		Natural Vegetation in Wet Areas	0.028 sq km
		Pakka Planned Area	3.187 sq km
		Pakka Unplanned Area	2.353 sq km
		Range Land	0.186 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	9
		Grain Mandi	1
		Grid Stations	2
		Health Facilities	5
		Industries	2
		Mobile Towers	8
		Petrol Pumps	8
		Police Stations	2
		Post Offices	1
		Settlements	45
		Tourist Places	6
		Welfare Trust	1
Irrigation and Drainage Network	46.035 km		
Road Network	81.15 km		
Population	58548		
Household	10646		
Heatwave	Low – Extreme	Settlements	42
		Population	48343
		Household	8792
		Agriculture Area	38.887 sq km
		Kachcha Area	0.79 sq km
		Pakka Planned Area	3.184 sq km
		Pakka Unplanned Area	2.355 sq km
Meteorological	Low – Extreme	Settlements	44

Drought		Agriculture Area	39.473 sq km
		Bare Area with sparse Natural Vegetation	23.814 sq km
		Forest Area	0.862 sq km
		Natural Vegetation in Wet Areas	0.969 sq km
		Range Land	8.628 sq km
		Water Body	10.237 sq km
		Wet Area	2.765 sq km
		Population	49019
		Household	8919
Agricultural Drought	Low – High	Settlements	10
		Agriculture Area	8.702 sq km
		Bare Area with sparse Natural Vegetation	16.137 sq km
		Forest Area	0.84 sq km
		Natural Vegetation in Wet Areas	0.28 sq km
		Range Land	7.235 sq km
		Water Body	4 sq km
		Wet Area	0.153 sq km
		Population	4885
Household	914		
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	39.03 sq km
		Forest Area	0.033 sq km
		Kachcha Area	0.786 sq km
		Natural Vegetation in Wet Areas	0.017 sq km
		Pakka Planned Area	0.025 sq km
		Pakka Unplanned Area	0.156 sq km
		Range Land	0.068 sq km
		Bridges	1
		Grid Stations	1
		Mobile Towers	1
		Petrol Pumps	6
		Settlements	45
		Tourist Places	6
		Irrigation and Drainage Network	37.262 km
		Road Network	46.084 km
Population	11961		
Household	2250		
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

MIRPUR SAKRO			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	52.349 sq km
		Kachcha Area	0.085 sq km
		Pakka Planned Area	0.27 sq km
		Pakka Unplanned Area	0.256 sq km
		Range Land	0.238 sq km
		Bridges	4
		Bus Stops	1
		Education Facilities	1
		Health Facilities	2
		Mobile Towers	3
		Petrol Pumps	4
		Police Stations	1
		Settlements	29
		Irrigation and Drainage Network	37.991 km
		Road Network	68.092 km
Population	15783		
Household	3011		
Heatwave	Low – Extreme	Settlements	26
		Population	13117
		Household	2503
		Agriculture Area	52.298 sq km
		Kachcha Area	0.086 sq km
		Pakka Planned Area	0.271 sq km
		Pakka Unplanned Area	0.257 sq km
Meteorological Drought	Medium – Extreme	Settlements	29
		Agriculture Area	52.498 sq km
		Bare Area with sparse Natural Vegetation	0.09 sq km
		Natural Vegetation in Wet Areas	0.012 sq km
		Range Land	7.222 sq km
		Water Body	2.045 sq km
		Wet Area	8.334 sq km
		Population	13203
Household	2522		
Agricultural Drought	Low – Medium	Settlements	2
		Agriculture Area	3.512 sq km
		Range Land	7.948 sq km
		Water Body	1.502 sq km
		Wet Area	6.326 sq km

Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	52.332 sq km
		Kachcha Area	0.085 sq km
		Pakka Planned Area	0.014 sq km
		Pakka Unplanned Area	0.052 sq km
		Range Land	0.086 sq km
		Bridges	4
		Health Facilities	1
		Mobile Towers	1
		Petrol Pumps	3
		Police Stations	1
		Settlements	29
		Irrigation and Drainage Network	26.488 km
		Road Network	59.245 km
		Population	3905
Household	744		
Tsunami	Low – High	Agriculture Area	22.911 sq km
		Kachcha Area	0.064 sq km
		Pakka Unplanned Area	0.036 sq km
		Range Land	4.597 sq km
		Mobile Towers	1
		Petrol Pumps	1
		Settlements	6
		Irrigation and Drainage Network	9.007 km
		Road Network	17.334 km
		Population	2591
		Household	494

SONDA			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low – Extreme	Agriculture Area	23.417 sq km
		Natural Vegetation in Wet Areas	28.121 sq km
		Road Network	0.249 km
Earthquake	Low	Agriculture Area	40.587 sq km
		Forest Area	0.001 sq km
		Kachcha Area	0.296 sq km
		Natural Vegetation in Wet Areas	0.271 sq km
		Pakka Planned Area	0.048 sq km
		Pakka Unplanned Area	3.757 sq km
		Range Land	0.162 sq km
		Bridges	5
		Health Facilities	2
Mobile Towers	6		

		Petrol Pumps	2
		Police Stations	1
		Post Offices	1
		Settlements	29
		Tourist Places	1
		Irrigation and Drainage Network	44.908 km
		Road Network	65.174 km
		Population	37395
		Household	7012
Heatwave	Low – Extreme	Settlements	28
		Population	30826
		Household	5776
		Agriculture Area	40.443 sq km
		Kachcha Area	0.298 sq km
		Pakka Planned Area	0.048 sq km
		Pakka Unplanned Area	3.759 sq km
Meteorological Drought	Low – Extreme	Settlements	29
		Agriculture Area	41.027 sq km
		Bare Area with sparse Natural Vegetation	21.628 sq km
		Forest Area	0.065 sq km
		Natural Vegetation in Wet Areas	50.939 sq km
		Range Land	5.9 sq km
		Water Body	108.663 sq km
		Wet Area	2.899 sq km
		Population	31221
		Household	5855
Agricultural Drought	Low – Medium	Agriculture Area	18.525 sq km
		Bare Area with sparse Natural Vegetation	5.375 sq km
		Forest Area	0.078 sq km
		Natural Vegetation in Wet Areas	36.968 sq km
		Water Body	6.872 sq km
		Wet Area	0.209 sq km
		Population	17
		Household	4
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	40.552 sq km
		Forest Area	0.001 sq km
		Kachcha Area	0.296 sq km
		Natural Vegetation in Wet Areas	0.189 sq km
		Pakka Planned Area	0.008 sq km

		Pakka Unplanned Area	0.197 sq km
		Range Land	0.019 sq km
		Bridges	1
		Petrol Pumps	1
		Settlements	29
		Tourist Places	1
		Irrigation and Drainage Network	13.821 km
		Road Network	14.091 km
		Population	5264
		Household	984
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

SUKHPUR			
Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	107.33 sq km
		Kachcha Area	0.052 sq km
		Natural Vegetation in Wet Areas	0.059 sq km
		Pakka Planned Area	0.584 sq km
		Pakka Unplanned Area	0.81 sq km
		Range Land	0.063 sq km
		Ambulance Services	1
		Bridges	1
		Bus Stops	1
		Education Facilities	7
		Grid Stations	1
		Health Facilities	6
		Industries	1
		Mobile Towers	4
		Petrol Pumps	5
		Post Offices	1
		Settlements	44
Irrigation and Drainage Network	83.718 km		
Road Network	149.983 km		
Population	33497		
Household	6334		
Heatwave	Low – Extreme	Settlements	43
		Population	27111
		Household	5128
		Agriculture Area	107.246 sq km
		Kachcha Area	0.052 sq km
		Pakka Planned Area	0.584 sq km
		Pakka Unplanned Area	0.811 sq km

Meteorological Drought	Low – Extreme	Settlements	44
		Agriculture Area	107.543 sq km
		Natural Vegetation in Wet Areas	1.859 sq km
		Range Land	2.554 sq km
		Water Body	2.151 sq km
		Wet Area	8.56 sq km
		Population	27249
		Household	5154
Agricultural Drought	Low – Medium	Agriculture Area	20.419 sq km
		Natural Vegetation in Wet Areas	1.701 sq km
		Range Land	1.249 sq km
		Water Body	1.159 sq km
		Wet Area	0.2 sq km
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	107.295 sq km
		Kachcha Area	0.052 sq km
		Natural Vegetation in Wet Areas	0.012 sq km
		Pakka Planned Area	0.017 sq km
		Pakka Unplanned Area	0.11 sq km
		Range Land	0.056 sq km
		Ambulance Services	1
		Bridges	1
		Bus Stops	1
		Education Facilities	3
		Grid Stations	1
		Health Facilities	1
		Industries	1
		Mobile Towers	2
		Petrol Pumps	4
		Settlements	44
		Irrigation and Drainage Network	73.268 km
		Road Network	134.702 km
		Population	5285
Household	1001		
Tsunami	Low – High	Agriculture Area	35.046 sq km
		Natural Vegetation in Wet Areas	1.396 sq km
		Pakka Unplanned Area	0.138 sq km
		Range Land	2.229 sq km
		Settlements	3
		Irrigation and Drainage Network	14.822 km
		Road Network	24.104 km

		Population	3699
		Household	708

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Hazard Type	Risk	Elements at Risk	
Riverine Flood	Low – Extreme	Agriculture Area	39.812 sq km
		Kachcha Area	0.083 sq km
		Natural Vegetation in Wet Areas	33.783 sq km
		Pakka Unplanned Area	1.634 sq km
		Health Facilities	1
		Settlements	26
		Irrigation and Drainage Network	6.804 km
		Road Network	1.009 km
		Population	19524
		Household	3663
Earthquake	Low	Agriculture Area	76.157 sq km
		Kachcha Area	0.366 sq km
		Natural Vegetation in Wet Areas	0.406 sq km
		Pakka Unplanned Area	1.635 sq km
		Range Land	0.042 sq km
		Bridges	2
		Health Facilities	1
		Settlements	35
		Irrigation and Drainage Network	25.903 km
		Road Network	36.37 km
		Population	22740
		Household	4266
Heatwave	Low – Extreme	Settlements	34
		Population	18695
		Household	3507
		Agriculture Area	76.011 sq km
		Kachcha Area	0.368 sq km
		Pakka Unplanned Area	1.64 sq km
Meteorological Drought	Low – Extreme	Settlements	35
		Agriculture Area	76.566 sq km
		Forest Area	0.682 sq km
		Natural Vegetation in Wet Areas	43.353 sq km
		Range Land	1.718 sq km
		Water Body	0.17 sq km
		Wet Area	0.381 sq km
		Population	18817
Household	3529		

Agricultural Drought	Low – Medium	Settlements	2
		Agriculture Area	17.426 sq km
		Forest Area	0.834 sq km
		Natural Vegetation in Wet Areas	35.362 sq km
		Range Land	1.111 sq km
		Water Body	0.08 sq km
		Wet Area	0.004 sq km
		Population	162
Household	30		
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

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Hazard Type	Risk	Elements at Risk	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Earthquake	Low	Agriculture Area	32.152 sq km
		Forest Area	0.039 sq km
		Kachcha Area	0.079 sq km
		Pakka Planned Area	3.299 sq km
		Pakka Unplanned Area	1.05 sq km
		Range Land	0.117 sq km
		Bridges	5
		Bus Stops	3
		Education Facilities	5
		Health Facilities	10
		Industries	2
		Mobile Towers	6
		Petrol Pumps	11
		Police Stations	1
		Post Offices	3
		Settlements	49
		Tourist Places	7
		Welfare Trust	2
		Irrigation and Drainage Network	49.947 km
		Road Network	71.652 km
Population	71356		
Household	12661		
Heatwave	Low – Extreme	Settlements	44
		Population	58875
		Household	10446

		Agriculture Area	32.093 sq km
		Kachcha Area	0.08 sq km
		Pakka Planned Area	3.297 sq km
		Pakka Unplanned Area	1.052 sq km
Meteorological Drought	Low – Extreme	Settlements	48
		Agriculture Area	32.318 sq km
		Bare Area with sparse Natural Vegetation	3.1 sq km
		Forest Area	0.322 sq km
		Range Land	2.092 sq km
		Water Body	10.069 sq km
		Wet Area	2.066 sq km
		Population	59758
		Household	10602
Agricultural Drought	Low	Agriculture Area	0.266 sq km
		Bare Area with sparse Natural Vegetation	0.007 sq km
		Range Land	0.11 sq km
		Water Body	0.211 sq km
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Low	Agriculture Area	32.098 sq km
		Forest Area	0.012 sq km
		Kachcha Area	0.079 sq km
		Pakka Planned Area	0.044 sq km
		Pakka Unplanned Area	0.25 sq km
		Range Land	0.055 sq km
		Bridges	4
		Bus Stops	1
		Education Facilities	1
		Health Facilities	1
		Mobile Towers	2
		Petrol Pumps	3
		Settlements	49
		Tourist Places	7
		Irrigation and Drainage Network	34.534 km
		Road Network	41.696 km
Population	3087		
		Household	570
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

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Hazard Type	Risk	Elements at Risk

Riverine Flood	Low – Extreme	Agriculture Area	46.29 sq km
		Forest Area	0.038 sq km
		Kachcha Area	0.208 sq km
		Natural Vegetation in Wet Areas	38.058 sq km
		Pakka Unplanned Area	0.242 sq km
		Range Lands	0.009 sq km
		Settlements	19
		Irrigation and Drainage Network	0.461 km
		Road Network	8.234 km
		Population	12006
		Household	2325
Earthquake	Low	Agriculture Area	98.442 sq km
		Forest Area	0.024 sq km
		Kachcha Area	0.283 sq km
		Natural Vegetation in Wet Areas	0.433 sq km
		Pakka Unplanned Area	0.655 sq km
		Range Land	0.41 sq km
		Education Facilities	1
		Health Facilities	2
		Settlements	34
		Irrigation and Drainage Network	47.483 km
		Road Network	91.718 km
Population	25789		
Household	4974		
Heatwave	Low – Extreme	Settlements	33
		Population	21475
		Household	4141
		Agriculture Area	98.142 sq km
		Kachcha Area	0.283 sq km
		Pakka Unplanned Area	0.656 sq km
Meteorological Drought	Low – Extreme	Settlements	34
		Agriculture Area	99.204 sq km
		Forest Area	0.344 sq km
		Natural Vegetation in Wet Areas	46.027 sq km
		Range Land	10.014 sq km
		Water Body	2.083 sq km
		Wet Area	4.007 sq km
		Population	21859
Household	4218		
Agricultural Drought	Low	Agriculture Area	6.653 sq km
		Forest Area	0.022 sq km
		Natural Vegetation in Wet Areas	4.45 sq km

		Range Land	1.45 sq km
		Water Body	0.196 sq km
		Wet Area	0.009 sq km
		Population	20
		Household	4
Storm Surge	Low – Extreme	Agriculture Area	20.1 sq km
		Forest Area	0.139 sq km
		Kachcha Area	0.022 sq km
		Natural Vegetation in Wet Areas	7.97 sq km
		Pakka Unplanned Area	0.057 sq km
		Range Land	1.806 sq km
		Settlements	4
		Irrigation and Drainage Network	8.509 km
		Road Network	13.335 km
		Population	2063
		Household	400
Cyclone	Low	Agriculture Area	98.408 sq km
		Forest Area	0.011 sq km
		Kachcha Area	0.283 sq km
		Natural Vegetation in Wet Areas	0.401 sq km
		Pakka Unplanned Area	0.116 sq km
		Range Land	0.25 sq km
		Health Facilities	2
		Settlements	34
		Irrigation and Drainage Network	40.762 km
		Road Network	82.082 km
		Population	10776
Household	2085		
Tsunami	Low – High	Agriculture Area	39.733 sq km
		Forest Area	0.061 sq km
		Kachcha Area	0.052 sq km
		Natural Vegetation in Wet Areas	13.261 sq km
		Pakka Unplanned Area	0.239 sq km
		Range Land	6.222 sq km
		Settlements	6
		Irrigation and Drainage Network	16.953 km
		Road Network	30.096 km
		Population	8107
		Household	1560

ORGANIZATION STRUCTURE FOR DISASTER MANAGEMENT AT DISTRICT LEVEL

INTRODUCTION

Each year natural disasters kill thousands of people and inflict billions of dollars in economic losses. No nation or community is immune to the damage of disasters and certainly, the province of Sindh is no exception. Almost every year, a major or minor natural disaster disrupts the life and economy of people living in the province, especially those with high economic vulnerability or the poor strata of the population. Unless action is taken to reduce the toll of natural disasters, the damages and losses of disasters can only be expected to rise. The scientific and technological advances of today's world provide unprecedented opportunities for responding to the urgent need to mitigate the impacts of natural hazards.

It is a globally recognized fact that natural hazards do not kill but poor planning does. Better disaster management and disaster risk reduction can only be achieved through collective efforts in integrating hazard reduction policy and practice throughout the province. It is a need of the time and opportunity to reassess the approach to natural hazards and to develop strategies for reducing losses by prevention and preparedness.

Disaster management can be achieved through the collective effort of all segments of life. A central authority, like Provincial Disaster Management Authority, can oversee, plan, manage and coordinate for disaster management at the provincial scale, however, it is the responsibility of concerned departments and authorities to implement and execute disaster management measures at the grass-root level. For effective disaster management, it is also imperative to take onboard and empower communities at high disaster risk as first responders. The disaster management plan will be effective once the roles and responsibilities of each individual and department are well understood and disaster management measures are implemented.

Keeping in view the importance of disaster management at all levels i.e., from the Provincial level to UC or village level, different disaster management committees have been recommended to be constituted. These committees are District Disaster Management Authority (DDMA), Taluka Disaster Management Committee (TDMC), and Union Council Disaster Management Committee (UCDMC). The recommended composition of each committee is given in Table-2 to 4.

Table 2: District Disaster Management Authority

Sr.#	Committee Representative	Role
1.	Deputy Commissioner	Chairperson
2.	Additional Deputy Commissioner	DDMO
3.	Senior Superintendent of Police	Member
4.	Assistant Director Local Government	Member
5.	District Information Officer	Member
6.	Cantonment Officer (Where Applicable)	Member
7.	District Health Officer	Member
8.	District Education Officer	Member

9.	District Food Controller	Member
10.	Deputy Director Civil Defense	Member
11.	District Officer Social Welfare	Member
12.	District Officer Livestock	Member
13.	District Chairman Zakat	Member
14.	Executive Engineer (Works and Services)	Member
15.	Executive Engineer Irrigation	Member
16.	Executive Engineer Public Health	Member
17.	Municipal Commissioners / CMOs / TMOs	Member(s)
18.	Representative Officer of Armed Forces	Member
19.	Two Elected Representatives nominated by the chair	Members
20.	Two Representatives of NGOs/Civil Society	Members
21.	Two Representatives of Business Community	Members
22.	Representative of Agriculture and Livestock Department	Member
23.	Representative of NHA	Member
24.	Representative of Electric Supply Corporation	Member
25.	Representative of SSGC	Member
26.	Representative of Red Crescent	Member
27.	Representative of Sindh Scouts	Member
28.	Representation of Volunteers from Communities at Risk	Member(s)

Table 3: TDMC Taluka Disaster Management Committee

Sr.#	Committee Representative	Role
1.	Assistant Commissioner	Chairperson
2.	Mukhtiarkar	Secretary
3.	Town Municipal Officer (TMO)	Member(s)
4.	Sub Divisional Police Officer	Member
5.	Taluka Education Officer	Member
6.	Medical Superintendent Taluka Level Medical Facility	Member
7.	Representative from Civil Defense	Member
8.	Representative from Social Welfare Department	Member
9.	Representative from Livestock Department	Member
10.	Assistant Engineer (Works and Services)	Member
11.	Assistant Engineer Irrigation	Member
12.	Assistant Engineer Public Health	Member
13.	Two Representatives of NGOs/Civil Society	Members
14.	Two Representatives of Business Community	Members
15.	Representative of Agriculture and Livestock Department	Member
16.	Representative of Electric Supply Corporation	Member
17.	Representative of SSGC	Member
18.	Representative of Red Crescent	Member
19.	Representative of Sindh Scouts	Member
20.	Representation of Volunteers from Communities at Risk	Member

Table 4: UCDMC Union Council Disaster Management Committee

Sr.#	Committee Representative	Role
1.	UC Administrator	Chairperson
2.	Secretary UC	Secretary
3.	Station House Officer (Police) – Concerned	Member
4.	Two Representatives of NGOs/Civil Society	Members
5.	Representation of Volunteers from Communities at Risk	Members
6.	Representation of Renowned Persons	Members

RESPONSIBILITY OF DISTRICT DISASTER MANAGEMENT AUTHORITY

- The DDMA shall work as a coordinating body of all government agencies and non-government organizations operating in the district and act as a focal authority in the conduct and implementation of plan and actions on disaster management
- Additional Deputy Commissioner who is proposed as Disaster Management Officer shall also work as Secretary DDMA and will provide administrative support to DDMA
- The DDMA shall ensure to take all possible disaster management measures in the district in accordance with the guidelines laid down by PDMA or NDMA
- The DDMA shall provide leadership by taking initiative to achieve MHVRA Informed Disaster Management Plan goals and objectives
- The DDMA shall coordinate with PDMA Sindh in disaster preparedness, response and recovery
- The DDMA shall provide guidance and support for the implementation of district response plans including management of the District Emergency Operation Centre

FUNCTION OF DDMA

- To review district disaster management plan, including district response plan in-line with Provincial and National disaster management plans and policies
- To ensure that risk maps are developed and updated and disaster-prone areas have been identified and prioritized in the district
- To coordinate the efforts for prevention and mitigation measures that are undertaken by the government and local authorities in the identified vulnerable areas of the district
- To organize and coordinate specialized disaster management training programs for different levels of officers, employees, and volunteer rescue workers in the district

- To facilitate community training and awareness programs with the support of local authorities, government and non-government organizations
- To set up, maintain, review and upgrade the mechanism for early warning and dissemination of accurate information to concerned authorities and the general public
- To review development plans prepared by the government departments, statutory or local authorities with a view that disaster management plan has been integrated into the development activities and projects of the plan
- To coordinate with, and give guidelines to, local authorities in the district to ensure that pre-disaster and post-disaster management activities in the district are carried out promptly and effectively
- To prepare, review and update district level response and contingency plans.
- To identify buildings and places which could, in the event of disaster situation be, used as relief centers and camps and make arrangements for water supply and sanitation in such buildings or places
- To distribute relief and facilitate rescue or ensure disaster preparedness and response
- To ensure operationalization of District Emergency Operation Centre (DEOC) equipped with all necessary gadgets
- To activate the District Emergency Operation Centre (DEOC) and ensure its uninterrupted operation during and after disaster events
- To carry out rapid damage and needs assessment and develop a report for assisting PDMA and other relevant stakeholders
- To coordinate and monitor early recovery and rehabilitation activities with the support of PDMA or relevant local and international stakeholders
- To prepare and continuously update databases of external agency projects, future priority areas, funding framework, available resources, areas of operations/expertise etc.
- To perform other functions as deemed necessary by the provincial government or provincial authority for disaster management in the district

RESPONSIBILITY OF TALUKA DISASTER MANAGEMENT COMMITTEE

- The TDMC shall work as front-line body for disaster management in the district and shall ensure implementation of disaster management measures set by DDMA and PDMA
- The TDMC shall interact directly with communities at risk in disaster preparedness, disaster risk reduction and response
- The TDMC shall bridge between government and communities in disaster response
- The TDMC shall coordinate between DDMA, PDMA and all stakeholders working at grass-root level in pre, during and post disaster events

FUNCTION OF TALUKA DISASTER MANAGEMENT COMMITTEE

- Identification and updation of all hazards in their respective locations and conduct of risk and vulnerability analysis and communicate with DDMA and subsequently with PDMA
- Ensure that the officers and employees are trained in disaster management
- Ensure that resources relating to disaster management are maintained and readily available for use in the event of any threatening disaster situation or disaster
- To coordinate and monitor disaster management plan mainstreaming operations in the district and over all disaster management initiatives
- Land use planning and zoning within the municipality by preparing master plans while keeping the multi hazard of the municipality and Taluka in context
- To ensure the implementation of bylaws related to encroachment at hazardous places, building codes, land use planning and zonation etc.
- To identify evacuation/shelter places to face any disaster/emergency
- To monitor the disaster management activities of NGOs, UCDCMs and private sectors
- To share initial damage and needs assessment reports to DDMA and subsequently to PDMA
- To carry out relief, rehabilitation and reconstruction activities in the affected areas in accordance with the DDMA and PDMA

RESPONSIBILITY OF UNION COUNCIL DISASTER MANAGEMENT COMMITTEE

1. UCDCM shall work as front-line, first responder body at village, mohalla and ward level.
2. Shall assist TDMC, DDMA and PDMA especially in disaster response.
3. Shall encourage and keep record of volunteers in Union Council.
4. Shall formulate different groups to respond disaster and emergency events such as evacuation group, camp management group etc. and share this record with TDMC, DDMA and PDMA.
5. Shall prepare awareness and capacity development proposals and training programs and follow-up with TDMC, DDMA and PDMA for arranging such events at grass root level.

FUNCTION OF UCDCM

1. Identification and updation of all hazards in their respective locations and conduct of risk and vulnerability analysis and communicate with TDMC, DDMA and subsequently with PDMA.
2. To prepare/update UC level disaster management plan for emergent hazards or new hazards caused by any disaster event.
3. To make an analysis of disaster risk and to prepare a list of vulnerable villages and areas of the concerned union councils.
4. To mobilize community for maintaining public ways, public streets, culverts, bridges and public buildings, de-silting of canals and other development activities.
5. To coordinate with the village and neighborhood UCs in case of emergency in order to get quick information about the severity and extent of a disaster impact and report it to the TDMC and DDMA.
6. To report cases of handicapped, destitute and socially excluded groups to TDMC, DDMA and PDMA in order to streamline their special needs in relief and response operation.
7. Mobilizing and coordinating work of volunteers and ensuring community participation.
8. Conduct of search and rescue operations in coordination with the rescue teams and Police.
9. To provide assistance to other agencies for mobility/transport of staff, including rescue parties, relief personnel and relief materials. To communicate with the TDMC, DDMA or PDMA for required additional resources.

10. To monitor NGO activities and provide necessary support to ensure community participation by establishing coordination mechanisms among NGOs and local communities.

ESTABLISHMENT OF EMERGENCY OPERATION CENTERS

PROVINCIAL EMERGENCY OPERATION CENTER (PEOC)

As envisioned by PDMA Sindh, PEOC is established at HQ of PDMA Sindh. The center is equipped with modern tools and techniques for management and operation activities in pre, during and post disaster events. The center works under the management of PDMA with 24/7 operation.

The functions of PEOC are summarized below;

- Coordinating node for planning, management and operations of disaster management activities
- Inventory management and goods distribution.
- Assets and vehicles management and monitoring
- Monitoring of extreme weather and disasters
- Issuance of early warnings
- Disposal and monitoring of man and material resources during disaster events
- Coordination with community based associations, volunteers, NGOs and other relevant institutions involved in disaster management
- Assessment of disaster risk and elements at risk and dissemination of information to concerned departments
- Coordination for evacuation, medical, search, rescue and relief
- Preparation and collection of damage assessment reports
- Coordination with all management tiers
- Daily briefings on disaster events, search and rescue operations, damages and losses, recovery and rehabilitation
- Hosting of online meetings
- Damage data collection through imaging drones

DISTRICT EMERGENCY OPERATION CENTER (DEOC)

The PEOC established at PDMA HQ is connected with districts through DEOC. The DEOC is supposed to work as field arm of PEOC for execution and implementation of instructions passed on by PEOC. The center is equipped with modern tools and techniques for management and operation activities in pre, during and post disaster events. The center works under the management of DDMA with 24/7 operation during disasters.

FUNCTION OF DEOC

The functions of DEOC are appended below;

- Receive information and instructions from PEOC regarding implementation and execution of action plans
- Monitor the situation and put everything ready and functional in the DEOC
- Dissemination of early warnings issued from PEOC to stakeholders and communities
- To coordinate with PEOC, PDMA, concerned departments and other stakeholders
- To monitor emergency operations and make efforts for preventing secondary hazards
- To conduct rapid assessment of the relief needs by collecting information from affected areas and circulate to PDMA and other concerned departments and stakeholders
- To deploy evacuation, medical, search and rescue teams in the affected areas
- To provide relief assistance in terms of relief camps, medical and sanitation facilities and temporary shelter to the affected population in the district
- To establish a liaison with concerned departments and stakeholders engaged in emergency response by anticipating resource inventory
- To collect information for daily briefings on disaster situation for PEOC, media, general public and other stakeholders
- Record keeping and preparation of consolidated reports and response plans and projects.
- Coordination and mobilization of community based associations, volunteers, NGOs and other relevant institutions involved in disaster management

SECTOR WISE ROLES AND RESPONSIBILITIES OF GOVERNMENT FUNCTIONARIES

AGRICULTURE AND LIVESTOCK DEPARTMENT

Pre-Disaster

- Capacity building of department regarding disaster management and risk reduction and implementation of sector specific disaster risk reduction measures
- Provide recommendation on changing/rescheduling of cropping patterns with respect to changing climate and weather scenarios
- Create Community Seed Bank at Union Council level
- Provide livestock vaccination and de-worming
- Assessment of high prone areas and estimation of possible damage and needs for recovery regarding livestock, crops, irrigation facilities in case of any disaster
- Mass awareness regarding epidemics and diseases to livestock and crops
- Close coordination with PDMA and DDMA

During-Disaster

- Close and regular coordination with DDMA and PDMA
- Immediate transfer of current situation to DDMA and PDMA
- Vaccination of livestock

Post-Disaster

- Facilitation to institutions / NGOs/ INGOs which focus on rehabilitation activities as per guidelines provided by DDMA and PDMA
- Submit report on damages and needs to DDMA and PDMA
- Mass awareness regarding epidemics and diseases to livestock and crops
- Vaccination of livestock
- Upgrade Community Seed Bank (CSB)
- Timely compensation to affected farmers

- Prepare overall report of the department regarding intervention and disseminate to DDMA and PDMA

PROVINCIAL DISASTER MANAGEMENT AUTHORITY (PDMA)

Pre-Disaster

- Close coordination with national and international institutions engaged in disaster forecasting.
- Coordinate meeting and engage DDMA for preparation of anticipated disasters
- Ensure readiness of equipment and inventory
- Disseminate disaster alerts to concerned DDMA with action plans for forecastable disasters
- Ensure availability of relief goods and other relevant stuff before anticipated disaster
- Advise concerned departments on removal of congestion from water ways before monsoon and flooding period
- Aware and sensitize public and private departments on main streaming disaster risk reduction in developing planning
- Ensure availability and functioning of provincial emergency operation center
- Provide and report high risk population and infrastructure in anticipated hazard areas.
- Capacity building of line and stakeholder department on disaster risk reduction and management.

During disaster

- Coordination and mobilization of man and material resources
- For rescue and evacuation of people, provide and manage temporary shelter and life restoration equipment in disaster affected regions
- Coordinate with line departments for health and veterinary services in the affected regions and ensure to control outbreak of any communicable diseases
- Coordinate with DDMA and line departments

- Coordinate with individual donors, donor organizations, NGOs and INGOs and ensure distribution of relief among disaster affectees

Post Disaster

- Coordination with DDMA and line departments for need and damage assessment
- Need and damage assessment reporting to higher management, NGOs, INGOs and other agencies for rehabilitation
- Ensure rehabilitation on build back better principle

DISTRICT DISASTER MANAGEMENT AUTHORITY (DDMA)

Pre-Disaster

- Close coordination with PDMA and other relevant stakeholders
- Risk assessment and identification of disaster-prone areas
- Aware and sensitize public and private departments on main streaming disaster risk reduction in developing planning
- Coordinate meeting and engage TDMC for preparation of anticipated disasters.
- Ensure readiness of equipment and inventory
- Disseminate disaster alerts to concerned TDMC with action plans for forecastable disasters
- Ensure availability of relevant staff before anticipated disaster
- Advise concerned departments on removal of congestion from water ways before monsoon and flooding period
- Ensure availability and functioning of district emergency operation center
- Arrange emergency response exercises and drills along with volunteer groups, social welfare and civil defense on various disaster scenarios

During disaster

- Mobilization of man and material resources
- For rescue and evacuation of people, provide and manage temporary shelter and life restoration equipment in disaster affected regions
- Coordinate with TDMC and line departments
- The DDMA shall lead the evacuation of people to safer places with the assistance of PDMA. DDMA shall also ensure safety, security, supply chain, life commodities and management of relief camps
- Only authorized officials of DDMA shall brief media on disaster situation and the response activities.

Post Disaster

- Coordination with TDMC and line departments for need and damage assessment
- Need and damage assessment reporting to PDMA
- Ensure rehabilitation on Build Back Better principle

CIVIL DEFENSE

Pre-Disaster

- Assign representatives for DDMA to participate in meetings
- Information sharing regarding capacities and needs of Civil Defense department regarding disaster risk management
- Capacity building of Civil Defense department regarding disaster risk management
- Information sharing regarding technical and personnel expertise with DDMA
- Conduct trainings for Volunteers regarding Rescue and other relevant expertise in collaboration with Health department and PDMA
- Create awareness regarding rescue, evacuation and first aid
- Effectively establish, train and systemize volunteers' initiatives in collaboration with education department / institutions

During-Disaster

- Fire fighting
- Rescue and evacuation
- Assign volunteers in coordination with PDMA and DDMA
- Communicate to DEOC about details of all activities
- Communicate to DEOC any additional resources required for performing the above tasks
- Facilitate line departments as per demand in disaster response

Post-Disaster

- Assist in rehabilitation process if required

EDUCATION DEPARTMENT

Pre-Disaster

- Assign representatives for DDMA and participate in meetings
- Information sharing regarding capacities and needs of Education department regarding disaster risk management
- Teachers and students are informed about the disaster prone areas of the district
- Teachers and students are informed of their responsibilities to take care of materials and documents to safe places during disaster
- Facilitate and collaborate with PDMA in preparation of disaster management curriculum
- Collaborate with PDMA and DDMA in synergizing volunteers

During-Disaster

- Mobilize human resources for intervention during disaster
- Inform schools situated in high risk areas about hazard and hazard forecast
- Assist in arrangement of relief and shelter camps in educational institutes for the disaster affectees

- Facilitate Health department and other relevant entities in arranging medical camps, blood donations and provision of medical aid during disaster and emergencies
- Coordinate with PDMA and DDMA in assigning volunteers for emergency response

Post-Disaster

- Assessment of damages occurred to educational institutes
- Provide assistance to teachers, students and other staff who are victimized by disasters (lack of food, shelter, etc.)
- Rehabilitation and reconstruction of affected educational facilities
- Facilitate institutions / NGOs / INGOs which focus on rehabilitation of educational facilities
- Prepare overall report of the department regarding intervention and disseminate to PDMA and DDMA

FINANCE DEPARTMENT

Pre-Disaster

- Regular coordination with PDMA
- Allocate budget on contingency basis, to handle any emergency situations
- Facilitate other departments in planning and meeting their financial needs

During-Disaster

- Provide funds to PDMA and other line departments for procurement of material and equipment required for emergency response
- Provide funds to PDMA and other line departments for rescue and relief activities

Post-Disaster

- Get statistical data regarding actual damage and recovery needs from all line departments
- Provide funds for execution of rehabilitation process

HEALTH DEPARTMENT

Pre-Disaster

- Assign representatives for DDMA, and participate in meetings
- Information sharing regarding capacities and needs of Health department regarding disaster risk management
- Build capacity of health department regarding disaster risk management and preventive health care especially in disaster prone areas
- Monitor the general health situation, e.g. monitor outbreak of diseases
- Provide specific information required regarding precautions for epidemics
- Establish a health mobile team in district and taluka headquarter hospital
- Set-up an information Centre to organize sharing of information for public information purposes
- Prepare first aid kits, medicines, water test kits, chloramines and anti-snake venom serum.
- Collaboration with relevant organizations / partner NGOs for participation and support through technical resources
- Up-gradation and smooth functioning of hospitals, BHUs, equipped with required staff, medicines and equipment
- Database and linkages with ambulance services/blood banks
- Health and hygiene awareness and education
- Ensure proper disposal of hospital waste

During-Disaster

- Provide emergency treatment for the seriously injured
- Ensure emergency supplies of medicines and first-aid
- Supervise food, water supplies, sanitation and disposal of waste

- Assess and co-ordinate provision of ambulances and hospitals where they could be sent (public and private);
- Provide special information required regarding precautions for epidemics
- Set-up an information Centre to organize sharing of information for public information purposes
- Conduct disaster impact assessment on health
- Intervene in case of disease outbreak
- Medical camps and vaccination
- Ongoing surveillance with regard to health issues and disease outbreaks

Post-Disaster

- Conduct disaster impact assessment on health situation
- Prepare plan for the following year along with reports and submit to PDMA and concerned department.
- Medical camps and vaccination
- Rehabilitation of health infrastructure affected during disaster
- Preparation of impact assessment surveys covering strengths and weaknesses of interventions and impact on affected victims and dissemination of learning to PDMA and other concerned institutions

IRRIGATION DEPARTMENT

Pre-Disaster

- Inspection and identification of vulnerable embankments
- Monitoring and dissemination of river water levels
- Implementation of SOPs defined by Bund Manual
- Ensure readiness of equipment and machinery before monsoon and flooding season
- Monitor and disseminate flood level information to DDMA and PDMA

- Initiate necessary embankments reinforcing interventions for vulnerable embankments
- Initiate interventions for river training where necessary
- Introduce and ensure water harvesting and modern water management interventions in likely drought affected areas
- Ensure safety and compactness of irrigation channels, canals, branches, etc. before start of monsoon season to avoid breaches in irrigation system during heavy rains
- Ensure removal of congestion from storm water and draining channels before monsoon

During-Disaster

- Ensure 24/7 vigilance of vulnerable embankments
- Measure and report flood water inundation levels to DDMA and PDMA
- Ensure to drain/de-water from agriculture fields and its safe conveyance to minimize losses
- Coordinate with PDMA and DDMA during entire disaster event for execution of on-demand action plans

Post-Disaster

- Conduct assessment of damages and needs and report to PDMA through DEOC
- Restore and repair damaged irrigation systems
- Prepare overall report of the department regarding intervention and disseminate to PDMA and DDMA

INFORMATION DEPARTMENT

Pre-Disaster

- Close coordination and liaison with PDMA and DDMA
- During monsoon, flooding season and forecastable hazards issuance of press releases regarding hazards and preparedness plans of the government
- Issue and publish disaster alerts on appropriate media forums
- Coverage and publication of government initiatives on disaster risk reduction and management

- Ensure media coverage and publication of PDMA and DDMA meetings for pre disaster preparations

During-Disaster

- Coordination with PDMA and DDMA for announcement of warnings and updates on disasters
- Publication of bulletins on government actions, facilities, relief and rescue efforts
- Publication of camp management and relief distribution announcements
- Publication of safety measures during disasters to minimize disaster domino effects
- Communicate voice of affectees to concerned departments

Post-Disaster

- Focus on problems being faced by the people of the affected area
- Publish, broadcast /telecast programs highlighting strengths, weaknesses and scars in disaster response activities
- Publish, broadcast /telecast programs highlighting government initiatives and collective response of NGOs, INGOs and other departments for relief and rehabilitation

PAKISTAN METEOROLOGICAL DEPARTMENT (PMD)

Pre-Disaster

- Update and upgrade forecast equipment
- Timely and authentic forecast of rains, windstorms and other forecastable hazards
- Timely transfer of information regarding abnormal weather conditions to PDMA

During-Disaster

- Monitoring of flood waters, river flows and sharing of information with PDMA
- Forecasting for any confluencing disaster
- Issuance of precautionary measures to avoid domino effects of disaster

Post-Disaster

- Technical assistance in rescue and rehabilitation process

POLICE DEPARTMENT

Pre-Disaster

- Coordinate with the DDMA in the pre-disaster planning
- Participate in DDMA meetings
- Capacity building of Police department regarding disaster risk management
- Information dissemination through 15 helpline service to local residents
- Prepare team for emergency intervention
- Prepare plan for shifting to safer places and early warning system

During-Disaster

- Co-ordinate with DEOC
- Assistance in shifting of rescued/affected people to relief camps and hospitals
- Provide protection and easy access to rescue and relief personnel/vehicles
- Maintain law and order
- Provide warning / instruction to travelers
- Divert traffic on alternate routes as and when necessary
- Ensure security to workers of NGOs and INGOS who perform duties for disaster response
- Ensure safety and security of relief goods and maintain discipline during relief distribution process
- Provide security in Relief Camps

Post-Disaster

- Assist in relief and rehabilitation process

REVENUE DEPARTMENT

Pre-Disaster

- Assign representatives for DDMA, and participate in meetings
- Information sharing regarding capacities and needs of Revenue department regarding disaster risk management
- Capacity building of Revenue department regarding disaster risk management
- Assessment of high prone areas and estimation of possible damage and needs for recovery in case of emergency
- Arrangement of financial resources
- Facilitate getting tax exemptions to institutions/NGOs/INGOs focus on disaster risk management
- Collect and update population data at village level

During-Disaster

- Coordination with the DEOC
- Establish relief distribution centers
- Accept relief donations and relief support
- Timely release of funds

Post-Disaster

- Allocation of funds for recovery and rehabilitation process
- Assessment of damage of industry/business, crops and livestock and settlement of applicable taxes accordingly in coordination with Industry, Agriculture and Irrigation departments

ARMED FORCES

Pre-Disaster

- Coordinate with the DDMA in the pre-disaster planning

- Prepare necessary equipment, labor, transportation and other materials for emergency interventions
- Provide training to soldiers and determine the role of soldiers who are stationed in flood prone areas
- Assist in evacuation of people to safe places

During-Disaster

- Maintain liaison with the DEOC for vital inputs during response
- Collect information and warn appropriate Army units for engagement in safety, rescue and evacuation activities
- Establish communication infrastructure and supplement the civil communication set-up if required
- Coordinate all military activity required by the civil administration
- Provision of medical care with the help of the medical teams, including treatment at the nearest armed forces hospital
- Transportation of relief material
- Provision of logistic back-up (aircrafts, helicopters, boats)
- Assist in establishment of Relief Camps
- Assist in evacuation of people to safe places during the disaster
- Installation of temporary Bridges, Bunds

Post-Disaster

- Cooperate and coordinate with district authorities
- Assist in rehabilitation process if required

SOCIAL WELFARE AND COMMUNITY DEVELOPMENT

Pre-Disaster

- Coordination with NGOs and civil society organizations working for disaster risk management

- Empower the extremely vulnerable people emphasizing women and children through public awareness involving respective departments for various fields such as Education, Health etc.
- Capacity building of community based groups and volunteers engaged in disaster management activities

During-Disaster

- Provide information on the situation of the disaster to the DEOC
- Coordinate all NGOs / INGOs and civil society organizations working during the emergency response
- Monitor progress of relief operations in the affected areas
- In coordination with PDMA, Health, Revenue and other line departments, ensure delivery of relief to most vulnerable segments of society such as children, orphans, widows, destitute
- Assist and facilitate Damage and Needs Assessment teams from NGOs
- Share human resources with DDMA

Post-Disaster

- Monitor and follow up the status of the extremely vulnerable people
- Assist and facilitate Damage and Needs Assessment teams from NGOs
- Conduct impact assessment studies and analysis of strengths and weaknesses of stakeholders and disseminate learning to PDMA, DDMA and other concerned institutions
- Facilitate institutions / NGOs/ INGOs which focus on rehabilitation activities

NGOs / INGOs

Pre-Disaster

- Facilitate PDMA and DDMA for capacity building regarding disaster risk management
- Capacity building of community groups regarding disaster risk management
- Linkages with concerned departments and institutions for providing technical and financial resources regarding diverse sectors related to disaster management

- Resource mobilization at local and international level

During-Disaster

- Collaborate and facilitate in relief operations
- Incorporate local and international expertise in disaster response
- Facilitate establishment of temporary shelters and camps
- Facilitate in overall disaster response in collaboration with concerned departments
- Regular updates and alerts to local and international partners
- Utilization of existing resources and further mobilization at local and international level
- Assessment of losses using sphere standards

Post-Disaster

- Collaborate and facilitate in rehabilitation activities
- Incorporate local and international expertise in rehabilitation activities
- Facilitate overall rehabilitation in collaboration with concerned departments
- Impact assessment studies and sharing findings with PDMA, DDMA, local and international partners
- Linkages with partners for sustainable resources mobilization

DISASTER MANAGEMENT GUIDELINES

INTRODUCTION

Multi-hazard vulnerability Risk Assessment of Thatta district reveals that the district is prone to multiple natural hazards. The pertinent hazards to district are hydro-meteorological hazards including drought, cyclone, tsunami and riverine flood. The risk of geophysical hazards is low in the district. In modern technological era, hydro-meteorological hazards can be precisely forecasted and action can be taken well in time to minimize damages and losses. In other words, the vulnerabilities and risks are manageable and losses and damages can be minimized through adoption of best management practices and mobilization of resources.

These guidelines introduce best practices which can be adopted to manage risk of natural hazards in the district.

Riverine Floods	<ol style="list-style-type: none">1. River Indus in Sindh can be segmented in three broad reaches Guddu to Sukkur, Sukkur to Kotri and Kotri to Arabian Sea.2. During past years, road bridges have been built over river Indus at different location. Though such developments and interventions were essential to bring prosperity in the region, however, have embedded impacts on fluvial geomorphology and natural flood plain of the Indus. Further, extensive human interventions such as use of land for agriculture, road infrastructure, civil embankments, etc. are observed through satellite imagery within the existing flood plain. In such scenario, risk of breaches in flood protective embankments and consequential flooding of adjoining areas have been increased. To minimize this risk, it is essential to restore Indus flood plain in its natural form. This arrangement will significantly reduce riverine flood risk through adoption of ecosystem friendly disaster risk reduction. The arrangement will not only reduce disaster risk but restore and enrich biodiversity in Indus flood plain.3. Though river Indus floodplain is bounded by flood protective embankment, but still some parts of district Thatta adjoining river Indus are likely to be affected due to breaches in embankments of river Indus.4. Though floodplain from Kotri to Arabian Sea is large tract and sufficiently wide to accommodate flood inundation within the embankments, however, high tides in Arabian Sea and daily tidal bulges may hamper the flood water flow and likely to pose threat to protected infrastructure.5. Other natural risk associated with riverine flood in district Thatta is
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	<p>phenomenon of erosion, migration and river course changes which certainly is major threat and require vigilant monitoring of floodplain and embankments during flooding season. It is highly recommended to identify and reinforce sections of vulnerable embankments before flooding season to avoid breaches in embankments and consequential damages.</p> <ol style="list-style-type: none">6. As far as riverine floods are concerned, the Sindh province has sufficient time for preparation and reaction. Close monitoring of river discharge level in coordination with irrigation department, the government of Punjab, Federal Flood Commission and Pakistan Meteorological Department (PMD) be conducted.7. Timely alerts be issued to people living in low lying areas within flood plain.8. In case of high anticipated flows evacuation of people and livestock be carried out.9. Soaking and compacting of embankments before arrival of flood water.10. Reinforcement and stone pitching of high-risk embankments.11. Use alternative eco-friendly options like use of bamboo wood etc. to minimize erosion impact on high-risk embankments.12. Where necessary and possible, erection of guide embankments and spur before arrival of high flood water.13. 24/7 vigilance of high-risk embankments by Sindh Irrigation Department.14. Readily availability of breach filling stock and machinery at high risk embankments.15. Restoration of natural eco-system within flood plain such as revival of braided/Yazoo channels and natural lakes within flood plain to disperse and distribute flood water across the plain.16. Removal of possible congestion factors within the flood plain.17. Public participation comprising local people be encouraged in pre and during flood periods.
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<p>Earthquake</p>	<ol style="list-style-type: none"> 1. The geology of Sindh is divisible in three main regions, the mountain ranges of Kirthar, Pab containing a chain of minor hills in the west and in east it is covered by the Thar Desert and part of Indian Platform where the main exposure is of Karoonjhar Mountains, which is famous for Nagar Parkar Granite. District Thatta is a coastal district of Sindh Province and falls away from the fault line and is unlikely to be affected by a massive earthquake. 2. Some of prominent faults situated in the coastal zones are (a) Karachi-Jati, (b) Surjan-Jhampir, (c) Pab Fault (d) Hub Fault and (e) Allah Bund-Rann of Kutch faults. 3. Though risk of geophysical hazards in Thatta district is low but still some actions must be taken to avoid losses in case of minor jolts. Urban settings are most likely to be affected by jolts. Thatta is old and historical city having abundance of closely spaced houses. It is highly recommended to identify old and weak buildings in the city and other urban settings of the district. Local concerned authorities may decide evacuation or retrofitting of such buildings / structures. 4. It is also recommended that, new housing schemes, societies and infrastructure be built with proper town planning and following Building Codes recommended for the zone in which Thatta district is situated. 5. Local government departments must be strengthened to manage situation arisen from earthquake jolts. Strengthening must include capacity building to act as first responder in any likely situation.
<p>Heatwave</p>	<ol style="list-style-type: none"> 1. Historically, Thatta district is not prone to severe heatwave seasons. However, the district has witnessed rapidly increased severity of heatwave in the past five years. Most of the district is sparsely populated, which significantly lowers the chances of severe heatwave impacts. However, urban centers including cities of Makli, and Thatta along with some unplanned settlements are vulnerable to heatwave. 2. Heatwaves are forecastable hazards and actions can be taken well before occurrence of heatwaves. The most suitable action is issuance of warnings and alerts in public for precautions and safety. Suitable media for the purpose is social media and SMS.

	<ol style="list-style-type: none"> 3. Scientific studies suggest that, frequency and intensity of heatwaves is increased due to climate change. Though climate change is global phenomena, however, its impacts can be minimized through local interventions. The most efficient and cost-effective solution is tree plantation. Tree plantation must be encouraged at levels including government functionaries, NGOs, community and individual levels. 4. Additionally, introduction of reduced Urban Heat Islands (UHI) through policies and implementation in infrastructure development will significantly reduce impacts of heatwaves.
<p>Cyclone</p>	<ol style="list-style-type: none"> 1. The persistent threat to coastal belt of district Thatta is cyclone. The frequency and intensity of cyclone formation in Arabian Sea may further increase due to climate change and global warming. Fortunately, cyclone is forecastable hazard, its intensity, possible landfall, timings etc. can be precisely predicted before landfall. If population to be affected is well aware and already prepared for likely event, then major losses and damages can be minimized. Such example can be seen in regional countries like India, Bangladesh and Philippines etc. 2. It is utmost important to strengthen cyclone detection and warning systems in the coastal belt of not only Thatta but along entire coast in Sindh. Besides strengthening of cyclone detection, it is equally important to place robust warning and dissemination system in far flung coastal belt and specially in fisherman community. Community based disaster risk management, capacity development of prone communities, establishment of permanent shelters and provision of life support facilities will increase the trust and confidence of communities on government functionaries in early evacuation process. 3. The introduction and construction of cyclone resistant human dwellings and infrastructure will further ensure minimized damages and losses. 4. Additionally, ecosystem based disaster risk reduction measures like plantation of mangroves and coastal forests along the coast line, construction of location specific sea walls in consultation with experts, and development of a “Bio-Shield” - a narrow strip of land along coastline may be taken to minimize the impact of cyclones. Bio-Shield can be developed as coastal zone disaster management sanctuary, which must have thick plantation are some of the eco-friendly, efficient and cost

	effective solutions which will support minimized losses and damages.
Drought	<ol style="list-style-type: none"> 1. Geographically district Thatta can be divided into four zones, namely eastern desert, western hilly / mountainous area, a coastal area in the south and irrigated agriculture area in the middle. Its 60% area is arid receiving rainfall on average of 5 inches during monsoon and very little during the month of December and January. The arid area people depend upon the scanty rainfall raising livestock and millet crops. 2. Drought is also forecastable hazard and can be predicted well in advance. Though drought does not bring any prominent or famine like conditions in the districts, however, it causes reduction in agricultural production and some extent disturb food supply for the animals and livestock. The best practice to manage drought related impacts is storage of food supplies for both humans and animals. 3. The situation of drought may vary in future due to climate change effects, therefore, introduction of drought resilient crops is need of the time. Additionally, efficient use of available water resources and introduction of efficient irrigation systems in agriculture sector is also required. 4. Further, farmers may be encouraged for alternative crops during expected drought seasons. Also policies for compensation of framers must also be introduced to assist and encourage drought hit farmers.
Tsunami	<ol style="list-style-type: none"> 1. The only known tsunami which hit some parts of Sindh coast happened to major earthquake in Makran coast in Balochistan which triggered tsunami in the region. This event happened in November 1945. No authentic record is available on damage and losses caused by tsunami in coastal belt of Sindh. The effects of the Tsunami of December, 2004 caused by earthquake in Indonesia were along the coastline of Pakistan in the form of abnormal changes in tide gauge stations placed at Keti Bunder. 2. As tsunami is consequence of major earthquake, hence not forecastable hazard in true sense but once the earthquake is occurred in sea or near coast, special sensors can detect the occurrence of tsunami. Once tsunami is detected little time is left for evacuation. However, installation of tsunami early warning system along the coast may greatly reduce losses.

	<p>The best approaches to tsunami response are;</p> <ul style="list-style-type: none">○ Installation of tsunami early warning and dissemination system in coastal settlements○ Awareness of communities at risk on tsunami precautions and response○ Plantation of mangroves and coastal forests along the coast line○ Construction of location specific sea walls.○ Well-designed break waters along the coast to provide necessary cushion against tsunami hazards.
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STANDARD OPERATING PROCEDURES

INTRODUCTION

Overall, disaster risk reduction is collective responsibility of concerned departments, associated line departments, private sector and communities. Synergized and coherent efforts are required at each cycle of disaster in order to minimize and avoid disaster losses and damages. The implementation of this disaster management plan would only be possible until roles and responsibilities of every department are defined and well understood.

ACTION PLAN FOR FLOOD

The monsoon and flooding period is well defined and occur almost every year with different intensities and cause losses at different scales. The recommended action plan for monsoon and flooding is tabulated below:

Table 5: Action Plan for Flood Hazard Management

Action	Timelines	Responsibility
Letter to irrigation department for identification of vulnerable embankments and disaster mitigation measures	April-May	PDMA
Inspection, maintenance and ensure readiness of flood fighting equipment available with PDMA	May-June	PDMA
Inspection, maintenance and ensure readiness of flood fighting equipment available with line departments	May-June	Local Government, Irrigation, and other relevant functionaries
Letter to concerned departments for removal of congestions in water ways	May-June	PDMA
Conduct pre monsoon meetings/conference with concerned departments	June-July	PDMA

Organization and conduct of pre monsoon meetings headed by DDMA and chalking out of monsoon contingency and action plans	June-July	PDMA to write letter to concerned departments and organize such meetings through online or other feasible mechanism
Interaction and close liaison with Pakistan MD on weather forecast	June-July	PDMA
Dissemination of severe weather alerts to concerned DDMA and likely population to be affected	Based on forecast	PDMA
Daily monitoring of discharge data and flood inundation levels	During flooding	Sindh Irrigation Department
Deployment of man and material resources and soaking, inspection and monitoring of flood protecting infrastructure	Pre and during flooding	Sindh Irrigation Department

ACTION PLAN FOR FORECASTABLE DISASTERS

Severe weather, heatwave, drought, and cyclone are only forecastable hazards. For such hazards following action plan is recommended

Table 6: Action Plan for Heatwave Hazard Management

Action	Timelines	Responsibility
Interaction with PMD for forecasting and monitoring of heatwave	Based on forecast	PDMA
Dissemination of forecast to	Based on forecast	PDMA

concerned DDMA and local community		
Mobilization of NGOs, INGOs and individuals for arrangement of heat stroke and medical camps within affected areas	During disturbance period	PDMA and DDMA

Table 7: Action Plan for Drought Hazard Management

Action	Timelines	Responsibility
Interaction with PMD for forecasting and monitoring of drought	Based on forecast	PDMA
Dissemination of forecast to concerned DDMA and local community	Based on forecast	PDMA
Mobilization of NGOs, INGOs and individuals for stocking of food and life support items to prevent and mitigate famine conditions depending upon severity and spell of drought	During disturbance period	PDMA and DDMA

Table 8: Action Plan for Cyclone Hazard Management

Action	Timelines	Responsibility
Interaction with PMD for forecasting and monitoring of cyclone and likely landfall	Based on forecast	PDMA
Dissemination of forecast to concerned DDMA and local community	Based on forecast	PDMA
Evacuation of population likely to	Before forecasted landfall	PDMA and DDMA

be affected to safe places		
Temporary shelter and camp management for affected population and livestock	Before forecasted landfall	PDMA and DDMA
Arrangement of initial relief for affectees	During disturbance period	PDMA and DDMA
Recovery and resettlement of population to native places	Post disaster	PDMA and DDMA

ACTION PLAN FOR UNFORECASTABLE HAZARDS

Earthquake/Tsunami

The earthquake and tsunami are unforecastable hazards and do not provide reaction time to prevent damages. The recommended post disaster action plan are as follows

Table 9: Action Plan for Earthquake/Tsunami Hazard Management

Action	Timelines	Responsibility
Mobilization of man and material resources for rescue and recovery	Post disaster	PDMA and DDMA
Mobilization of NGO, INGO, volunteer groups, scouts and armed services for rescue and recovery	Post disaster	PDMA and DDMA
Coordination and establishment of relief camps, mobile medical camps, life support facilities and provision of relief to affectees	Post disaster	PDMA and DDMA
Coordination and mobilization of rescue teams to search and rescue life in collapsed structures	Post disaster	PDMA and DDMA

Coordination with National Disaster Management Authority (NDMA) for seeking assistance from international agencies (depending on severity of events and damages/losses)	Post disaster	PDMA
Coordination and mobilization of resources on Build Back Better principles	Post disaster	PDMA

SOP FOR PEOC AND DEOCs

- For the smooth operation of the emergency activities the PEOC and District Emergency Response Centre (DEOC) will work under defined Standard Operating Procedures (SOPs). These SOPs are broadly categorized in three sections
 - a. Action on receipt of early warning, safe evacuation, search and rescue, initial assessment, relief distribution, recovery and deactivation of response.
 - b. Coordination and information dissemination
 - c. Contingency planning and response actions
- For localized emergencies, the situation shall be dealt within the regular operating mode of the emergency management services in the district.
- DDMA shall activate the DEOC and take the operational lead for the district government response.
- The DEOC will serve as the center for receiving early warning and issuing information to public at village level, taking measures to evacuate people, updating relevant departments, response agencies, and media etc.
- The DEOC will lead the coordination and management of relief operations in affected areas in the district with the assistance of PEOC.
- DEOC will coordinate with all concerned departments and humanitarian agencies at district level.
- DEOC will coordinate for early recovery with the assistance of PDMA and other concerned departments.

- In standby position, PEOC and DEOC shall be alert and ready to start emergency operations. The PEOC shall coordinate with concerned departments like NDMA, PMD, etc. for regular updates on likely disaster events. Once the threat is established, the PDMA shall approve the alert and activate response mechanism of PEOC and DEOC.
- Once PEOC and DEOC activation is approved or issued, both centers will remain fully operational on 24/7 basis and coordination shall be established with all concerned departments.
- PEOC and DEOC will collect regular updates on disaster situation and after normalization of situation and with mutual consultation shall inform PDMA to issue stand down or disaster deactivation call and final report on emergency operations will be circulated to stakeholders.
- The operationalization of PEOC and DEOC means complete activation of centers during disaster situation. Management of PDMA shall ensure full functionalities of PEOC including stock for emergency food, office supplies, communication system with backup support, electricity generators, computers, screens, multimedia projectors and other necessary equipment. While Deputy Commissioner Thatta shall ensure availability of all necessary equipment and supplies at DEOC for 24/7 operations. The deputy commissioner or chairperson DDMA will also ensure availability and presence of representatives of DDMA in DEOC during emergency operations for liaison and close coordination and smooth emergency response.
- A contact information of relevant government officials, influential personnel, political figures, volunteer groups, social welfare organizations and communities of high disaster risk prone areas shall be collected and maintained by PEOC and DEOC. For establishing quick liaison and coordination this contact information shall be used by both PEOC and DEOC. In addition to these contacts, PEOC will arrange random SMS alerts, robo calls etc. through commercial cellular services.
- The PEOC will establish the direct contact/coordination with district disaster management officer for disaster alerts and warnings and onward dissemination and other immediate actions.
- All warnings and alerts shall be carefully scrutinized by the central body i.e. PDMA and disaster warning alerts shall only be issued through single nodal agency to avoid any circulation of misinformation etc.
- During the disaster, all instructions, guidelines, action plans and advisories on disaster events, evacuation, relief operations etc. shall be issued by PEOC or DEOC in consultation with PEOC.

DISASTER MANAGEMENT PLAN

INTRODUCTION

Following disaster management measures are recommended for effective preparation, response and rehabilitation of communities. PDMA may identify suitable partners/agencies to carry out each of the below-mentioned measures to maximize the effectiveness of disaster management plan and minimize losses in case of any disaster.

Riverine Flood	
UCs at Risk (10)	Choto Chand, Domani, Jhurruck, Kalan Kot, Khan, Kotri Allah Rakhio, Sonda, Tando Hafiz Khan, Udasi, Mahar
UCs not at Risk (17)	Keti Bandar, Buhara, Choubandi, Dhabeji, Girano, Ghulamullah, Gharo, Gujjo, Mirpur Sakro, Karampur, Sukhpur, Kalri, Makli, Jungshahi, Jhampir, Thatta 1, Garho
General Description	<ol style="list-style-type: none"> 1. The river Indus flood plain in district Thatta is bounded by flood protective embankments. The lands and settlements on right bank of the river Indus are relatively safe from flooding due to higher elevation and hilly terrain. 2. The land and settlements on left side of river Indus are susceptible to riverine flooding due to breaching in any segment of flood protective embankment as it happened in 2010 floods at Kot Alamo. 3. As district Thatta lies in the tail of river Indus, the high sea tides during riverine floods make embankments more vulnerable. 4. The entire district is prone to urban flooding due to natural low gradient slope, and poor drainage 5. Based on MHVRA Study 2022, population count of 80,597 out of total 979,817 of district Thatta is prone to riverine flood risk. 6. According to MHVRA study 2022, flood hazard intensity for district Thatta is “Low to Very High” 7. According to MHVRA study 2022, flood risk for district Thatta is “Low to Extreme”
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Recording of daily river discharge at barrages in Sindh, and regular dissemination among stakeholders. 2. In case of high discharge, dissemination of warnings and alerts to masses living in flood plain. 3. Identification and inspection of vulnerable embankments likely to be affected due to flooding during pre-monsoon season, as per “Bund Manual” of irrigation department. 4. Inspection and readiness of flood fighting equipment available with district government departments prior to flooding season. 5. Classify and map bunds based on their origin (Mud, Brick, Stone, Concrete, Boulder, etc.) 6. Readiness of flood camps in high riverine flood and breaching risk areas. 7. Maintenance and strengthening of identified weak embankments. 8. Awareness and motivation campaigns on construction of flood resilient buildings and infrastructures. 9. Regular awareness campaigns on flood precautions and safe evacuations using various media platform. 10. Inclusion and implementation of Disaster Risk Reduction (DRR) measures in development projects at 	

planning stage for building flood resilient infrastructure.

11. Conduct of satellite imagery based study for identification of vulnerable embankments before each monsoon and flooding period.
12. Collection and management of contact information of area/village influential for alert and warning dissemination.
13. Readiness of community-based volunteers and other related organizations / NGOs.
14. Regular community-based flood fighting trainings through government departments or any other appropriate platforms.
15. Installation of digital flood level gauges along embankments and dissemination of real-time flow level measurements to concerned authorities.
16. Installation of surveillance cameras at safe places for consistent monitoring of structural integrity of vulnerable embankments.

Response

1. Mobilization of rescue services, relevant NGOs, scouts and volunteers.
2. Evacuation of people and livestock to shelters/camps.
3. Camp management as per standard practices.
4. Relief distribution.
5. Precautionary measures for communicable diseases.
6. Activation of mobile health and education services for flood affectees.
7. Arrangements for early recovery including flood de-watering and early restoration of communication and essential services.

Recovery and Rehabilitation

1. Damage assessment of flood affected areas.
2. Conduct post flood repairs or refurbishment of embankments/barrages/canals
3. Resettlement of population on build back better basis.
4. Complete restoration of communication and essential services.

Earthquake	
UCs at Risk	All UCs
General Description	<ol style="list-style-type: none"> 1. District Thatta falls away from the fault line and is unlikely to be affected by a massive earthquake. 2. Historical record of damages caused by earthquakes is not available, however, known earthquake occurred in October, 2005 caused minor damages in the district. 3. Some of the prominent faults situated in the coastal zones are (a) Karachi-Jati, (b) Surjan-Jhampir, (c) Pab Fault (d) Hub Fault and (e) Allah Bund-Rann of Kutch faults. 4. Over the last sixty years, earthquakes of intensity lower than 5 on Richter scale, including those in 1945 and 1985, have struck the region comprising the macro-environment and thus far they have been of minor significance. 5. According to MHVRA study 2022, earthquake hazard intensity for district Thatta is “Low” 6. According to MHVRA study 2022, earthquake risk for district Thatta is “Low”
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Identifying and inventorying weak buildings and structures especially in urban settings of the district and situation demanding action by concerned departments. 2. Preparation of landuse plans, town plans and implementation of building codes in new residential schemes, schools, public and private offices. 3. Implementation of DRR measures in public infrastructure development schemes. 4. Establishment of search and rescue infrastructure and services which can be mobilized as first responder in post-earthquake situation. 5. Mobilize NGOs, INGOs, community development organizations and volunteers, and conduct earthquake safety awareness campaigns and drills especially in main urban settings. 6. Availability of necessary material and equipment required for establishing temporary shelters with life support facilities i.e. mobile medical camps, schools, power supply, water and sanitation etc. 7. Availability of alternative communication system in case if usual communication means are disturbed by earthquake. 8. Preparation of medical emergency plan to manage mass casualties in case of any major earthquake event. 	
Response	
<ol style="list-style-type: none"> 1. Obtain firsthand information on intensity of earthquake and damages; prioritize areas for search and rescue operation. 2. Mobilize community-based volunteers, scouts and other trained personnel to hard hit areas to assess situation and help victims. 3. Establish emergency camps / shelters with necessary life support facilities. 4. Establish medical camps for provision of first aid and possible medical assistance to injured. 5. Evacuate people from damaged houses to safe places and shelters. 6. Provide security in affected areas and maintain law and order situation to prevent incidents of thefts and stampede. 	

7. Arrangement and conduct of aerial / drone survey of the affected areas.
8. Establish information and help desks for facilitation of affectees.
9. Restore essential services like power, water supply, and telecommunication of critical infrastructure like hospitals, control Rooms, etc. on priority basis.

Recovery and Rehabilitation

1. Detailed damage and need assessment for recovery and rehabilitation.
2. Rehabilitation on build back better principle.

Heatwave	
UCs at Risk	All UCs
General Description	<ol style="list-style-type: none"> Thatta has a hot desert climate (Köppen climate classification BWh). The mean maximum and minimum recorded temperature is about 40°C and 25°C respectively. Sea breeze blows eight months of the year during March to October, making the hot weather relatively cool. January is the coldest month while June is hottest. Annual average rainfall in the district is about 200 mm. Heatwave impact on the district Thatta is mostly restricted to the urban centers. Thatta and Makli, two major cities in the district are away from the coast, hence are prone to the impact of heatwaves. In the last five years, the frequency and severity of the heatwave episodes have increased in the district. According to MHVRA study 2022, heatwave hazard intensity for district Thatta is “High to Extreme” According to MHVRA study 2022, heatwave risk for district Thatta is “Low to Extreme”
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> Consistent future development strategy: Tree plantation, restoration of natural ecosystem, construction of environment friendly and well planned residential societies, offices, infrastructure and human dwellings. Monitoring for hot weather alerts through local and international sources and issuance of timely Hot Day Advisories, and Hot Day Warnings. Upgradation of major public health care facilities with necessary equipment and medicines to treat heatstroke patients. Heatstroke awareness campaigns and wide public coverage through media, social media, SMS, NGOs and social welfare organizations. Arrangements for uninterrupted supply of electricity and water in vulnerable areas. 	
Response	
<ol style="list-style-type: none"> Mobilization of NGOs, social welfare organization and volunteers for arranging heatstroke facilitation camps and distribution of fresh drinking water in affected areas. Local radio FM broadcasts to disseminate heatstroke safety and precautions. Mobilize mobile medical teams for first-aid and other medical emergency support in affected area. Record keeping of heatwave patients and fatalities. 	
Recovery and Rehabilitation	
<ol style="list-style-type: none"> Post event review of heatwave plan and modifications if required. 	

Cyclone	
UCs at Risk	All UCs
General Description	<ol style="list-style-type: none"> 1. Due to its geographical location, District Thatta is among districts badly affected by the cyclone surge on several occasions. 2. The cyclones carry 03 major threats i.e. winds, thunderstorm accompanied with heavy rains and storm surge which causes sea intrusion in land areas. 3. Majority of the population living along immediate coastal belt depends on marine economy and partly on agriculture. In absence of diverse economic resources cyclones not only cause immediate damages and losses but impacts last for longer period of time. 4. Tropical cyclones not only wipe out the human settlements, but also destroy and badly damage the fishing boats and fish harbors, affecting the livelihood of the majority of fishermen communities of the district. 5. According to MHVRA study 2022, cyclone hazard intensity for district Thatta is “Tropical Storm to CAT-2 TC” 6. According to MHVRA study 2022, cyclone risk for district Thatta is “Low to Medium”
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Identify community based DRR measures and inclusion of disaster prone communities in disaster risk management. 2. Establishment of multipurpose permanent shelters with all life support facilities to facilitate safe evacuation of people and livestock. 3. DRR mainstreaming in development planning. 4. Strengthening of cyclone detection, forecasting and warning dissemination centers. 5. Launching a series of public awareness campaign throughout the coastal area by various means including Radio, TV and other media. 6. Training of local administration in warning dissemination and evacuation techniques. 7. Mobilization of NGOs and community based organizations for awareness on construction of houses, billboards, roof tops, and boundary walls, keeping in view effects of high winds. 8. Review/Update emergency response plans and disaster recovery plans. 9. Stocking of key equipment and supplies to carry out immediate response activities including evacuation, shelters, medical camps, water and sanitation, power supply, alternate communication means etc. 10. Design, practice and implementation of evacuation plans with emphasis on self-reliance. 11. Cleaning of water channel, drainage and sewerage before cyclone season in Arabian Sea. 12. Readiness of de-watering machines before start of monsoon and cyclone season. 13. Ensure availability of real-time cyclone hazard map depicting the probable track and landfall impact on PDMA website 	

Response

1. Issue early reliable warning through siren or other relevant means to reduce the severity of the cyclone related disasters and save valuable human lives.
2. Establish communications with isolated fishermen / coastal communities for furnishing cyclone early warning.
3. Identify, involve and mobilize local NGOs which can assist in community awareness and mobilization for response.
4. Identify and mobilize volunteers' / volunteer organizations which can assist various facets of response like provision of emergency healthcare and relief items.
5. Initiate preliminary damage assessment and run search and rescue operations.
6. Provision of immediate relief including provision of food and potable water to affectees.
7. Deployment of emergency medical support.
8. Provide emergency health care to the affected population, in order to cover risk of spread of epidemic diseases like acute watery diarrhea, typhoid fever, malaria and measles, relapsing of fever and acute respiratory illness.

Recovery and Rehabilitation

1. Assess damage to buildings across the impacted areas to gather information about the extent and severity of damage.
2. Rehabilitation on build back better principle.

Drought	
UCs at Risk	All UCs
General Description	<ol style="list-style-type: none"> 1. Thatta has Indus deltaic and coastal region in south, and river Indus flows along its eastern boundary. Water bodies, urban and major crop areas are mostly situated in the middle of the district and mostly bare and mountainous areas at the upper end. 2. The district is situated in hot desert climatic zone. Scanty and Intra-seasonal variability of rainfall exists across the district with average annual rainfall less than 200 mm. 3. Water logging and salinity also hinder the crop production across different cropped areas. 4. Many areas in district are at high drought risk. 5. The severe 1999-2002 drought affected huge region across South Asia including Thatta. The years 2004-05, 2014-15 and 2018-19 were also the drought years in Thatta with moderate to severe intensities due to which losses of livelihood and crop were reported. However, drought risk in Thatta district is in acceptable limits and pronounced impacts on life and livelihood leading to famine conditions have never been reported. 6. According to MHVRA study 2022, <ol style="list-style-type: none"> a. Meteorological drought hazard for district Thatta is “Extreme” b. Meteorological drought risk for district Thatta is “Medium to Extreme” c. Agricultural drought hazard for district Thatta is “Mild to Extreme” d. Agricultural drought risk for district Thatta is “Low to Extreme”
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Implement Drought Early Warning System (EWS) at provincial/district level to get clear indications of the impending drought and its consequences, e.g. forecast of impending drought conditions related to changing weather conditions linked to El Nino or La Nina events. 2. Implementation of water supply and demand management and encouragement of efficient irrigation systems in agriculture. 3. Research and promote drought resistant agriculture crops. 4. Resilience and improvement of adaptive capacity of farmers. 5. Monitoring of temperature, precipitation, potential evapotranspiration, soil moisture, stream flow, groundwater levels, lakes, and reservoirs for drought forecasting. 6. Control ground water extraction from upper and lower aquifers to be within the sustainable yield limits. 7. Desalination of sea water and reuse of treated waste water. 	
Response	
<ol style="list-style-type: none"> 1. Assess data about the nature of drought conditions and their impact. 2. Provision and installation of solar water pumps for availability of clean drinking water. 3. Public information campaign for water management and saving. 	
Recovery and Rehabilitation	
<ol style="list-style-type: none"> 1. Cash and in-kind support to farmers for next cropping. 2. Awareness and encouragement of farmers on best irrigation practices and water saving. 	

Tsunami	
UCs at Risk (8)	Buhara, Mirpur Sakro, Udasi, Girano, Karampur, Keti-Bandar, Mahar, Sukhpur
UCs not at Risk (19)	Choubandi, Dhabeji, Ghulamullah, Gharo, Gujjo, Kalri, Makli, Jungshahi, Jhimpir, Thatta 1, Garho, Choto Chand, Domani, Jhurruck, Kalan Kot, Khan, Kotri Allah Rakhio, Sonda, Tando Hafiz Khan
General Description	<ol style="list-style-type: none"> 1. Due to its geographical location, District Thatta can be affected by the tsunami. During November 1945, a tsunami hit the Makran coast in Balochistan Province generating sea waves of 12-15 meters' height and killed about 4,000 people in the Makran coast. Although Karachi and Thatta were away from the epicenter, but still 6 feet high sea waves affected harbor facilities and coast of Sindh. 2. The effects of Tsunami of December, 2004, generated by earthquake in Indonesia were also felt along the coastline of Pakistan. The abnormal rise in water detected by tide gauge station in Keti Bunder area of District Thatta created panic in the coastal population including Karachi. 3. According to MHVRA study 2022, Tsunami hazard intensity for district Thatta is “Low to Extreme” 4. According to MHVRA study 2022, Tsunami risk for district Thatta is “Low to High” 5. According to MHVRA study 2022, Storm Surge hazard intensity for district Thatta is “Low to Very High” 6. According to MHVRA study 2022, Storm Surge risk for district Thatta is “Medium to Extreme”
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Strengthening of tsunami detection, forecasting and warning dissemination centers. 2. Conduct feasibility study for deployment of tsunami early warning systems along coastal belt of Sindh. 3. Launching a series of public awareness campaign through NGOs and community development organizations. 4. Training of local administration in warning dissemination and evacuation techniques. 5. Preservation of mangroves and coastal forests along the coast line. 6. Development of a network of local knowledge centers (rural/urban) along the coast lines to provide necessary training and emergency communication during crisis time. 7. Design, practice and implementation of evacuation plans and shelter sites with emphasis on self-reliance. 8. Identify buildings and places that could, in the event of a Tsunami, be used as relief centers or camps and make arrangements for water supply and sanitation in such buildings or places. 9. Protect hazardous material storage facility located in tsunami prone area. 	
Response	
<ol style="list-style-type: none"> 1. Coordination with Pakistan Meteorological Department as nodal agency for earthquake and tsunami detection service and dissemination of alerts and warnings through dedicated tsunami warning systems in coastal belt. 2. Immediate evacuation of nearest coastal belt population to safe sides emphasizing population living near coastal creeks. 3. Arrangement for alternate communication links like satellite phones, HF/ VHF communication, VSAT, etc. 	

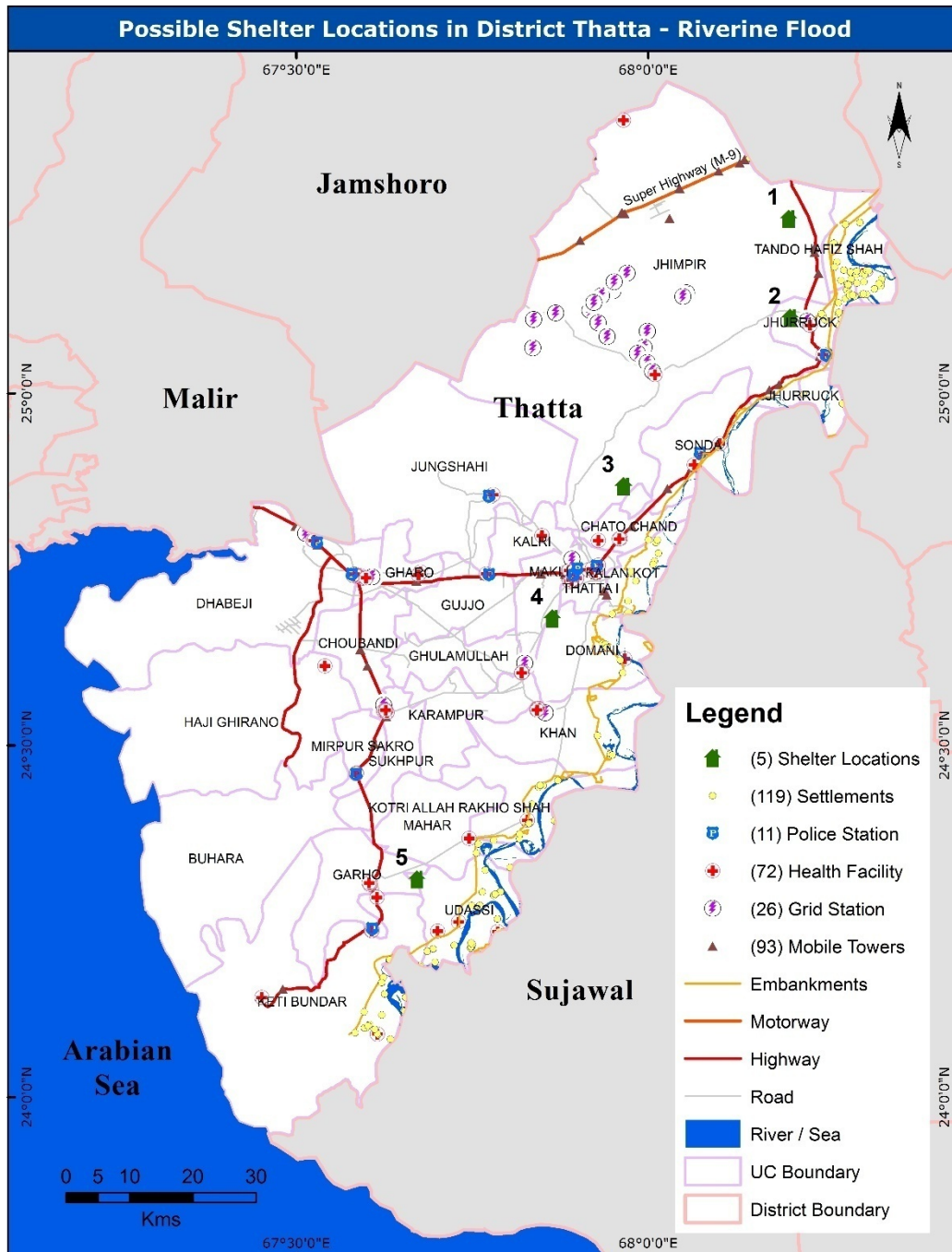
4. Establishment of shelters with all necessary life support facilities.
5. Mobilize and deploy resources e.g. search and rescue and medical teams in the Tsunami affected areas.
6. Supply food, drinking water and medical supplies to the affected population.
7. Assess hygiene of affected area and prevent the spread of disease.

Recovery and Rehabilitation

1. Reconstruction of essential infrastructure, such as access to roads, water supply and sanitation, waste water treatment and solid waste disposal.
2. Enhance the ability of the natural system to act as a bio-shield to protect people and their livelihoods by conserving, managing and restoring wetlands, mangroves, spawning areas, seagrass beds and coral reefs.
3. Conduct post-Tsunami damage assessment analysis to provide a clear, and concise picture of post disaster situation, to identify damage caused to different sectors and to develop strategies for rehabilitation, reconstruction and recovery on build back better principle.

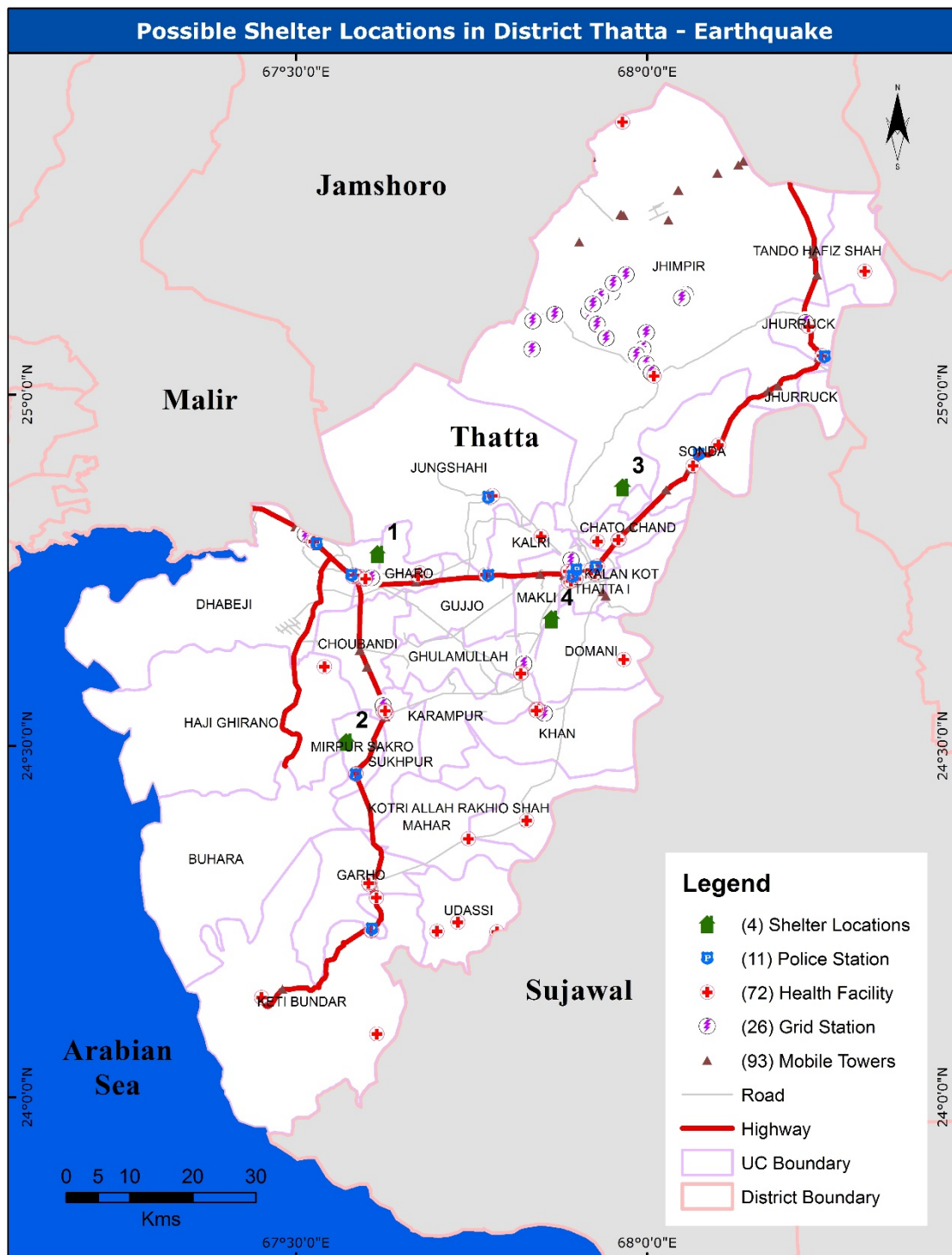
SHELTER LOCATION MAP

As part of preparedness, response, and rehabilitation against hazards, shelter places are integral. These are necessary to relocate, evacuate, or replenish the population that may be affected from hazards. Proposed shelters are illustrated in the maps.

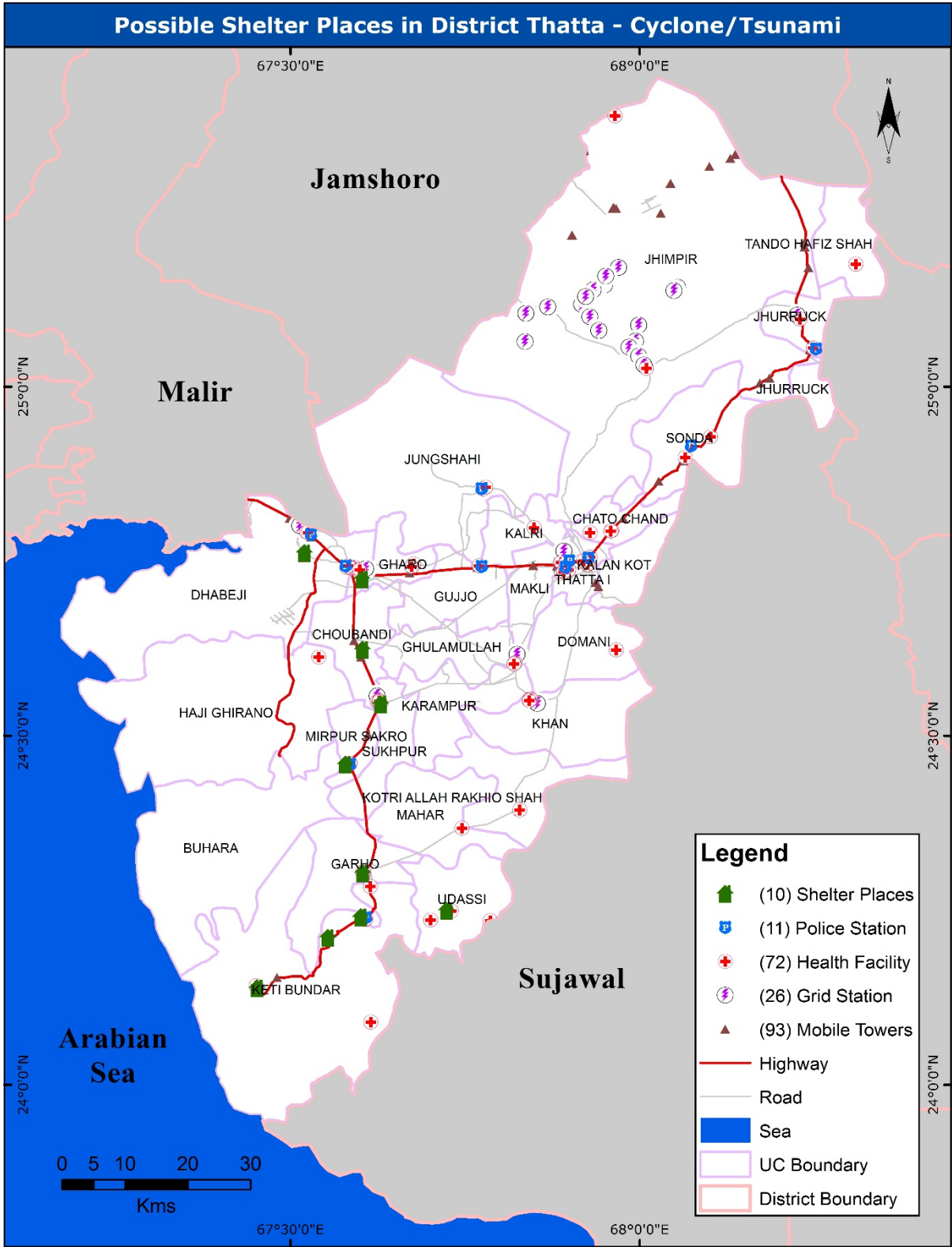


*Annex-A details the list of vulnerable settlements within flood plains prone to riverine flooding

*Annex-B details the list of flood shelter locations



*Annex-C details the list of earthquake shelter locations



PROPOSED PRIORITY DISASTER RISK MANAGEMENT PROJECTS

INTRODUCTION

Following are the recommended disaster risk management projects, which may be initiated to ensure effective disaster management in district Thatta. PDMA may identify suitable partnering agencies / line departments to carry out and prioritize each proposed project.

Hazard wise list of Priority Disaster Risk Management Projects	
Disaster Risk Management Projects/ Studies	Brief
Riverine Floods	
1. Geomorphological study of flood plain & river course modelling	Conduct flood plain study for identification of bottlenecks, including elevated islands (Annex – D) impeding the flow of (super) flood water, and Indus River course modeling (historic and predictive) for simulating catchment processes and river flow, etc.
2. Conduct feasibility study for Indus River training and straightening (Annex – E).	The river has a tendency to meander over large width of low lying land thereby flooding it occasionally. River training measures, like bell bunds, guide and confine the river flow within the embankments. Straightening the river speeds up the water so high volumes of water can pass through an area quickly. Dredging makes the river deeper so it can hold more water.
3. Installation of river/flood flow digital gauges at suitable locations for real time monitoring of water level, water discharge rates, wave height and flow speed.	Digital water gauges may be installed to collect water flow characteristics. Digital water gauge is an electronic device, which uses an advance processor chip as a controller, records the water flow characteristics through measuring electrodes and transmit it using wired/wireless communication channel after digital processing.
4. Monitoring of vulnerable bunds using IP Camera systems and Drones for surveillance during floods.	Image camera sensors and drones have relatively low procurement cost, portability, high efficiency, durability, maintenance and power consumption. Camera networks can effectively be used at remote 'Landhis' for real-time monitoring of flood level.
5. Capacity building of vulnerable communities	Create Community based disaster risk management (CBDRM) associations and equip them with training and equipment for early response, including rope rescue, sand bags, bamboo and others.
6. Develop emergency operation center.	Establish and equip emergency operation center with modern tools and techniques for management and operation activities in pre, during and post disaster events.
7. Establish a database of resources and equipment for emergency response in relevant agencies.	Create a well-maintained data repository for all available resources with operational status, quantity, location, and maintenance authority in the district.
Earthquake	
1. Ensure implementation of building codes and standards.	Prepare policy and SOP to ensure new buildings in the district are constructed as per the seismic codes and standard of the area.
2. Identification and retrofitting of weak existing structures and unsafe buildings (schools, hospitals and government offices).	Coordinate with local community regarding unsafe buildings and regularly conduct building safety surveys to check structural integrity of buildings against the seismic risk of the district and take necessary retrofitting measures to strengthen weak structures. Create database of vulnerable and unsafe buildings and retrofitting measures taken to strengthen the structure of such buildings.
3. Preparation of rescue and rehabilitation plan	Coordinate with line departments to create a comprehensive plan with clearly defined roles and responsibilities of first responding departments, as well as, correspond with rescue agencies/NGOs for their role in an event of earthquake. The

	plan should also details the rescue equipment available with concerned departments.
Drought	
1. Conduct feasibility study for identification of suitable sites for rainwater harvesting and aquifer recharge in the district.	<p>The rainwater harvesting sites should be identified by using geospatial technologies and ancillary data, which can be used as clean water aquifers by communities, which in turn can use it for drinking, and irrigation purposes.</p> <p>Potential rainwater harvesting sites may be identified by using Analytical Hierarchy Process (AHP) and spatial analyst tool, with multiple thematic layers (rain data, population, digital elevation model, soil type, etc.)</p>
Cyclone/Tsunami	
1. Establishment of tsunami/cyclone early warning detection and dissemination system using Common Alert Protocol (CAP).	A single emergency alert using Common Alert Protocol (CAP) can trigger a variety of public warning systems, increasing the likelihood that people receive the alert by one or more communication pathways. The CAP is capable to disseminate rich multimedia such as photographs, maps, streaming video and audio. An early warning system based on CAP may be established at suitable location.
2. Construction of permanent multipurpose Cyclone / Tsunami shelters.	Multi-Purpose Shelters are meant to provide refuge to vulnerable populations at the time of a cyclonic storm and otherwise to be used as community centers etc. The Multi-Purpose Cyclone Shelters act as a safe shelter for people living in a cyclone threatened region or meant for those who fail to evacuate due to various reasons. The number of Multi-Purpose Shelters should be proportionate to the population size with due examination of its safety and sustainability aspects.
3. Preparation of cyclone/Tsunami response and evacuation plan	Collaborate with community leaders to create community evacuation plans, including evacuation zones and routes. Identify and prepare shelter locations above sea level and conduct emergency evacuation trainings to ensure readiness of communities.
4. Installation of tidal gauges along the coast.	Install digital tide gauges as part of the early warning system, to continuously record the height of the surrounding water level and send real-time notifications to monitoring centers.
5. Establishment of a meteorological radar system along coastal areas.	Update and expand meteorological radar stations across the coastal belt as part of early warning system to detect precipitation particles in the atmosphere and send real-time notifications for any in-coming cyclone / heavy precipitation.
6. Construction of coastal dikes along major public facilities against tsunamis and storm surges (cyclones).	Dikes can provide a high degree of protection against flooding in low-lying coastal areas. Important public infrastructure like schools, hospitals and shelter places should be secured by constructing protection dikes with a slope. The sloped dike forces the wave to break when the water becomes shallow, and therefore reduces the energy of the wave.
7. Conduct of District Level Mock Exercise (DLME).	Develop a calendar for mock exercises to assess the preparedness, review the District Disaster Management Plans, Standard Operating Procedures and to evaluate the readiness of various departments to any disaster or emergency.
8. Development of insurance policy for financial risk management	Collaborate with Provincial Govt. and Private Partners to devise a disaster insurance policy for vulnerable communities. Disaster insurance provides a means of covering losses incurred through disasters and catastrophic events and reducing disasters' severe financial impact on individuals and communities. Financial liquidity provided by insurance helps mitigate disasters' effects on food security, health and livelihood assets.

COST BENEFIT ANALYSIS

INTRODUCTION

1. Cost Benefit Analysis (CBA) is a key analytical tool that can provide quantitative information regarding the prioritization of risk reduction based on comparing benefits of an actual or planned intervention with its costs.
2. Cost Benefit Analysis (CBA) can play a pivotal role in advocacy and decision-making on Disaster Risk Reduction (DRR) by demonstrating the financial and economic value of incorporating DRR initiatives into planning.
3. In an age of austerity, cost–benefit analysis continues to be an important tool for prioritizing efficient DRM measures but with a shifting emphasis from infrastructure-based options (hard resilience) to preparedness and systemic interventions (soft resilience), other tools such as cost-effectiveness analysis, multi-criteria analysis and robust decision-making approaches deserve more attention.
4. Studies categorize interventions into hard and soft type of measures. Hard resilience refers to the strengthening of structures and physical components of systems in order to brace against shocks imposed by extremes such as earthquakes, storms and floods. In contrast, soft resilience (Behavioural DRR) refers to less tangible and process-oriented measures as well as policy in order to robustly cope with events as they occur and minimize the adverse outcomes.
5. The studies find that many of the highest economic returns exist for behavioural DRR strategies
6. The benefits of hazard mitigation are the avoided losses, i.e., those losses that would have occurred in a probabilistic sense if the mitigation activity had not been implemented.

COST BENEFIT ANALYSIS – THATTA DISTRICT

The existing nature of disasters in Thatta district can be categorized as low to Extreme. The prominent hazards in the district is heatwave, drought and flood. The meteorological drought risk in the district ranges from medium to extreme, while agricultural drought risk in the district ranges from low to extreme. The risk of earthquake is determined to be low. The risk of tsunami is low to high while storm surge is medium to extreme. The cyclone risk in the district is determined to be low to medium. As far as heatwave is concerned Thatta district is at low to extreme risk. As far as riverine flood is concerned, Thatta district is at low to extreme risk; however, the settled areas of UCs in the district are only likely to be effected in breaching scenario of flood protection embankments of river Indus. As far as population living within the flood plain is concerned, they are well aware of flood risk and live on their own risk, therefore, government functionary is recommended to be mobilized for dissemination of warnings and alerts to population, safe evacuation and providing temporary shelters. Based on the results of the MHVRA study the hazards of the district can be managed through soft and enhanced

management measures. In this scenario, cost benefit analysis of proposed interventions is appended in table below:

Table 10: Cost Benefit Analysis of Disaster Risk Measures in District Thatta

S. no.	Soft resilience (Behavioral DRR)	Cost	Benefit
1.	Identification and management of shelters for earthquake, cyclone, storm surge and Tsunami	Identification and management of shelter spaces is a cost-effective way to ensure rapid, and effective management of population at times of crisis. Government schools can serve as ideal cost-effective shelter spaces in district Thatta, as these can accommodate large number of people during disasters. Gradually, permanent multi-purpose shelters specially near coast line and at safe location can be established in future to avoid use of education facilities.	Shelter places are highly beneficial at times of disaster as it offers a unified accommodation place for displaced people. Shelter place also help administration in effective management of displaced people and provide them with much needed relief. Shelter space keeps people off the highways during and after disaster. Shelters are often the only safe heaven for those without the financial means to take other protective measures.
2.	Monitoring / Strengthening of flood protection embankments	Pre-emptive monitoring activity to check the wellness and structural integrity of flood protection embankments before the onset of monsoon season. This would allow identification of embankments that are in need of repairs and would help identify areas where new embankments are required. Following this activity, assets can be mobilized to enhance the flood protection embankments prior to the occurrence of high flow in rivers.	Timely identification of weak embankments and repairs would prevent flood water from breaching the river floodplains and thereby save millions of acres of crop land, settlements and infrastructure from inundation, possibly saving life and property. This would also reduce the burden on emergency services during hazard and the government can concentrate efforts on severely affected areas. Less damage to communication lines including roads and power lines would improve disaster response and outreach. This would also result in reduced number of internally displaced people (IDPs).
3.	Early warning system for heatwave	Dissemination of forecast of heatwaves from the meteorological department through public radio announcements, print and digital media increases the preparedness of local populace against the	Early warnings give people time to prepare in advance and postpone activities after daytime. Local authorities would get ample time to establish relief centers with provisions of shade and hydration. Hospitals would be prepared to receive more patients than usual. An overall reduction in emergency cases would reflect in less

		impending hazard.	mortality and more savings in medical expenditure.
4.	Awareness campaigns	Public private partnership and use of electronic/print media for raising public awareness is a cost-effective approach to build society resilience and improved disaster risk management capabilities of vulnerable communities.	Public awareness and public education for disaster reduction helps to reduce disaster risks. It mobilizes people through clear messages, supported with detailed information. People who know how to react in case of a disaster, community leaders who have learned to warn their people in time, and whole social layers who have been taught how to prepare themselves for natural hazards can contribute to better mitigation strategies and dissemination of information on the consequences of hazards. Education and knowledge can provide people with tools for vulnerability reduction and life-improving self-help strategies.
5.	Early warning for riverine floods	Enhanced communication between the upstream and local Irrigation department allows ample time for emptying reservoirs and increase flows to downstream areas in advance of the arrival of flood waters.	Early warning system and streamlined communication between the upstream and local irrigation department help lowers the adverse impacts of floods in the shape of reduced damage to crops, settlements and infrastructure. This all results in a positive socio-economic impact.
6.	Strengthening of mobile health care facilities	Setup of temporary health facilities reduce difficulty in patients' transportation to permanent hospital facilities. Mobile health care units are already available with government of Sindh, their mobilization to disaster management will ensure lifesaving.	Mobile health facilities play a very significant role in the mitigation of disaster because of their particular function in providing essential first aid. Ease of access to basic health facilities will reduce burden on hospitals. The systematic organization and easy mobilization of the staff, equipment and medical supplies in a safe environment are crucial if disaster response is to be prompt and effective.

ANNEX – A – VULNERABLE SETTLEMENTS PRONE TO RIVERINE FLOOD

List of Vulnerable Settlements (119) within flood Plains Prone to Riverine Flood

S.#	Name	Longitude	Latitude	Area (acres)
1	Yaru Katwar	67.622	24.117	18.324
2	Usman Ota	67.697	24.192	16.209
3	Usman Junejo	67.748	24.212	3.536
4	Tando Hafiz Shah	68.312	25.175	-
5	Siddiq Chaudhary	67.694	24.211	6.941
6	Rais Ghulam Husain	67.626	24.147	9.040
7	Pir jo Goth	67.960	24.621	5.297
8	Musa Himayati	67.817	24.368	3.452
9	Mehiu Bakero	67.872	24.450	19.065
10	Haji Siddiq Baloch	67.624	24.171	5.254
11	Haji Mohammad Ota	67.584	24.092	17.489
12	Haji Khair Mohammad Marwo	67.604	24.102	3.131
13	Haji Ibrahim Lako	67.724	24.216	1.610
14	Goth Yusuf	67.936	24.644	5.275
15	Goth Taju	67.964	24.603	-
16	Goth Sumra	67.949	24.687	30.378
17	Goth Siddiq	68.278	25.175	59.999
18	Goth Shoro	67.780	24.365	24.102
19	Goth Shaikh Sumar Aulia	68.288	25.173	1.568
20	Goth Sattan	67.804	24.327	11.967

S.#	Name	Longitude	Latitude	Area (acres)
21	Goth Sabu Sumro	68.280	25.240	1.397
22	Goth Rawal Dal	68.305	25.171	6.978
23	Goth Rais Jamali	68.009	24.762	6.102
24	Goth Pirano	68.321	25.149	49.238
25	Goth Muhammad Siddiq Chandio	67.768	24.323	6.109
26	Goth Muhammad Hashim Sumar	67.759	24.360	7.624
27	Goth Mithamani	68.288	25.162	4.240
28	Goth Mamu Nahanjo	67.749	24.273	1.429
29	Goth Mamon	68.272	25.113	17.074
30	Goth Hoti Baran	67.867	24.393	18.328
31	Goth Haji Saleh Dal	68.286	25.142	5.926
32	Goth Haji Qasim	68.268	25.187	163.204
33	Goth Haji Muhammad	68.282	25.147	6.705
34	Goth Haji Makko	68.274	25.161	2.672
35	Goth Haji Ibrahim	68.284	25.153	2.684
36	Goth Haji Faqir Dal	68.332	25.163	14.174
37	Goth Haji Babu Babar	68.248	25.111	20.581
38	Goth Ghulam Rasul Babar	68.252	25.104	12.878
39	Goth Galani Baloch	67.756	24.347	5.388
40	Goth Daulatpur	67.790	24.292	-
41	Goth Beran	68.264	25.214	56.903
42	Goth Bagga Lashari	68.331	25.158	10.562

S.#	Name	Longitude	Latitude	Area (acres)
43	Goth Allah Dino Khaskheli	68.011	24.788	22.058
44	Autaq Haji Muhaud	68.280	25.135	2.892
45	Untitled Settlement	67.655	24.142	3.994
46	Untitled Settlement	67.653	24.124	2.178
47	Untitled Settlement	67.633	24.194	6.081
48	Untitled Settlement	67.634	24.083	19.219
49	Untitled Settlement	67.616	24.089	4.525
50	Untitled Settlement	67.615	24.090	3.590
51	Untitled Settlement	67.612	24.097	5.644
52	Untitled Settlement	67.597	24.122	3.485
53	Untitled Settlement	67.621	24.163	13.257
54	Untitled Settlement	67.749	24.214	0.415
55	Untitled Settlement	67.748	24.214	4.314
56	Untitled Settlement	67.750	24.218	5.120
57	Untitled Settlement	67.748	24.220	1.727
58	Untitled Settlement	67.790	24.292	8.370
59	Untitled Settlement	68.276	24.986	11.481
60	Untitled Settlement	67.599	24.099	2.407
61	Untitled Settlement	67.597	24.099	4.870
62	Untitled Settlement	67.604	24.104	2.569
63	Untitled Settlement	67.602	24.102	3.425
64	Untitled Settlement	67.686	24.208	3.488

S.#	Name	Longitude	Latitude	Area (acres)
65	Untitled Settlement	67.786	24.254	8.417
66	Untitled Settlement	67.764	24.292	33.639
67	Untitled Settlement	67.759	24.271	5.747
68	Untitled Settlement	67.761	24.273	3.761
69	Untitled Settlement	67.780	24.287	4.950
70	Untitled Settlement	67.783	24.289	6.738
71	Untitled Settlement	68.001	24.792	7.489
72	Untitled Settlement	67.939	24.644	2.875
73	Untitled Settlement	67.942	24.639	4.770
74	Untitled Settlement	68.273	25.114	1.434
75	Untitled Settlement	68.270	25.114	4.071
76	Untitled Settlement	68.271	25.115	3.375
77	Untitled Settlement	68.270	25.129	6.216
78	Untitled Settlement	68.294	25.138	5.757
79	Untitled Settlement	68.286	25.139	3.463
80	Untitled Settlement	68.291	25.140	4.872
81	Untitled Settlement	68.221	24.999	19.258
82	Untitled Settlement	68.251	25.106	12.084
83	Untitled Settlement	68.246	25.113	4.500
84	Untitled Settlement	67.972	24.689	24.425
85	Untitled Settlement	67.971	24.705	3.474
86	Untitled Settlement	67.983	24.734	8.146

S.#	Name	Longitude	Latitude	Area (acres)
87	Untitled Settlement	67.976	24.745	6.999
88	Untitled Settlement	68.007	24.757	25.426
89	Untitled Settlement	68.014	24.773	8.866
90	Untitled Settlement	68.013	24.792	3.928
91	Untitled Settlement	67.976	24.747	4.009
92	Untitled Settlement	67.633	24.196	2.971
93	Untitled Settlement	67.946	24.488	1.101
94	Untitled Settlement	67.949	24.487	-
95	Untitled Settlement	67.928	24.514	24.903
96	Untitled Settlement	67.817	24.374	13.043
97	Untitled Settlement	67.831	24.389	51.234
98	Untitled Settlement	67.835	24.417	2.731
99	Untitled Settlement	67.844	24.441	9.757
100	Untitled Settlement	67.851	24.443	8.433
101	Untitled Settlement	67.847	24.444	5.097
102	Untitled Settlement	68.309	25.140	2.674
103	Untitled Settlement	68.311	25.141	2.763
104	Untitled Settlement	68.304	25.141	2.635
105	Untitled Settlement	68.306	25.141	2.279
106	Untitled Settlement	68.331	25.153	2.431
107	Untitled Settlement	68.283	25.155	8.690
108	Untitled Settlement	68.328	25.156	13.815

S.#	Name	Longitude	Latitude	Area (acres)
109	Untitled Settlement	68.297	25.157	4.202
110	Untitled Settlement	68.307	25.159	14.417
111	Untitled Settlement	68.295	25.169	7.392
112	Untitled Settlement	68.308	25.169	3.574
113	Untitled Settlement	68.296	25.174	2.488
114	Untitled Settlement	68.310	25.175	9.442
115	Untitled Settlement	68.313	25.174	15.496
116	Untitled Settlement	68.265	25.180	6.566
117	Untitled Settlement	68.301	25.243	21.177
118	Untitled Settlement	68.285	25.155	0.008
119	Untitled Settlement	68.284	25.155	0.286

ANNEX – B – SHELTER LOCATIONS DESCRIPTION – RIVERINE FLOOD

The given shelter locations for riverine flood are proposed on the findings of the MHVRA 2022 study and information obtained through satellite technology and online verifiable sources. It is recommended to conduct on ground physical surveys to evaluate their suitability.

Shelter location	Co-ordinates	Area (acres)	Estimated Tents (numbers)	Avg. elevation (ft.)
1	Upper right corner: 25°15'27.94"N 68°12'42.35"E Upper left corner: 25°15'24.58"N 68°11'14.72"E Lower right corner: 25°14'16.14"N 68°12'43.08"E Lower left corner: 25°14'18.13"N 68°11'13.54"E	1298	~60,000	145
2	Upper right corner: 25° 6'50.43"N 68°12'38.71"E Upper left corner: 25° 6'55.72"N 68°11'35.87"E Lower right corner: 25° 5'57.15"N 68°12'32.80"E Lower left corner: 25° 5'57.22"N 68°11'36.59"E	707	~32,000	111
3	Upper right corner: 24°52'15.01"N 67°58'13.50"E Upper left corner: 24°52'23.80"N 67°58'1.78"E Lower right corner: 24°51'43.47"N 67°57'43.43"E Lower left corner: 24°51'50.77"N 67°57'32.36"E	129	~5,800	145
4	Upper right corner: 24°41'18.22"N 67°52'21.30"E Upper left corner: 24°41'21.02"N 67°51'28.13"E Lower right corner: 24°40'19.02"N 67°52'12.72"E Lower left corner: 24°40'18.42"N 67°51'9.68"E	759	~34,000	140
5	Upper right corner: 24°18'42.16"N 67°40'15.92"E Upper left corner: 24°18'37.62"N 67°40'10.66"E Lower right corner: 24°18'34.03"N 67°40'24.88"E Lower left corner: 24°18'29.48"N 67°40'19.93"E	18	~800	14

A total of 5 shelter locations have been selected as Flood shelter places across district Thatta. The shelter locations are selected based on their proximity to the population vulnerable to flood, distance from area under high flood risk, elevation from the nearby areas, and accessibility to roads and other basic facilities (healthcare, education, police station, etc.) A total of approximately 132,600 tents (tent with size of 45 sq. m each) can be set up within the demarcated shelter places.

ANNEX – C – SHELTER LOCATIONS DESCRIPTION – EARTHQUAKE

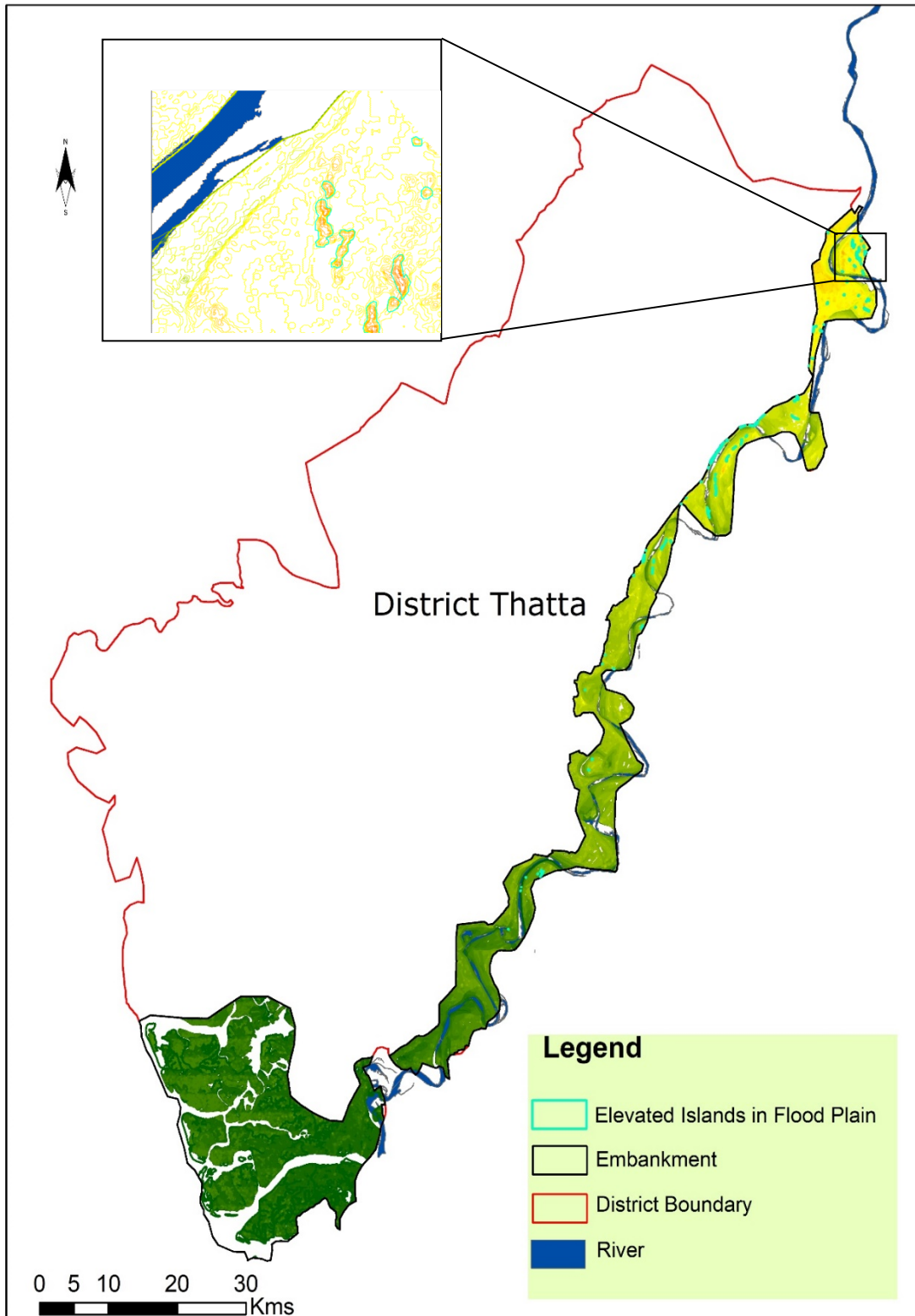
The given shelter locations for earthquake are proposed on the findings of the MHVRA 2022 study and information obtained through satellite technology and online verifiable sources. It is recommended to conduct on ground physical surveys to evaluate their suitability.

Shelter location	Co-ordinates	Area (acres)	Estimated Tents (numbers)	Avg. elevation (ft.)
1	Upper right corner: 24°46'43.40"N 67°37'45.71"E Upper left corner: 24°47'9.08"N 67°37'13.31"E Lower right corner: 24°45'40.44"N 67°36'45.16"E Lower left corner: 24°46'7.52"N 67°36'14.03"E	763	~34,000	91
2	Upper right corner: 24°30'57.02"N 67°34'42.74"E Upper left corner: 24°31'0.35"N 67°33'57.19"E Lower right corner: 24°29'37.67"N 67°34'36.84"E Lower left corner: 24°29'38.95"N 67°33'50.69"E	799	~36,000	12
3	Upper right corner: 24°52'15.01"N 67°58'13.50"E Upper left corner: 24°52'23.80"N 67°58'1.78"E Lower right corner: 24°51'43.47"N 67°57'43.43"E Lower left corner: 24°51'50.77"N 67°57'32.36"E	129	~5,800	145
4	Upper right corner: 24°41'18.22"N 67°52'21.30"E Upper left corner: 24°41'21.02"N 67°51'28.13"E Lower right corner: 24°40'19.02"N 67°52'12.72"E Lower left corner: 24°40'18.42"N 67°51'9.68"E	759	~34,000	140

A total of 4 shelter locations have been selected as Earthquake shelter places across district Thatta. The shelter locations are selected based on their proximity to the population vulnerable to earthquake, and accessibility to roads and other basic facilities (healthcare, education, police station, etc.) A total of 109,800 tents approximately (tent with size of 45 sq. m each) can be set up within the demarcated shelter places.

ANNEX – D – ELEVATED ISLANDS WITHIN EMBANKMENTS IN THATTA

Total 101 elevated islands have been identified within the embankments in district Thatta, with a cumulative area of approximately 900 acres. These elevated islands obstruct the river flow and thereby may be demolished/removed to reinstate the normal river flow within the flood plain.



ANNEX – E – RIVER TRAINING AND STRAIGHTENING

Since most of the time riverine flood are contained in between river embankments therefore only settlements lying in flood plain are prone to low to very high floods while settled areas of Thatta districts are safe from riverine flood. However, settled areas of the district may be endangered to severe flooding condition if any breaching occurs in river embankment.

Embankment breach due to Normal River flow meandering:

Indus river continuously meander within flood plain area (3-5 miles). As river reached very close to embankments it starts eroding it hence making it vulnerable to any type of flood (low to very high flood). To avoid this situation irrigation department, make loop bund where river is close to main bund. This is a costly task and not a permanent solution because of the reason that river again change its path in 4-5 years and starts meandering to other part of bund. Therefore, there is need to stop the river to come close to the main bunds. It is, thereby, suggested to straight the path of river where it is currently meandering inside the flood plain away from the both sides of main bunds.

Below figure illustrate the concept:



Once path A to B has been developed, then river in normal condition will flow in this path. However annual or bi-annual cleaning of this path will be required by removing the sediments/clay deposit in this path. Special boats will be required to carry out this task by excavating the sand/clay beneath the river and put it on its sides. The feasibility study may be carried out to estimate the cost of digging of A-to-B path and its bi-annual maintenance and to compare it with the cost of making and maintenance of loop bunds to avoid meandering of the river. If the proposed conceptual model is financially and technically viable than it can be taken as project. If this conceptual model is implemented than damaged losses (life and material) due to breaching scenarios may be minimized or even reduced to zero.

ANNEX – F – LIST OF EQUIPMENT AVAILABLE IN DISTRICT THATTA

De-watering Machine	308
Dumper	13
Buildozers / Dozers	10
Excavator	8
Fire Brigade / Engine / Tender	11
Tractor / Trolley / Blade	27
Vehicle / Bus/ Van/Truck/	22
Loader	11
Shawal	3
Cess Pool	1
Water Tanker	8
Tralor	2
Ambulances	14
Mech. Street Sweepe	1
Refuge Van	36
Garbage Van	3
Riksha Container	3
Power Generators	3
Bobkit	4

Source: Provincial Monsoon contingency plan 2020 – PDMA, Government of Sindh