

MHVRA

INFORMED DISASTER MANAGEMENT PLAN

2023-2032

DISTRICT JAMSHORO



DEVELOPED BY
PDMA SINDH



THROUGH
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WITH THE SUPPORT OF



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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 Jamshoro 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 Jamshoro 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 Jamshoro 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 JAMSHORO

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 and 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.

1. 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.
2. 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

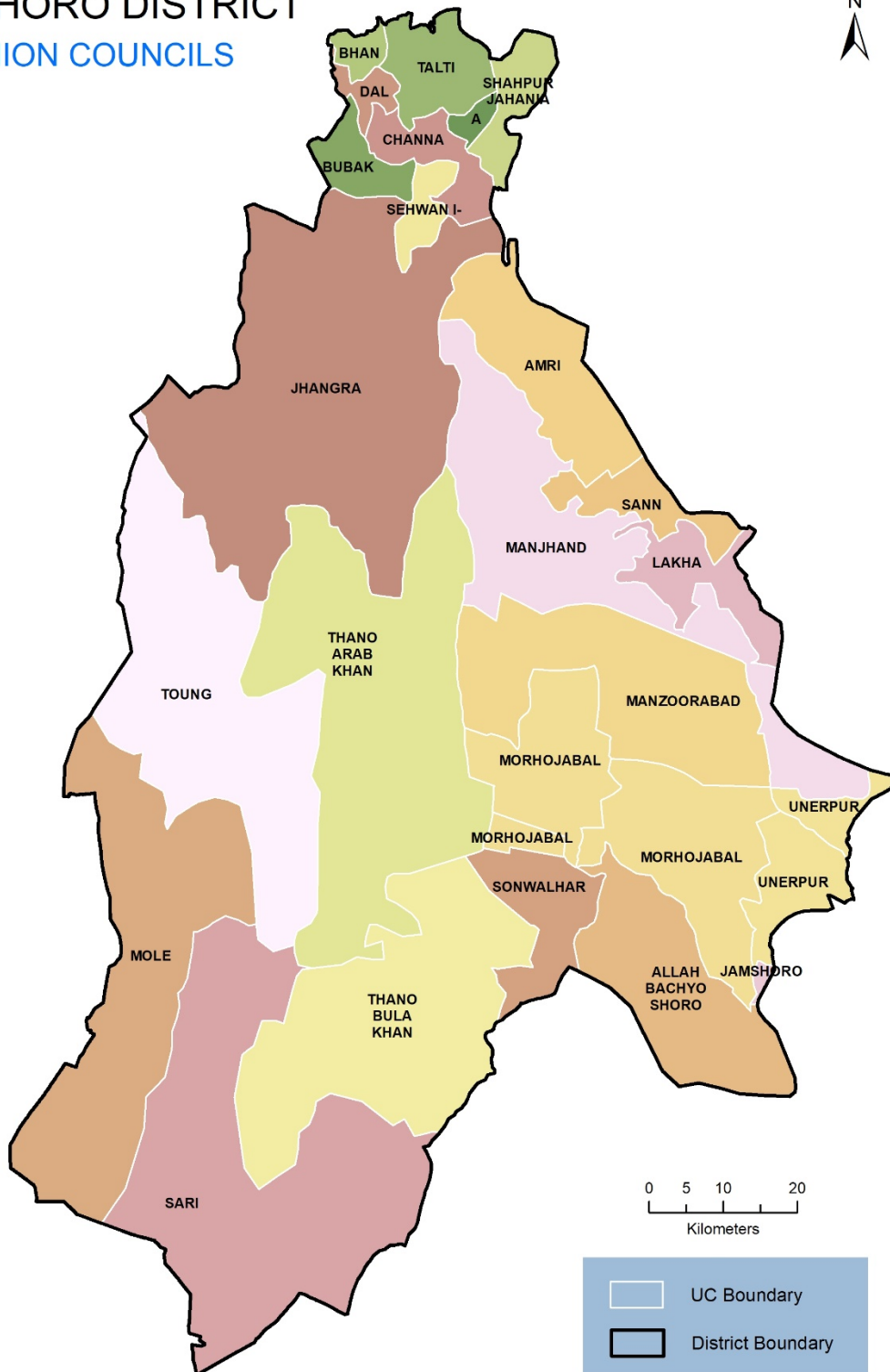
MODES OF REVIEW

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 JAMSHORO

JAMSHORO DISTRICT UNION COUNCILS



Source: Board of Revenue, GoS

District area in Sq. Km	11,111	
Coordinates	Longitude 67° 37' 60" to 68° 20' 58" East Latitude 24° 58' 14" to 26° 33' 59" North	
Surrounding Districts	Dadu in North and North-West Naushahro Feroze in the North Shaheed Benazirabad, Matiari and Hyderabad in the East Thatta in the South Karachi in South-West	
Climate Conditions	Hot and Semi-Arid	
Coldest Month	January	
Hottest Month	May	
Seasonal Temperatures	Max Mean (°C)	Min Mean (°C)
Spring (March and April)	36.90	20.20
Dry Summer (May and June)	41.89	26.81
Wet Summer (July to September)	38.28	26.22
Autumn (October to November)	34.52	19.31
Winter (December to February)	26.67	11.67
Average Rainfall	124.66 mm/year	
Physiographic Features	Mountains (Kirther Range) in the west River Indus in the east	

DEMOGRAPHY

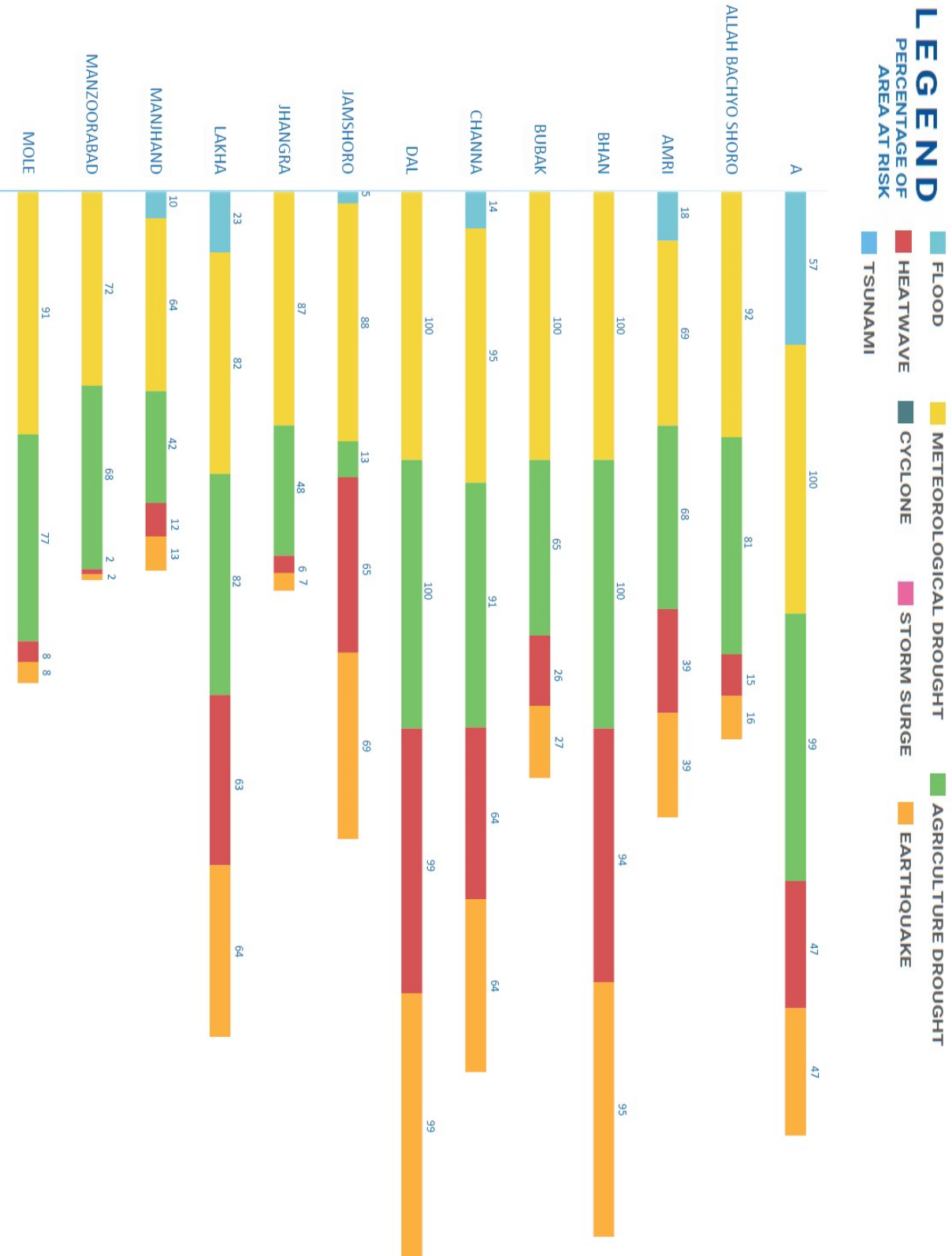
	Year-1998	Year-2017
Population	582,094	993,908
Urban	131,628	432,621
Rural	450,466	561,287
No. of Household	-	180,922
Average Annual Growth Rate 1998-2017	2.85 %	

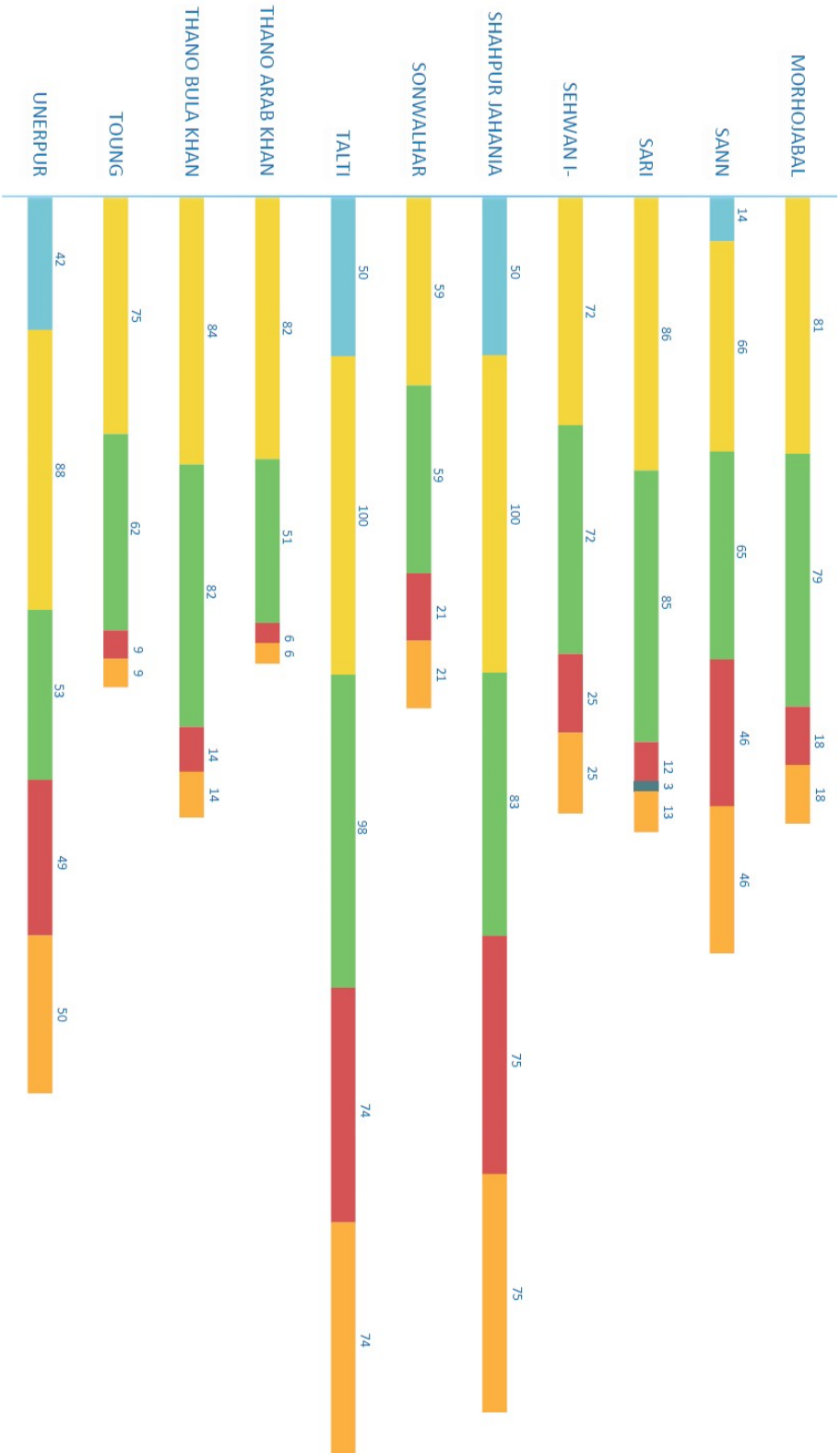
ECONOMY

Industries	Mining And Industries
Agriculture	Production in M.tons as per (2016-17)
Major Crops	
Wheat	115,605
Sugarcane	25,956
Cotton	17,813
Minor Crops	
Bajra	262
Jowar	367
Maize	177
Barley	73
Rapeseed And Mustard	239
Sesame	311
Gram	856

TALUKA NAMES	UC NAMES
<ol style="list-style-type: none">1. Kotri Taluka2. Manjhand Taluka3. Sehwan Taluka4. Thano Bula Khan Taluka	<ol style="list-style-type: none">1. A2. Allah Bachyo Shoro3. Amri4. Bhan5. Bubak6. Channa7. Dal8. Jamshoro9. Jhangra10. Lakha11. Manjhand12. Manzoorabad13. Mole14. Morhojabal15. Sann16. Sari17. Sehwan-I18. Shahpur Jahania19. Sonwalhar20. Talti21. Thano Arab Khan22. Thano Bula Khan23. Toung24. Unerpur

JAMSHORO DISTRICT MULTI-HAZARD RISK PROFILES





UC WISE RISK PROFILE

A			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	11.465 sq km
		Kachcha Area	0.115 sq km
		Natural Vegetation in Wet Areas	0.023 sq km
		Education Facilities	1
		Settlements	2
		Road Network	0.485 km
		Population	2274
		Household	455
Meteorological Drought	Medium - Extreme	Settlement	2
		Agriculture Area	11.544 sq km
		Natural Vegetation in Wet Areas	5.984 sq km
		Water Body	0.451 sq km
		Population	1840
		Household	368
Agricultural Drought	Low - High	Settlements	2
		Agriculture Area	14.394 sq km
		Natural Vegetation in Wet Areas	7.463 sq km
		Water Body	0.562 sq km
		Population	1840
		Household	368
Heatwave	Low - Medium	Settlement	2
		Population	1833
		Household	367
		Agriculture Area	11.444 sq km
		Kachcha Area	0.115 sq km
Riverine Flood	Low - Extreme	Agriculture Area	11.454 sq km
		Kachcha Area	0.115 sq km
		Natural Vegetation in Wet Areas	2.445 sq km
		Education Facilities	1
		Settlements	2
		Road Network	0.038 km
		Population	2274
		Household	455

Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge

ALLAH BACHYO SHORO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	51.955 sq km
		Forest Area	0.003 sq km
		Kachcha Area	0.648 sq km
		Natural Vegetation in Wet Areas	0.028 sq km
		Pakka Planned Area	16.205 sq km
		Pakka Unplanned Area	1.173 sq km
		Range Land	0.447 sq km
		Ambulance Services	2
		Bridges	8
		Bus Stops	2
		Education Facilities	62
		Fire Stations	1
		Grid Stations	2
		Health Facilities	6
		Industries	57
		Mobile Towers	28
		Petrol Pumps	24
		Police Stations	2
		Post Offices	1
		Power Plants	2
Settlements	70		
Irrigation and Drainage Network	7.509 km		
Railway Line	19.959 km		
Road Network	206.078 km		
Population	275808		
Household	48096		
Meteorological Drought	Medium - Extreme	Settlement	63
		Agriculture Area	52.46 sq km
		Bare Area with sparse Natural Vegetation	281.717 sq km
		Forest Area	0.259 sq km
		Natural Vegetation in Wet Areas	5.907 sq km

		Range Land	45.623 sq km
		Water Body	0.34 sq km
		Wet Area	0.645 sq km
		Population	224454
		Household	39139
Agricultural Drought	Low - Extreme	Settlements	21
		Agriculture Area	28.154 sq km
		Bare Area with sparse Natural Vegetation	345.3 sq km
		Forest Area	0.317 sq km
		Natural Vegetation in Wet Areas	7.136 sq km
		Range Land	54.853 sq km
		Water Body	0.05 sq km
		Population	66448
		Household	11521
Heatwave	Low - Extreme	Settlement	62
		Population	225356
		Household	39298
		Agriculture Area	51.824 sq km
		Kachcha Area	0.65 sq km
		Pakka Planned Area	16.2 sq km
		Pakka Unplanned Area	1.173 sq km
Riverine Flood	Low - Extreme	Agriculture Area	2.314 sq km
		Pakka Planned Area	0.54 sq km
		Pakka Unplanned Area	0.076 sq km
		Education Facilities	8
		Mobile Towers	3
		Petrol Pumps	1
		Settlements	7
		Railway Network	6.467 km
		Road Network	10.709 km
		Population	15695
		Household	2743
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

AMRI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	133.525 sq km
		Forest Area	0.013 sq km
		Kachcha Area	0.199 sq km
		Natural Vegetation in Wet Areas	0.094 sq km
		Pakka Planned Area	0.009 sq km
		Pakka Unplanned Area	1.606 sq km
		Range Land	0.166 sq km
		Bridges	9
		Education Facilities	35
		Grid Stations	1
		Health Facilities	3
		Mobile Towers	9
		Petrol Pumps	1
		Power Plants	1
		Settlements	33
		Railway Line	38.671 km
		Road Network	81.132 km
		Population	26017
Household	4948		
Meteorological Drought	Medium - Extreme	Settlement	26
		Agriculture Area	133.944 sq km
		Bare Area with sparse Natural Vegetation	25.528 sq km
		Forest Area	6.458 sq km
		Natural Vegetation in Wet Areas	25.084 sq km
		Range Land	17.25 sq km
		Water Body	2.79 sq km
		Wet Area	1.046 sq km
		Population	19710
		Household	3749
Agricultural Drought	Low - Extreme	Settlements	25
		Agriculture Area	166.158 sq km
		Bare Area with sparse Natural Vegetation	29.622 sq km
		Forest Area	8.023 sq km
		Natural Vegetation in Wet Areas	31.148 sq km
		Range Land	21.374 sq km
		Water Body	3.461 sq km
		Wet Area	1.297 sq km
		Population	20856

		Household	3967
Heatwave	Low - High	Settlement	24
		Population	20988
		Household	3992
		Agriculture Area	133.426 sq km
		Kachcha Area	0.199 sq km
		Pakka Planned Area	0.009 sq km
		Pakka Unplanned Area	1.606 sq km
Riverine Flood	Low - Extreme	Agriculture Area	56.354 sq km
		Forest Area	0.014 sq km
		Kachcha Area	0.009 sq km
		Natural Vegetation in Wet Areas	8.361 sq km
		Pakka Unplanned Area	0.086 sq km
		Bridges	2
		Education Facilities	8
		Mobile Towers	1
		Settlements	5
		Road Network	5.608 km
		Population	1365
Household	259		
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BHAN			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	34.231 sq km
		Pakka Planned Area	1.227 sq km
		Pakka Unplanned Area	1.596 sq km
		Range Land	0.01 sq km
		Ambulance Services	1
		Bridges	3
		Education Facilities	38
		Health Facilities	5
		Industries	1
		Mobile Towers	5
		Petrol Pumps	10
Police Stations	1		

		Power Plants	1
		Settlements	26
		Irrigation and Drainage Network	15.086 km
		Railway Line	6.795 km
		Road Network	63.346 km
		Population	51733
		Household	10685
Meteorological Drought	Medium - Extreme	Settlement	26
		Agriculture Area	34.299 sq km
		Range Land	0.23 sq km
		Water Body	0.018 sq km
		Population	41698
		Household	8610
Agricultural Drought	Low - Medium	Settlements	26
		Agriculture Area	42.824 sq km
		Range Land	0.288 sq km
		Water Body	0.022 sq km
		Population	41698
		Household	8610
Heatwave	Low - High	Settlement	24
		Population	41444
		Household	8562
		Agriculture Area	34.208 sq km
		Pakka Planned Area	1.226 sq km
		Pakka Unplanned Area	1.598 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BUBAK			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	23.178 sq km
		Pakka Planned Area	0.974 sq km
		Pakka Unplanned Area	0.531 sq km
		Bridges	1

		Education Facilities	25
		Industries	2
		Mobile Towers	3
		Settlements	18
		Irrigation and Drainage Network	12.036 km
		Road Network	51.935 km
		Population	10519
		Household	2108
Meteorological Drought	Medium - Extreme	Settlement	18
		Agriculture Area	23.265 sq km
		Range Land	0.066 sq km
		Water Body	69.289 sq km
		Wet Area	0.01 sq km
		Population	8593
		Household	1721
Agricultural Drought	Low - Extreme	Settlements	12
		Agriculture Area	26.225 sq km
		Range Land	0.082 sq km
		Water Body	48.603 sq km
		Wet Area	0.002 sq km
		Population	7185
		Household	1439
Heatwave	Low - High	Settlement	16
		Population	8435
		Household	1691
		Agriculture Area	23.169 sq km
		Pakka Planned Area	0.975 sq km
		Pakka Unplanned Area	0.531 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

CHANNA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	75.522 sq km

		Kachcha Area	0.129 sq km
		Natural Vegetation in Wet Areas	0.025 sq km
		Pakka Unplanned Area	2.91 sq km
		Range Land	0.005 sq km
		Bridges	11
		Bus Stops	3
		Education Facilities	65
		Grid Stations	1
		Health Facilities	4
		Industries	1
		Mobile Towers	11
		Petrol Pumps	6
		Police Stations	2
		Post Offices	4
		Settlements	26
		Tourist Places	2
		Irrigation and Drainage Network	33.631 km
		Railway Line	17.712 km
		Road Network	123.197 km
		Population	52066
		Household	10103
Meteorological Drought	Medium - Extreme	Settlement	26
		Agriculture Area	75.727 sq km
		Bare Area with sparse Natural Vegetation	3.963 sq km
		Natural Vegetation in Wet Areas	15.046 sq km
		Range Land	0.78 sq km
		Water Body	1.744 sq km
		Wet Area	0.807 sq km
		Population	41878
		Household	8125
Agricultural Drought	Low - Extreme	Settlements	26
		Agriculture Area	94.369 sq km
		Bare Area with sparse Natural Vegetation	4.932 sq km
		Natural Vegetation in Wet Areas	18.72 sq km
		Range Land	0.971 sq km
		Water Body	2.174 sq km
		Wet Area	1.006 sq km
		Population	35665
		Household	6944

Heatwave	Low - High	Settlement	25
		Population	41752
		Household	8101
		Agriculture Area	75.463 sq km
		Kachcha Area	0.129 sq km
		Pakka Unplanned Area	2.909 sq km
Riverine Flood	Low - Extreme	Agriculture Area	9.939 sq km
		Natural Vegetation in Wet Areas	7.043 sq km
		Education Facilities	2
		Road Network	2.877 km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

DAL			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	41.474 sq km
		Pakka Planned Area	0.09 sq km
		Pakka Unplanned Area	0.448 sq km
		Education Facilities	24
		Mobile Towers	1
		Petrol Pumps	1
		Power Plants	1
		Settlements	15
		Irrigation and Drainage Network	23.255 km
		Railway Line	5.779 km
		Road Network	59.246 km
		Population	8870
Household	1775		
Meteorological Drought	Medium - Extreme	Settlement	15
		Agriculture Area	41.512 sq km
		Water Body	0.155 sq km
		Population	7214
		Household	1442
Agricultural Drought	Low - High	Settlements	15
		Agriculture Area	51.789 sq km

		Water Body	0.194 sq km
		Population	7214
		Household	1442
Heatwave	Low - High	Settlement	15
		Population	7119
		Household	1424
		Agriculture Area	41.461 sq km
		Pakka Planned Area	0.091 sq km
		Pakka Unplanned Area	0.449 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

JAMSHORO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	1.204 sq km
		Pakka Planned Area	4.837 sq km
		Range Land	0.041 sq km
		Bridges	8
		Bus Stops	2
		Education Facilities	17
		Health Facilities	4
		Industries	1
		Mobile Towers	11
		Petrol Pumps	9
		Police Stations	1
		Post Offices	1
		Settlements	16
		Irrigation and Drainage Network	2.894 km
		Railway Line	4.228 km
		Road Network	35.599 km
Population	23677		
Household	3649		
Meteorological Drought	Medium - Extreme	Settlement	14
		Agriculture Area	1.212 sq km
		Range Land	0.232 sq km

		Water Body	0.18 sq km
		Wet Area	0.071 sq km
		Population	19408
		Household	2990
Agricultural Drought	Low - Medium	Settlements	2
		Agriculture Area	0.106 sq km
		Range Land	0.145 sq km
		Water Body	0.04 sq km
		Population	2930
		Household	451
Heatwave	Low - Medium	Settlement	11
		Population	19293
		Household	2972
		Agriculture Area	1.205 sq km
		Pakka Planned Area	4.831 sq km
Riverine Flood	Medium - High	Agriculture Area	0.437 sq km
		Road Network	0.205 km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

JHANGRA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	94.315 sq km
		Kachcha Area	0.098 sq km
		Natural Vegetation in Wet Areas	0.067 sq km
		Pakka Planned Area	0.114 sq km
		Pakka Unplanned Area	1.265 sq km
		Range Land	0.622 sq km
		Bridges	7
		Education Facilities	33
		Health Facilities	4
		Mobile Towers	3
		Petrol Pumps	4
		Police Stations	2
		Power Plants	2
Settlements	44		

		Tourist Places	1
		Railway Line	5.11 km
		Road Network	133.514 km
		Population	27733
		Household	5552
Meteorological Drought	Medium - Extreme	Settlement	37
		Agriculture Area	94.932 sq km
		Bare Area with sparse Natural Vegetation	943.749 sq km
		Forest Area	0.015 sq km
		Natural Vegetation in Wet Areas	8.499 sq km
		Range Land	226.862 sq km
		Water Body	24.413 sq km
		Wet Area	0.238 sq km
		Population	22496
		Household	4501
Agricultural Drought	Low - Extreme	Settlements	29
		Agriculture Area	115.841 sq km
		Bare Area with sparse Natural Vegetation	583.807 sq km
		Forest Area	0.019 sq km
		Natural Vegetation in Wet Areas	10.554 sq km
		Range Land	162.935 sq km
		Water Body	17.431 sq km
		Wet Area	0.219 sq km
		Population	21313
		Household	4265
Heatwave	Low - High	Settlement	23
		Population	22299
		Household	4464
		Agriculture Area	94.172 sq km
		Kachcha Area	0.098 sq km
		Pakka Planned Area	0.114 sq km
		Pakka Unplanned Area	1.264 sq km
		Natural Vegetation in wet areas	2.76 sq km
Riverine Flood	Low - Extreme	Agriculture Area	11.222 sq km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge
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LAKHA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	105.138 sq km
		Kachcha Area	0.242 sq km
		Natural Vegetation in Wet Areas	0.073 sq km
		Pakka Unplanned Area	1.534 sq km
		Range Land	0.106 sq km
		Bridges	5
		Education Facilities	28
		Health Facilities	1
		Mobile Towers	6
		Petrol Pumps	2
		Settlements	21
		Railway Line	22.353 km
		Road Network	46.039 km
		Population	27751
Household	5371		
Meteorological Drought	Medium - Extreme	Settlement	21
		Agriculture Area	105.406 sq km
		Bare Area with sparse Natural Vegetation	3.86 sq km
		Natural Vegetation in Wet Areas	7.273 sq km
		Range Land	7.404 sq km
		Water Body	0.232 sq km
		Wet Area	3.762 sq km
		Population	22685
Household	4388		
Agricultural Drought	Low - Extreme	Settlements	21
		Agriculture Area	130.206 sq km
		Bare Area with sparse Natural Vegetation	4.765 sq km
		Natural Vegetation in Wet Areas	8.979 sq km
		Range Land	9.143 sq km
		Water Body	0.287 sq km
		Wet Area	4.459 sq km
Population	22718		
Household	4396		

Heatwave	Low - High	Settlement	21
		Population	22478
		Household	4350
		Agriculture Area	105.08 sq km
		Kachcha Area	0.241 sq km
		Pakka Unplanned Area	1.537 sq km
Riverine Flood	Low - Extreme	Agriculture Area	33.082 sq km
		Natural Vegetation in Wet Areas	5.444 sq km
		Pakka Unplanned Area	0.078 sq km
		Range Land	0.002 sq km
		Education Facilities	4
		Settlements	2
		Road Network	3.777 km
		Population	1129
		Household	215
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

MANJHAND			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	87.804 sq km
		Kachcha Area	1.415 sq km
		Natural Vegetation in Wet Areas	0.125 sq km
		Pakka Planned Area	0.144 sq km
		Pakka Unplanned Area	2.116 sq km
		Range Land	0.53 sq km
		Bridges	7
		Education Facilities	41
		Grid Stations	1
		Mobile Towers	9
		Petrol Pumps	4
		Settlements	47
		Tourist Places	2
		Railway Line	19.477 km
		Road Network	82.568 km
		Population	50911
Household	9681		

Meteorological Drought	Medium - Extreme	Settlement	45
		Agriculture Area	88.187 sq km
		Bare Area with sparse Natural Vegetation	271.044 sq km
		Forest Area	0.021 sq km
		Natural Vegetation in Wet Areas	15.563 sq km
		Range Land	83.674 sq km
		Water Body	0.395 sq km
		Wet Area	2.438 sq km
		Population	41739
		Household	7934
Agricultural Drought	Low - Extreme	Settlements	44
		Agriculture Area	91.385 sq km
		Bare Area with sparse Natural Vegetation	170.105 sq km
		Forest Area	0.026 sq km
		Natural Vegetation in Wet Areas	13.219 sq km
		Range Land	96.436 sq km
		Water Body	0.469 sq km
		Wet Area	0.623 sq km
		Population	41645
		Household	7915
Heatwave	Low - High	Settlement	41
		Population	41336
		Household	7859
		Agriculture Area	87.708 sq km
		Kachcha Area	1.416 sq km
		Pakka Planned Area	0.144 sq km
		Pakka Unplanned Area	2.117 sq km
Riverine Flood	Low - Extreme	Agriculture Area	59.659 sq km
		Kachcha Area	0.006 sq km
		Natural Vegetation in Wet Areas	14.669 sq km
		Pakka Unplanned Area	0.257 sq km
		Range Land	0.114 sq km
		Education Facilities	13
		Settlements	10
		Railway Network	8.789 km
		Road Network	33.212 km
		Population	3789
		Household	720

Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge

MANZOORABAD			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	10.346 sq km
		Kachcha Area	0.033 sq km
		Pakka Planned Area	1.504 sq km
		Pakka Unplanned Area	0.105 sq km
		Range Land	0.105 sq km
		Health Facilities	2
		Police Stations	1
		Power Plants	1
		Settlements	9
		Road Network	58.68 km
		Population	1982
		Household	376
Meteorological Drought	Medium - Extreme	Settlement	8
		Agriculture Area	10.515 sq km
		Bare Area with sparse Natural Vegetation	383.686 sq km
		Range Land	63.922 sq km
		Water Body	0.009 sq km
		Wet Area	0.023 sq km
		Population	1640
Household	311		
Agricultural Drought	Low - Extreme	Settlements	8
		Agriculture Area	12.954 sq km
		Bare Area with sparse Natural Vegetation	441.507 sq km
		Range Land	76.766 sq km
		Water Body	0.011 sq km
		Wet Area	0.029 sq km
		Population	1654
Household	315		
Heatwave	Low - High	Settlement	7
		Population	1611
		Household	306

		Agriculture Area	10.295 sq km
		Kachcha Area	0.033 sq km
		Pakka Planned Area	1.505 sq km
		Pakka Unplanned Area	0.105 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

MOLE			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	65.993 sq km
		Forest Area	0.002 sq km
		Kachcha Area	0.655 sq km
		Natural Vegetation in Wet Areas	0.045 sq km
		Pakka Unplanned Area	0.943 sq km
		Range Land	1.287 sq km
		Education Facilities	34
		Settlements	76
		Irrigation and Drainage Network	5.821 km
		Road Network	85.802 km
		Population	20090
		Household	3519
Meteorological Drought	Medium - Extreme	Settlement	66
		Agriculture Area	67.294 sq km
		Bare Area with sparse Natural Vegetation	548.293 sq km
		Forest Area	0.098 sq km
		Natural Vegetation in Wet Areas	5.086 sq km
		Range Land	193.513 sq km
		Water Body	0.509 sq km
		Wet Area	0.022 sq km
		Population	16013
Household	2805		
Agricultural Drought	Low - Extreme	Settlements	59
		Agriculture Area	82.354 sq km

		Bare Area with sparse Natural Vegetation	522.816 sq km
		Forest Area	0.119 sq km
		Natural Vegetation in Wet Areas	6.214 sq km
		Range Land	235.287 sq km
		Water Body	0.623 sq km
		Wet Area	0.027 sq km
		Population	13325
		Household	2332
Heatwave	Low - Extreme	Settlement	32
		Population	16427
		Household	2876
		Agriculture Area	65.752 sq km
		Kachcha Area	0.655 sq km
		Pakka Unplanned Area	0.944 sq km
Cyclone	Low	Agriculture Area	1.447 sq km
		Kachcha Area	0.125 sq km
		Pakka Unplanned Area	0.016 sq km
		Range Land	0.078 sq km
		Settlements	11
		Irrigation and Drainage Network	1.056 km
		Road Network	0.04 km
		Population	1770
		Household	310
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

MORHOJABAL			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	134.948 sq km
		Kachcha Area	0.159 sq km
		Natural Vegetation in Wet Areas	0.002 sq km
		Pakka Planned Area	5.419 sq km
		Pakka Unplanned Area	0.546 sq km
		Range Land	0.384 sq km
		Ambulance Services	1

		Bus Stops	4
		Education Facilities	12
		Grid Stations	1
		Health Facilities	4
		Mobile Towers	4
		Police Stations	3
		Post Offices	2
		Power Plants	1
		Settlements	46
		Road Network	74.537 km
		Population	28355
		Household	4773
Meteorological Drought	Medium - Extreme	Settlement	41
		Agriculture Area	135.698 sq km
		Bare Area with sparse Natural Vegetation	397.02 sq km
		Natural Vegetation in Wet Areas	0.955 sq km
		Range Land	84.804 sq km
		Water Body	0.112 sq km
		Population	23324
		Household	3926
Agricultural Drought	Low - Extreme	Settlements	36
		Agriculture Area	166.894 sq km
		Bare Area with sparse Natural Vegetation	479.314 sq km
		Natural Vegetation in Wet Areas	1.173 sq km
		Range Land	102.418 sq km
		Water Body	0.138 sq km
		Population	20831
		Household	3544
Heatwave	Low - High	Settlement	38
		Population	23189
		Household	3905
		Agriculture Area	134.73 sq km
		Kachcha Area	0.159 sq km
		Pakka Planned Area	5.425 sq km
		Pakka Unplanned Area	0.547 sq km
		Pakka Unplanned Area	0.012 sq km
		Education Facilities	1
		Settlements	1
		Population	179

		Household	34
Riverine Flood	Medium	Agriculture Area	0.123 sq km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

SANN			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	57.975 sq km
		Natural Vegetation in Wet Areas	0.059 sq km
		Pakka Planned Area	1.23 sq km
		Pakka Unplanned Area	0.238 sq km
		Range Land	0.102 sq km
		Bridges	1
		Education Facilities	22
		Mobile Towers	5
		Petrol Pumps	1
		Settlements	16
		Railway Line	10.948 km
		Road Network	32.23 km
		Population	14578
Household	2794		
Meteorological Drought	Medium - Extreme	Settlement	13
		Agriculture Area	58.16 sq km
		Bare Area with sparse Natural Vegetation	1.498 sq km
		Natural Vegetation in Wet Areas	3.894 sq km
		Range Land	12.887 sq km
		Wet Area	1.275 sq km
		Population	11849
		Household	2270
Agricultural Drought	Low - Extreme	Settlements	13
		Agriculture Area	71.948 sq km
		Bare Area with sparse Natural Vegetation	1.852 sq km
		Natural Vegetation in Wet Areas	4.813 sq km
		Range Land	15.946 sq km

		Wet Area	1.447 sq km
		Population	11860
		Household	2273
Heatwave	Low - High	Settlement	11
		Population	11782
		Household	2257
		Agriculture Area	57.929 sq km
		Pakka Planned Area	1.232 sq km
		Pakka Unplanned Area	0.238 sq km
Riverine Flood	Low - Extreme	Agriculture Area	16.741 sq km
		Natural Vegetation in Wet Areas	1.408 sq km
		Education Facilities	2
		Road Network	1.275 km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

SARI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	129.669 sq km
		Forest Area	0.031 sq km
		Kachcha Area	0.487 sq km
		Natural Vegetation in Wet Areas	0.011 sq km
		Pakka Planned Area	12.024 sq km
		Pakka Unplanned Area	4.129 sq km
		Range Land	3.375 sq km
		Bridges	5
		Bus Stops	2
		Education Facilities	49
		Grid Stations	2
		Health Facilities	5
		Industries	49
		Mobile Towers	12
		Petrol Pumps	20
		Police Stations	4
		Post Offices	1
Power Plants	2		

		Settlements	131
		Irrigation and Drainage Network	47.55 km
		Road Network	479.618 km
		Population	58029
		Household	10171
Meteorological Drought	Medium - Extreme	Settlement	121
		Agriculture Area	131.86 sq km
		Bare Area with sparse Natural Vegetation	651.22 sq km
		Forest Area	0.537 sq km
		Natural Vegetation in Wet Areas	1.422 sq km
		Range Land	234.293 sq km
		Water Body	2.455 sq km
		Wet Area	0.158 sq km
		Population	47513
		Household	8326
Agricultural Drought	Low - Extreme	Settlements	121
		Agriculture Area	160.96 sq km
		Bare Area with sparse Natural Vegetation	783.256 sq km
		Forest Area	0.654 sq km
		Natural Vegetation in Wet Areas	1.741 sq km
		Range Land	285.956 sq km
		Water Body	3.002 sq km
		Wet Area	0.192 sq km
		Population	48403
		Household	8483
Heatwave	Low - Extreme	Settlement	81
		Population	47512
		Household	8331
		Agriculture Area	129.241 sq km
		Kachcha Area	0.486 sq km
		Pakka Planned Area	12.018 sq km
		Pakka Unplanned Area	4.126 sq km
Cyclone	Low	Agriculture Area	38.242 sq km
		Forest Area	0.006 sq km
		Kachcha Area	0.039 sq km
		Pakka Planned Area	0.069 sq km
		Pakka Unplanned Area	0.132 sq km
		Range Land	0.372 sq km

		Bus Stops	1
		Mobile Towers	1
		Petrol Pumps	1
		Settlements	38
		Irrigation and Drainage Network	1.085 km
		Road Network	38.435 km
		Population	2158
		Household	379
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

SEHWAN-I			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	13.922 sq km
		Kachcha Area	0.081 sq km
		Pakka Unplanned Area	1.868 sq km
		Range Land	0.086 sq km
		Ambulance Services	1
		Bridges	3
		Bus Stops	1
		Education Facilities	14
		Health Facilities	5
		Mobile Towers	2
		Petrol Pumps	4
		Police Stations	2
		Settlements	4
		Irrigation and Drainage Network	10.928 km
		Railway Line	3.396 km
		Road Network	25.012 km
Population	34264		
Household	6519		
Meteorological Drought	Medium - Extreme	Settlement	4
		Agriculture Area	14 sq km
		Bare Area with sparse Natural Vegetation	8.553 sq km
		Range Land	8.244 sq km
		Water Body	13.323 sq km
		Population	27595

		Household	5251
Agricultural Drought	Low - Extreme	Settlements	4
		Agriculture Area	17.43 sq km
		Bare Area with sparse Natural Vegetation	10.642 sq km
		Range Land	10.256 sq km
		Water Body	16.587 sq km
		Population	27609
		Household	5253
Heatwave	Low - High	Settlement	3
		Population	27516
		Household	5236
		Agriculture Area	13.886 sq km
		Kachcha Area	0.081 sq km
		Pakka Unplanned Area	1.868 sq km
		Road Network	0.423 km
Riverine Flood	Low - High	Agriculture Area	0.06 sq km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

SHAHPUR JAHANIA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	79.245 sq km
		Natural Vegetation in Wet Areas	0.097 sq km
		Pakka Planned Area	0.921 sq km
		Pakka Unplanned Area	1.834 sq km
		Range Land	0.058 sq km
		Bridges	5
		Bus Stops	1
		Education Facilities	48
		Grid Stations	1
		Health Facilities	5
		Mobile Towers	6
		Petrol Pumps	6
		Power Plants	1
Settlements	33		

		Irrigation and Drainage Network	10.431 km
		Road Network	83.259 km
		Population	45010
		Household	9010
Meteorological Drought	Medium - Extreme	Settlement	33
		Agriculture Area	79.487 sq km
		Natural Vegetation in Wet Areas	12.592 sq km
		Range Land	1.185 sq km
		Water Body	0.976 sq km
		Wet Area	0.008 sq km
		Population	36464
		Household	7300
Agricultural Drought	Low - High	Settlements	18
		Agriculture Area	83.084 sq km
		Natural Vegetation in Wet Areas	15.694 sq km
		Range Land	1.469 sq km
		Water Body	1.216 sq km
		Population	19222
		Household	3850
Heatwave	Low - High	Settlement	32
		Population	36152
		Household	7239
		Agriculture Area	79.18 sq km
		Pakka Planned Area	0.923 sq km
		Pakka Unplanned Area	1.838 sq km
		Natural Vegetation in Wet Areas	2.413 sq km
		Pakka Unplanned Area	0.328 sq km
		Range Land	0.002 sq km
		Education Facilities	7
		Settlements	5
		Road Network	13.668 km
		Population	6491
		Household	1299
Riverine Flood	Low - Extreme	Agriculture Area	52.005 sq km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge
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SONWALHAR			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	42.468 sq km
		Kachcha Area	0.079 sq km
		Natural Vegetation in Wet Areas	0.009 sq km
		Pakka Unplanned Area	0.039 sq km
		Range Land	0.167 sq km
		Settlements	5
		Road Network	3.554 km
		Population	2210
		Household	378
Meteorological Drought	Medium - Extreme	Settlement	4
		Agriculture Area	42.89 sq km
		Bare Area with sparse Natural Vegetation	55.15 sq km
		Natural Vegetation in Wet Areas	4.416 sq km
		Range Land	17.379 sq km
		Water Body	0.771 sq km
		Population	1788
		Household	305
Agricultural Drought	Low - Extreme	Settlements	4
		Agriculture Area	52.611 sq km
		Bare Area with sparse Natural Vegetation	67.382 sq km
		Natural Vegetation in Wet Areas	5.41 sq km
		Range Land	21.24 sq km
		Water Body	0.946 sq km
		Population	1851
		Household	316
Heatwave	Low - Extreme	Settlement	3
		Population	1803
		Household	308
		Agriculture Area	42.36 sq km
		Kachcha Area	0.079 sq km
		Pakka Unplanned Area	0.039 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	

Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge

TALTI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	118.053 sq km
		Forest Area	0.011 sq km
		Natural Vegetation in Wet Areas	0.128 sq km
		Pakka Unplanned Area	1.751 sq km
		Range Land	0.023 sq km
		Bridges	2
		Education Facilities	53
		Health Facilities	2
		Petrol Pumps	1
		Settlements	38
		Irrigation and Drainage Network	36.124 km
		Railway Line	0.465 km
		Road Network	81.533 km
		Population	34670
Household	6943		
Meteorological Drought	Medium - Extreme	Settlement	38
		Agriculture Area	118.5 sq km
		Forest Area	0.471 sq km
		Natural Vegetation in Wet Areas	18.765 sq km
		Range Land	1.991 sq km
		Water Body	6.722 sq km
		Wet Area	1.522 sq km
		Population	27997
Household	5607		
Agricultural Drought	Low - High	Settlements	38
		Agriculture Area	147.849 sq km
		Forest Area	0.587 sq km
		Natural Vegetation in Wet Areas	23.384 sq km
		Range Land	2.484 sq km
		Water Body	8.39 sq km

		Wet Area	1.899 sq km
		Population	27997
		Household	5607
Heatwave	Low - High	Settlement	38
		Population	27818
		Household	5569
		Agriculture Area	117.962 sq km
		Pakka Unplanned Area	1.754 sq km
Riverine Flood	Low - Extreme	Agriculture Area	77.875 sq km
		Forest Area	0.027 sq km
		Natural Vegetation in Wet Areas	2.88 sq km
		Pakka Unplanned Area	0.651 sq km
		Bridges	1
		Education Facilities	13
		Settlements	7
		Irrigation and Drainage Network	8.471 km
		Road Network	11.653 km
		Population	12884
		Household	2579
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

THANO ARAB KHAN			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	75.874 sq km
		Forest Area	0.001 sq km
		Kachcha Area	0.32 sq km
		Natural Vegetation in Wet Areas	0.058 sq km
		Pakka Unplanned Area	0.178 sq km
		Range Land	0.72 sq km
		Education Facilities	26
		Settlements	49
		Road Network	61.103 km
		Population	6253
		Household	1095

Meteorological Drought	Medium - Extreme	Settlement	38
		Agriculture Area	76.917 sq km
		Bare Area with sparse Natural Vegetation	689.585 sq km
		Forest Area	0.215 sq km
		Natural Vegetation in Wet Areas	18.135 sq km
		Range Land	223.998 sq km
		Water Body	0.238 sq km
		Wet Area	0.613 sq km
		Population	5164
		Household	906
Agricultural Drought	Low - Extreme	Settlements	36
		Agriculture Area	93.992 sq km
		Bare Area with sparse Natural Vegetation	414.175 sq km
		Forest Area	0.265 sq km
		Natural Vegetation in Wet Areas	22.301 sq km
		Range Land	243.262 sq km
		Water Body	0.292 sq km
		Wet Area	0.469 sq km
		Population	5186
		Household	910
Heatwave	Low - High	Settlement	14
		Population	5092
		Household	892
		Agriculture Area	75.559 sq km
		Kachcha Area	0.32 sq km
		Pakka Unplanned Area	0.178 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

THANO BULA KHAN			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	119.869 sq km
		Forest Area	0.006 sq km

		Kachcha Area	1.371 sq km
		Natural Vegetation in Wet Areas	0.083 sq km
		Pakka Planned Area	0.272 sq km
		Pakka Unplanned Area	3.478 sq km
		Range Land	1.678 sq km
		Bus Stops	1
		Education Facilities	46
		Health Facilities	1
		Mobile Towers	9
		Petrol Pumps	1
		Police Stations	1
		Power Plants	1
		Settlements	66
		Road Network	154.65 km
		Population	54311
		Household	9438
Meteorological Drought	Medium - Extreme	Settlement	62
		Agriculture Area	121.511 sq km
		Bare Area with sparse Natural Vegetation	436.748 sq km
		Forest Area	1.22 sq km
		Natural Vegetation in Wet Areas	19.453 sq km
		Range Land	163.323 sq km
		Water Body	9.42 sq km
		Wet Area	0.195 sq km
		Population	44717
		Household	7773
Agricultural Drought	Low - Extreme	Settlements	62
		Agriculture Area	148.647 sq km
		Bare Area with sparse Natural Vegetation	515.946 sq km
		Forest Area	1.497 sq km
		Natural Vegetation in Wet Areas	23.834 sq km
		Range Land	199.823 sq km
		Water Body	11.539 sq km
		Wet Area	0.239 sq km
		Population	44900
		Household	7804
Heatwave	Low - Extreme	Settlement	51
		Population	44372
		Household	7712

		Agriculture Area	119.449 sq km
		Kachcha Area	1.372 sq km
		Pakka Planned Area	0.271 sq km
		Pakka Unplanned Area	3.475 sq km
Cyclone	Low	Agriculture Area	0.017 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

TOUNG			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	85.751 sq km
		Kachcha Area	0.203 sq km
		Natural Vegetation in Wet Areas	0.01 sq km
		Pakka Unplanned Area	0.117 sq km
		Range Land	0.973 sq km
		Education Facilities	23
		Health Facilities	1
		Settlements	63
		Road Network	54.174 km
		Population	4029
		Household	705
Meteorological Drought	Medium - Extreme	Settlement	46
		Agriculture Area	87.036 sq km
		Bare Area with sparse Natural Vegetation	478.158 sq km
		Forest Area	0.554 sq km
		Natural Vegetation in Wet Areas	1.914 sq km
		Range Land	165.331 sq km
		Water Body	1.956 sq km
		Wet Area	1.178 sq km
		Population	3296
Household	577		
Agricultural Drought	Low - Extreme	Settlements	42
		Agriculture Area	106.963 sq km
		Bare Area with sparse Natural Vegetation	449.89 sq km

		Forest Area	0.682 sq km
		Natural Vegetation in Wet Areas	2.355 sq km
		Range Land	183.851 sq km
		Water Body	2.407 sq km
		Wet Area	1.446 sq km
		Population	3359
		Household	588
Heatwave	Low - High	Settlement	18
		Population	3280
		Household	574
		Agriculture Area	85.346 sq km
		Kachcha Area	0.204 sq km
		Pakka Unplanned Area	0.117 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

UNERPUR			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	99.49 sq km
		Forest Area	0.008 sq km
		Kachcha Area	0.058 sq km
		Natural Vegetation in Wet Areas	0.146 sq km
		Pakka Planned Area	3.648 sq km
		Pakka Unplanned Area	3.406 sq km
		Range Land	0.325 sq km
		Bridges	5
		Education Facilities	33
		Grid Stations	1
		Health Facilities	4
		Mobile Towers	10
		Petrol Pumps	10
		Post Offices	1
		Power Plants	1
		Settlements	44
Railway Line	26.451 km		

		Road Network	79.792 km
		Population	123134
		Household	21164
Meteorological Drought	Medium - Extreme	Settlement	44
		Agriculture Area	99.945 sq km
		Bare Area with sparse Natural Vegetation	25.49 sq km
		Forest Area	0.221 sq km
		Natural Vegetation in Wet Areas	23.571 sq km
		Range Land	8.172 sq km
		Water Body	0.559 sq km
		Wet Area	4.216 sq km
		Population	100762
		Household	17315
Agricultural Drought	Low - Extreme	Settlements	32
		Agriculture Area	82.025 sq km
		Bare Area with sparse Natural Vegetation	31.308 sq km
		Forest Area	0.134 sq km
		Natural Vegetation in Wet Areas	7.891 sq km
		Range Land	10.01 sq km
		Water Body	0.678 sq km
		Wet Area	0.098 sq km
		Population	82772
		Household	14261
Heatwave	Low - High	Settlement	39
		Population	100328
		Household	17242
		Agriculture Area	99.33 sq km
		Kachcha Area	0.058 sq km
		Pakka Planned Area	3.647 sq km
		Pakka Unplanned Area	3.408 sq km
Riverine Flood	Low - Extreme	Agriculture Area	67.079 sq km
		Forest Area	0.217 sq km
		Kachcha Area	0.058 sq km
		Natural Vegetation in Wet Areas	23.083 sq km
		Pakka Unplanned Area	1.022 sq km
		Range Land	0.084 sq km
		Bridges	1
		Education Facilities	7

		Health Facilities	1
		Mobile Towers	2
		Settlements	10
		Railway Network	8.148 km
		Road Network	16.631 km
		Population	19462
		Household	3466
Cyclone			
	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami			
	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge			
	Nil	The UC falls out of vulnerable zone for Storm Surge	

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

S.#	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 conduction 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 Operations 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, UCDMCs 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. UCDMC 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 UCDMC

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

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 scams 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 Jamshoro district reveals that the district is prone to multiple natural disasters. The pertinent hazards to district are hydro-meteorological hazards including drought, heatwave and riverine flood with the potential to cause urban flooding. 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 disasters in the district.

Riverine Flood	<ol style="list-style-type: none">1. River Indus in Sindh can be segmented in three broad reaches Guddu to Hyderabad, Hyderabad to Kotri and Kotri to Arabian Sea. Additionally, 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.2. Though river Indus floodplain is bounded by flood protective embankment, but still some parts of district Jamshoro adjoining river Indus are likely to be affected due to breaches in embankments of river Indus.3. It is highly recommended to identify and reinforce sections of vulnerable embankments before flooding season to avoid breaches in embankments and consequential damages.4. 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
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	<p>Punjab, Federal Flood Commission and Pakistan Meteorological Department (PMD) be conducted.</p> <ol style="list-style-type: none"> 5. Timely alerts be issued to people living in low lying areas within flood plain. 6. In case of high anticipated flows evacuation of people and livestock be carried out. 7. Soaking and compacting of embankments before arrival of flood water. 8. Reinforcement and stone pitching of high-risk embankments. 9. Use alternative eco-friendly options like use of bamboo wood etc. to minimize erosion impact on high-risk embankments. 10. Where necessary and possible, erection of guide embankments and spur before arrival of high flood water. 11. 24/7 vigilance of high-risk embankments by Sindh Irrigation Department. 12. Readily availability of breach filling stock and machinery at high risk embankments. 13. 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. 14. Removal of possible congestion factors within the flood plain. 15. Public participation comprising local people be encouraged in pre and during flood periods.
<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 Jamshoro falls away from any major fault line and is unlikely to be affected by a massive earthquake. 2. Some of prominent faults situated in Sindh are (a) Karachi-Jati, (b) Surjan-Jhampir, (c) Pab Fault (d) Hub Fault and (e) Allah Bund-Rann of

	<p>Kutch faults.</p> <ol style="list-style-type: none"> 3. Though risk of geophysical hazards in Jamshoro district is low but still some actions must be taken to avoid losses in case of minor jolts. 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 Jamshoro 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.
Heatwave	<ol style="list-style-type: none"> 1. The district has witnessed rapidly increased severity of heatwave in the past five years. The district is moderately populated, which significantly increases the chances of heatwave impacts. 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. 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 different 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.
Drought	<ol style="list-style-type: none"> 1. Jamshoro is a moderately populated district with closely spaced homes in major cities. Climatic condition of the district can be categorized as Hot and Semi-Arid (Climate Classification of Pakistan (Khan et al.,

	<p>2010). Average annual rainfall received during a year across the district is 124.66 mm. Agriculture is practiced in the district which is mainly dependent rainfall, with little canal irrigation also practices in the district.</p> <ol style="list-style-type: none"> 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.
Cyclone	<ol style="list-style-type: none"> 1. The cyclone hazard threat to district Jamshoro is Tropical Storm to Cat-1 TC. However, 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 along entire coast in Sindh. 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.
Tsunami	<p>According to MHVRA Study 2022, there is no Tsunami Hazard in Jamshoro district.</p>

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, cyclone and drought 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

The earthquake is unforecastable hazard and does not provide reaction time to prevent damages. The recommended post disaster action plan are as follows

Table 9: Action Plan for Earthquake 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 Jamshoro 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 (14)	A, Allah Bachyo Shoro, Amri, Channa, Jamshoro, Jhangra, Lakha, Manjhand, Morhojabal, Sann, Sehwan-1, Shahpur Jahania, Talti, Unerpur
UCs not at Risk (10)	Bhan, Bubak, Dal, Manzoorabad, Mole, Sari, Sonwalhar, Thano Arab Khan, Thano Bula Khan, Toung
General Description	<ol style="list-style-type: none"> 1. Jamshoro is located on the right bank of Indus River, approximately 18 km northwest of Hyderabad. 2. The population of the district according to a 2017 census was 993,142. The majority of the population of the district is rural (about 558,955) and mainly involved in cultivation. 3. Farmers in most parts of Jamshoro depend on monsoon rainfall for cultivation as they are not connected to the irrigation network. 4. The district Jamshoro is prone to riverine flooding. 5. In the 2010 flood, 49% of the population was affected in 16 union councils of all talukas of the district. 6. Manchar lake overtopped and flooded vast area of district Jamshoro on September 16, 2010. 7. Jamshoro was also one of the worst-affected districts hit by 2011 floods. 8. As many as 250 villages were inundated due to flood in Indus River at various places of Kachcha area of Dadu and Jamshoro district in August 2019. 9. According to MHVRA study 2022 hazard of flood in the district is “Low to Very High”. 10. According to MHVRA study 2022 risk of flood in the district 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 Jamshoro falls away from any major fault line and is less likely to be affected by a massive earthquake. 2. There is no recorded historical data available of the damages in the district due to previous earthquakes. 3. According to MHVRA study 2022, Earthquake hazard in the district is of Low intensity. 4. According to MHVRA study 2022, Earthquake risk in the district is of Low intensity
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"> 1. The climate of Jamshoro is Hot and Semi-Arid (Climate Classification of Pakistan (Khan et al., 2010)), and the temperature reaches up to 49 °C in summer season 2. The mean maximum and minimum temperature in summer season across the district remain 42°C and 27°C while that of the winter season is 27°C and 11°C respectively. 3. According to MHVRA study 2022, Heatwave hazard in the district is of intensity “Severe to Extreme”. 4. According to MHVRA study 2022, Heatwave risk in the district is “Low to Extreme”.
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Consistent future development strategy: Tree plantation, restoration of natural ecosystem, construction of environment friendly and well planned residential societies, offices, infrastructure and human dwellings. 2. Monitoring for hot weather alerts through local and international sources and issuance of timely Hot Day Advisories, and Hot Day Warnings. 3. Upgradation of major public health care facilities with necessary equipment and medicines to treat heatstroke patients. 4. Heatstroke awareness campaigns and wide public coverage through media, social media, SMS, NGOs and social welfare organizations. 5. Arrangements for uninterrupted supply of electricity and water in vulnerable areas. 	
Response	
<ol style="list-style-type: none"> 1. Mobilization of NGOs, social welfare organization and volunteers for arranging heatstroke facilitation camps and distribution of fresh drinking water in affected areas. 2. Local radio FM broadcasts to disseminate heatstroke safety and precautions. 3. Mobilize mobile medical teams for first-aid and other medical emergency support in affected area. 4. Record keeping of heatwave patients and fatalities. 	
Recovery and Rehabilitation	
<ol style="list-style-type: none"> 1. Post event review of heatwave plan and modifications if required. 	

Cyclone	
UCs at Risk (03)	Mole, Sari, Thano Bula Khan
UCs not at Risk (21)	A, Allah Bachyo Shoro, Amri, Bhan, Bubak, Channa, Dal, Jamshoro, Jhangra, Lakha, Manjhand, Manzoorabad, Morhojabal, Sann ,Sehwan-I, Shahpur Jahania, Sonwalhar, Talti, Thano Arab Khan, Toung, Unerpur
General Description	<ol style="list-style-type: none"> 1. Jamshoro district is moderately vulnerable to tropical cyclones. 2. The tropical cyclones, which are characterized by torrential rain, gales, and storm surge, causing heavy loss of human lives and destruction of property, crops, and loss of livestock. 3. Although not a frequent phenomenon, cyclones can cause large-scale damage to the coastal areas of Sindh and Balochistan. 4. The period between 1971 and 2001 recorded 14 cyclones. The coastal areas of Sindh are most vulnerable and exposed to cyclones. 5. According to MHVRA study 2022, Cyclone hazard intensity for the district is “Tropical Storm to Cat-1 TC”, while the risk is “Low”.
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.

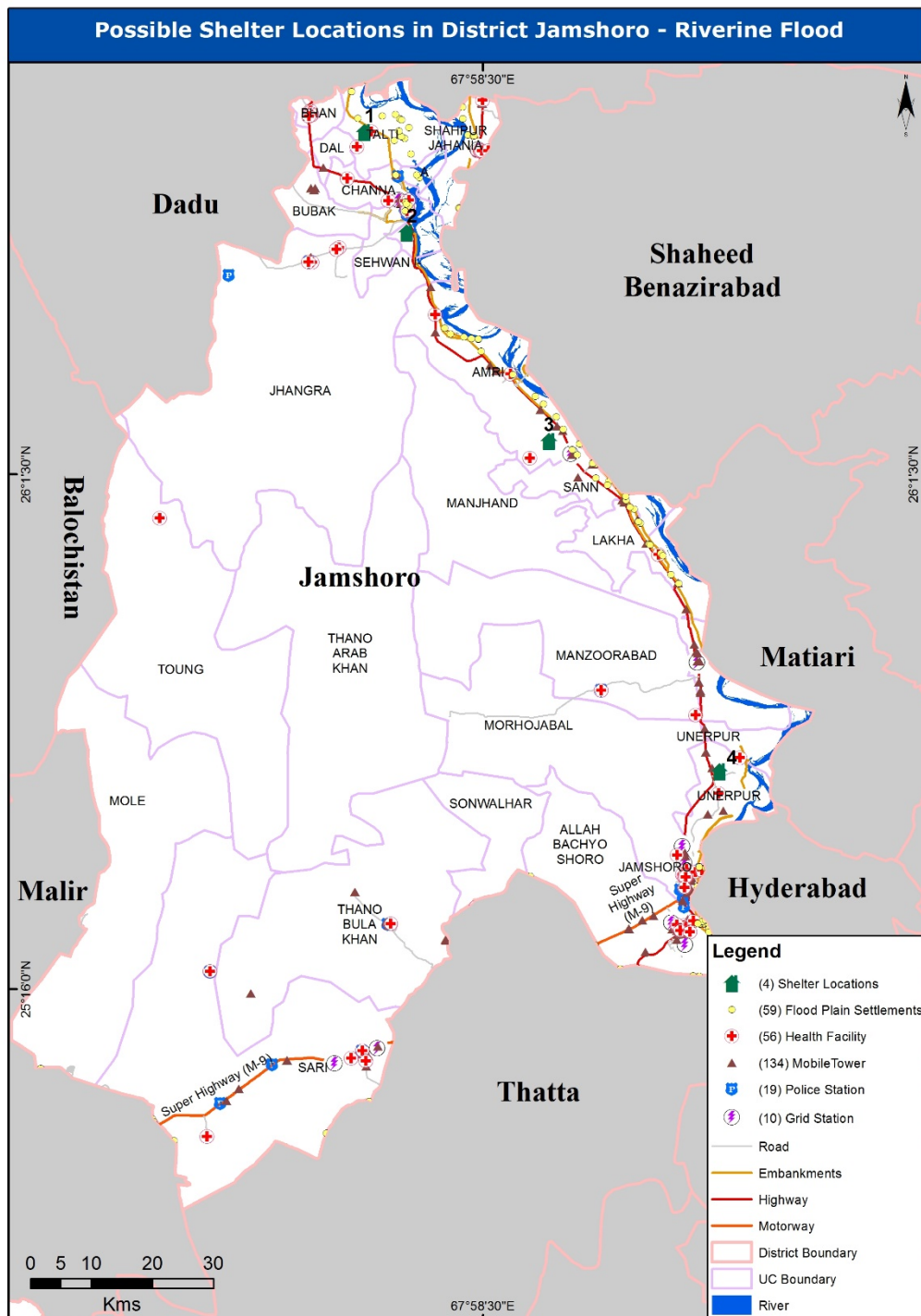
Recovery and Rehabilitation

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. Climatic condition of the district can be categorized as Hot and Semi-Arid (Climate Classification of Pakistan (Khan et al., 2010)) 2. Rainfall is very insufficient, average annual rainfall received during a year across the district is only 124.66 mm. 3. River Indus flows along eastern part of the district. 4. Most of the areas in Jamshoro district consists of bare areas and bare areas along with sparse natural vegetation as well as Range land (natural herbs and shrubs) across whole central and southern part while hilly/mountainous area are at the west. 5. Agricultural water needs are mostly dependent on rainfall. Canal irrigation is available up-to some extent, crops on both sides of river bed is irrigated through river water. 6. Jamshoro district is not significantly contributing in agricultural production, its soil type also hinders crop production. 7. Crops that are dependent on rainfall in the district is 11% of the total district area, while Irrigated crop fields are only 3%, Range land are 17.41%, bare areas with sparse natural vegetation are 57.73%, this makes this district highly drought prone. 8. According to MHVRA study 2022. <ol style="list-style-type: none"> a. Meteorological drought hazard for district Jamshoro is “Extreme” b. Meteorological drought risk for district Jamshoro is “Medium to Extreme” c. Agricultural drought hazard for district Jamshoro is “Mild to Extreme” d. Agricultural drought risk for district Jamshoro 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. 	

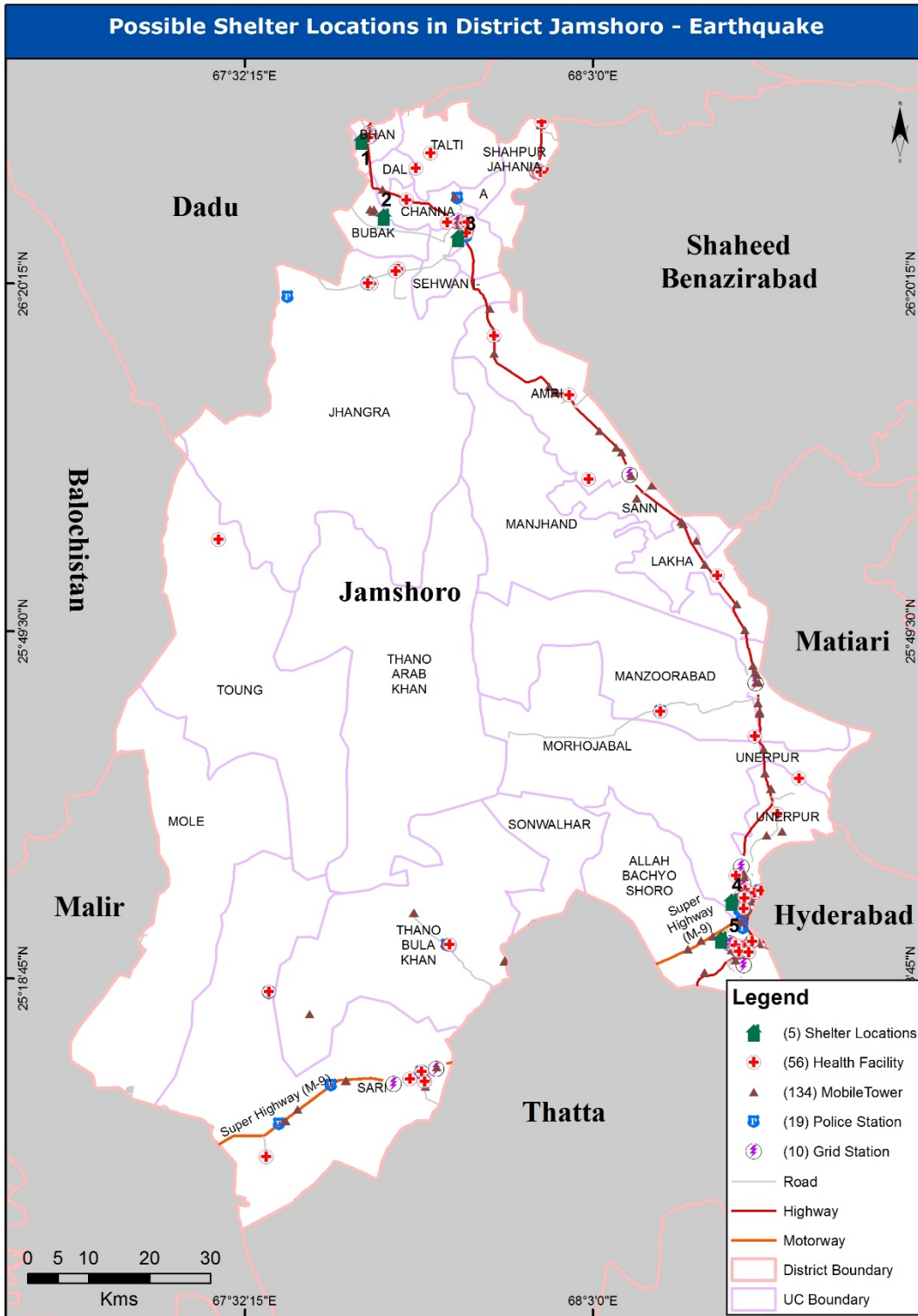
SHELTER LOCATION MAP

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.

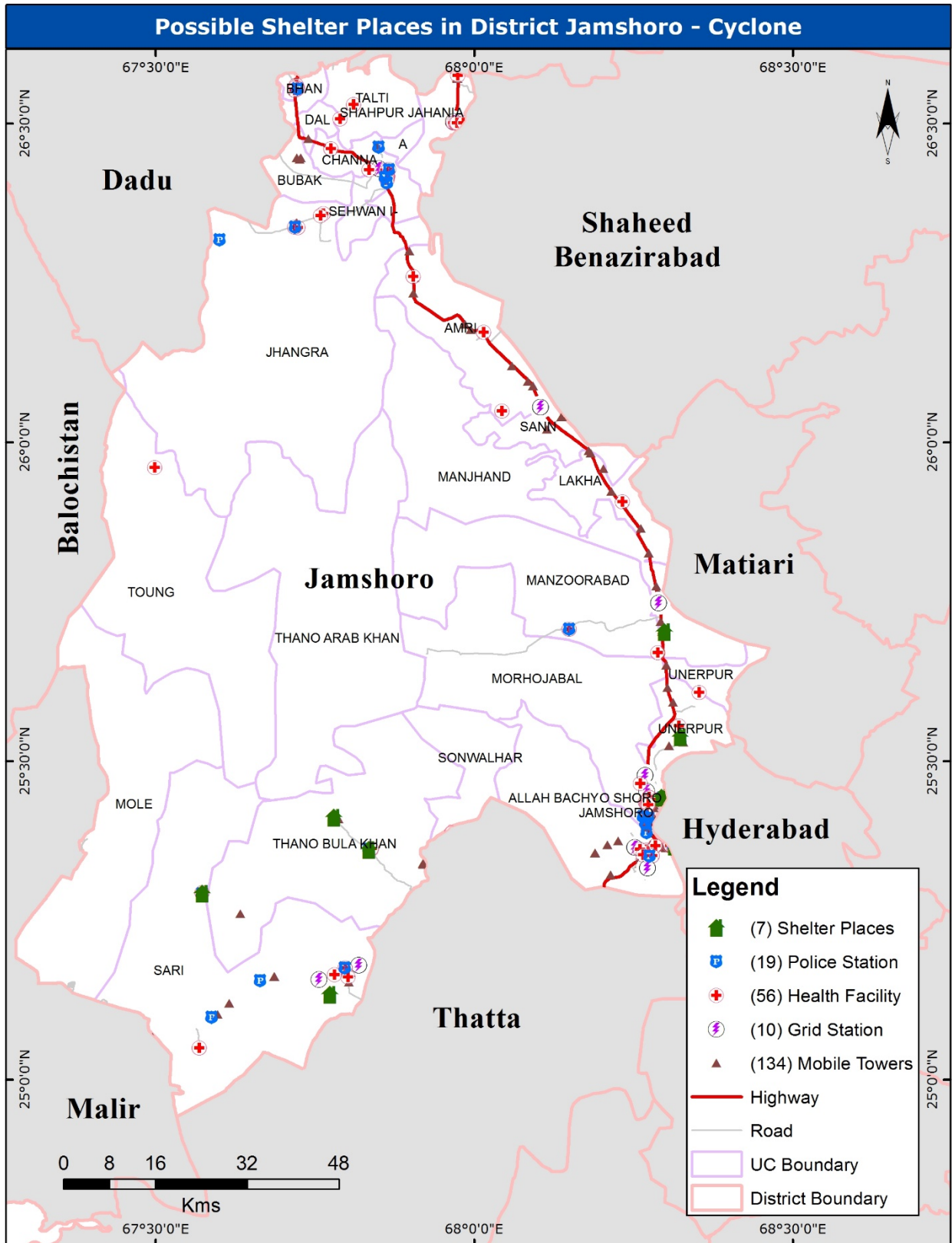


*Annex-A details the list of vulnerable settlements within flood plains prone to riverine flooding

*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 Jamshoro. 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	
1. Establishment of 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 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 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. 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.
5. 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 – JAMSHORO DISTRICT

The existing nature of disasters in Jamshoro 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 in the district ranges from low to extreme. There is no risk of storm surge, and Tsunami in the district. The risk of earthquake is determined to be low. The cyclone risk in the district is determined to be low. As far as Heatwave is concerned Jamshoro district is at low to extreme risk. As far as riverine flood is concerned the settled areas of UCs in the district are 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 Jamshoro

S. no.	Soft resilience (Behavioral DRR)	Cost	Benefit
1.	Identification and management of shelters	Identification and management of shelter spaces is a cost-effective way to ensure rapid, and effective management of population in times of crisis. Government schools can serve as ideal cost-effective shelter spaces in district Jamshoro, as these can accommodate large number of people. Gradually, permanent shelters can be established in future to avoid use of educational facilities.	Shelter places are highly beneficial at times of disaster as it offers a unified accommodation place for affected people. Shelter place also helps administration in effective management of affectees and provide them with required relief. Shelters serve as centralized facilities where government can concentrate relief efforts including distribution of relief goods and essential food supplies to affected people. Shelter spaces keep people off the highways during and after disaster. Shelters are often the only safe haven for those without the financial means to take other protective measures.
2.	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 impending hazard.	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 mortality and more savings in medical expenditure.
3.	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 seek to turn available human knowledge into specific local action 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 dangers of hazards. Education and knowledge can provide people with tools for

			vulnerability reduction and life-improving self-help strategies.
4.	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.
5.	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 (59) within flood Plains Prone to Riverine Flood

S.No	Name	Latitude	Longitude	Area (acres)
1	Balawalpur	26.552	67.826	49.20
2	But Bhutto	25.976	68.191	24.53
3	Chhachhar	26.140	68.052	51.70
4	Doad Baghio	26.565	67.945	15.01
5	Duri Dera	26.522	67.854	23.15
6	Gaicho	26.109	68.083	6.32
7	Goth Abad	26.232	67.927	8.35
8	Goth Amri	26.172	68.019	54.32
9	Goth Arab Shoro	25.356	68.307	5.70
10	Goth Bijora	26.240	67.918	1.90
11	Goth Bundwani Khoso	26.061	68.106	3.57
12	Goth Chachhar	26.070	68.117	12.88
13	Goth Haji Shan Baig	26.014	68.160	3.41
14	Goth Kehti	26.225	67.958	1.73
15	Goth Pahwar	26.227	67.947	2.77
16	Goth Tharo Solangi	26.054	68.113	4.00
17	Goth Usman Sehto	26.461	67.882	3.53
18	Gul Mohammad Lashari	25.922	68.219	14.91
19	Gulan Jam	26.524	67.953	30.33
20	Hayat Khan Jalbani	26.530	67.851	10.02
21	Jatoi	26.549	67.852	13.08
22	Jhandani	26.588	67.781	14.48
23	Kallri	26.091	68.093	31.48
24	Karampur	26.466	67.846	75.89
25	Khuman	25.974	68.198	5.62
26	Lakha	25.955	68.204	53.58
27	Machhi	25.987	68.185	18.12

S.No	Name	Latitude	Longitude	Area (acres)
28	Manjhand	25.908	68.237	108.08
29	Naga Colony	25.363	68.294	6.64
30	Niwan	26.517	67.844	22.40
31	Radhan	26.549	67.791	9.76
32	Railway Colony	25.371	68.298	9.84
33	Safan Faqir	26.548	67.945	31.46
34	Sann	26.041	68.136	305.85
35	Sehwan	26.426	67.861	433.66
36	Sumar Bagia	26.535	67.866	5.92
37	Tehbat	26.224	67.968	12.70
38	Tehti	26.206	67.972	4.00
39	Untitled Settlement	25.953	68.207	0.39
40	Untitled Settlement	26.412	67.860	453.19
41	Untitled Settlement	26.042	68.137	26.33
42	Untitled Settlement	25.447	68.293	0.47
43	Untitled Settlement	25.364	68.300	76.18
44	Untitled Settlement	25.351	68.307	13.23
45	Untitled Settlement	25.864	68.263	11.54
46	Untitled Settlement	25.921	68.221	1.82
47	Untitled Settlement	25.992	68.185	0.94
48	Untitled Settlement	26.224	67.968	3.84
49	Untitled Settlement	26.466	67.877	28.63
50	Untitled Settlement	26.496	67.868	22.81
51	Untitled Settlement	26.523	67.962	6.31
52	Untitled Settlement	26.546	67.855	1.84
53	Untitled Settlement	26.555	67.846	4.70
54	Untitled Settlement	25.905	68.240	6.94
55	Untitled Settlement	25.877	68.252	7.94
56	Untitled Settlement	25.367	68.297	18.94
57	Untitled Settlement	25.364	68.291	3.54

S.No	Name	Latitude	Longitude	Area (acres)
58	Wahan Chhachhar	26.128	68.064	7.00
59	Warya	26.519	67.859	10.33

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: 26°31'48.68"N 67°48'3.25"E Upper left corner: 26°31'46.25"N 67°47'47.34"E Lower right corner: 26°31'35.05"N 67°48'9.35"E Lower left corner: 26°31'32.26"N 67°47'60.00"E	44.4	~2000	125
2	Upper right corner: 26°23'11.34"N 67°51'57.91"E Upper left corner: 26°23'6.44"N 67°51'20.59"E Lower right corner: 26°22'30.22"N 67°52'11.51"E Lower left corner: 26°22'25.70"N 67°51'28.44"E	367	~16500	165
3	Upper right corner: 26° 5'4.44"N 68° 4'38.42"E Upper left corner: 26° 4'20.86"N 68° 3'33.59"E Lower right corner: 26° 4'13.03"N 68° 5'5.38"E Lower left corner: 26° 3'48.03"N 68° 3'57.70"E	784	~35250	140
4	Upper right corner: 25°35'21.49"N 68°19'48.74"E Upper left corner: 25°35'29.13"N 68°19'1.21"E Lower right corner: 25°34'58.71"N 68°19'43.34"E Lower left corner: 25°35'4.29"N 68°18'59.62"E	241	~10800	120

A total of 4 shelter locations have been selected as Flood shelter places across district Jamshoro. 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 64,550 tents (tent with size of 45 sq. m each) can be set up within the demarcated shelter places.

ANNEX – C – SHELTER LOCATIONS DESCRIPTION – EARTHQUAKE

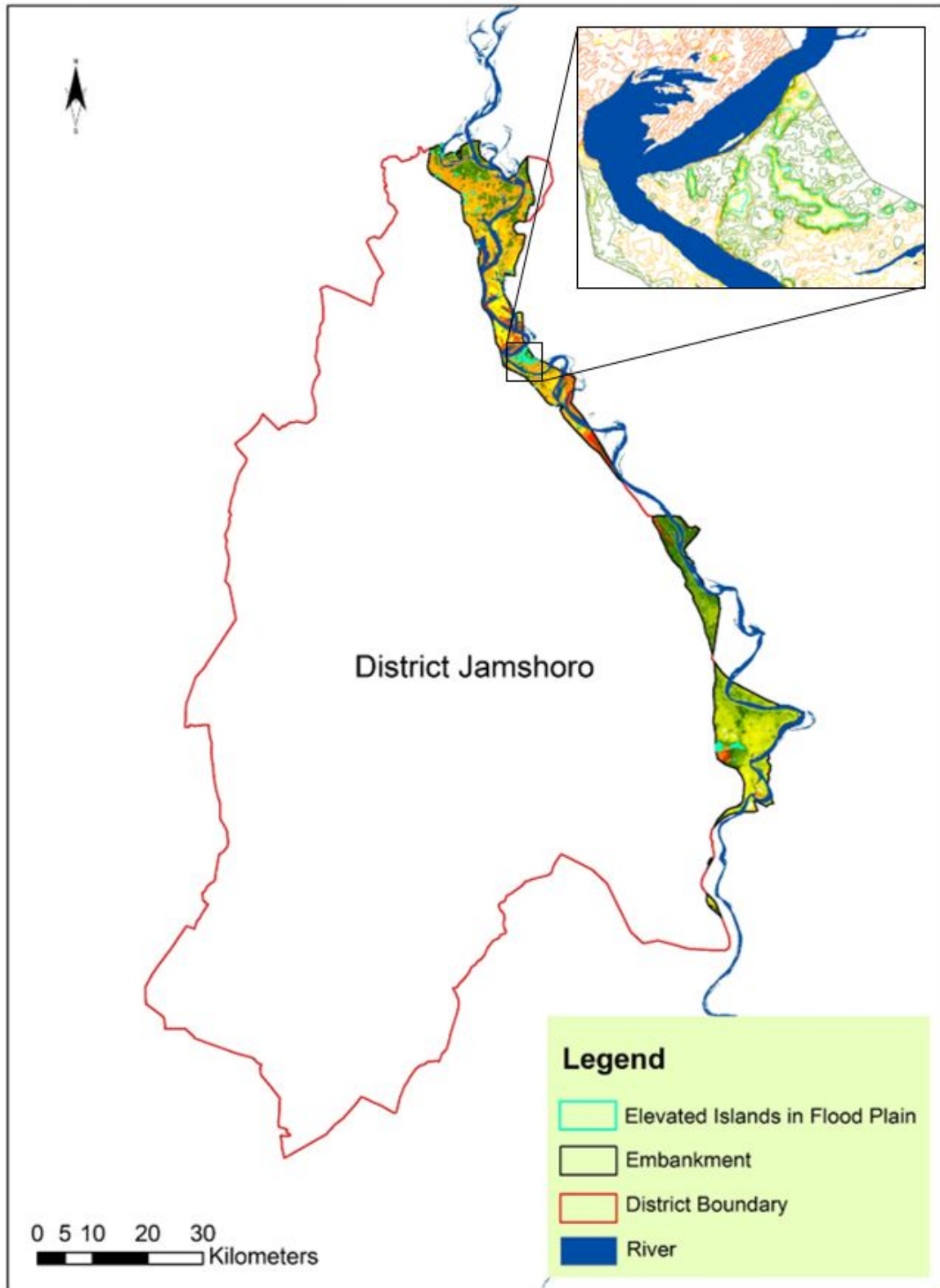
The given shelter locations for earthquake are proposed on the findings of the MHVRA 2022 study and information obtained through satellite technology and online verifiable sources. It is recommended to conduct on ground physical surveys to evaluate their suitability.

Shelter location	Co-ordinates	Area (acres)	Estimated Tents (numbers)	Avg. elevation (ft)
1	Upper right corner: 26°32'49.08"N 67°42'48.35"E Upper left corner: 26°32'57.08"N 67°42'19.82"E Lower right corner: 26°32'42.66"N 67°42'40.68"E Lower left corner: 26°32'50.09"N 67°42'19.12"E	44.9	~2000	118
2	Upper right corner: 26°26'10.97"N 67°44'44.53"E Upper left corner: 26°26'20.46"N 67°44'18.45"E Lower right corner: 26°25'59.62"N 67°44'40.19"E Lower left corner: 26°26'4.92"N 67°44'21.56"E	68.2	~3000	116
3	Upper right corner: 26°24'34.96"N 67°51'19.62"E Upper left corner: 26°24'38.30"N 67°51'7.19"E Lower right corner: 26°23'54.77"N 67°51'6.00"E Lower left corner: 26°23'55.04"N 67°50'51.95"E	139	~6200	145
4	Upper right corner: 25°25'55.39"N 68°15'35.35"E Upper left corner: 25°25'55.88"N 68°15'6.25"E Lower right corner: 25°25'6.35"N 68°15'20.13"E Lower left corner: 25°25'7.13"N 68°15'5.71"E	222	~10000	195
5	Upper right corner: 25°23'4.95"N 68°14'33.05"E Upper left corner: 25°22'21.03"N 68°13'23.35"E Lower right corner: 25°21'57.60"N 68°15'19.27"E Lower left corner: 25°21'16.35"N 68°14'8.97"E	1403	~63000	225

A total of 5 shelter locations have been selected as Earthquake shelter places across district Jamshoro. 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 84,200 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 JAMSHORO

Total 54 elevated islands have been identified within the embankments in district Jamshoro, with a cumulative area of approximately 707.90 acres. These elevated islands obstruct the river flow and thereby may be demolished/removed to reinstate the normal river flow within the flood plain.



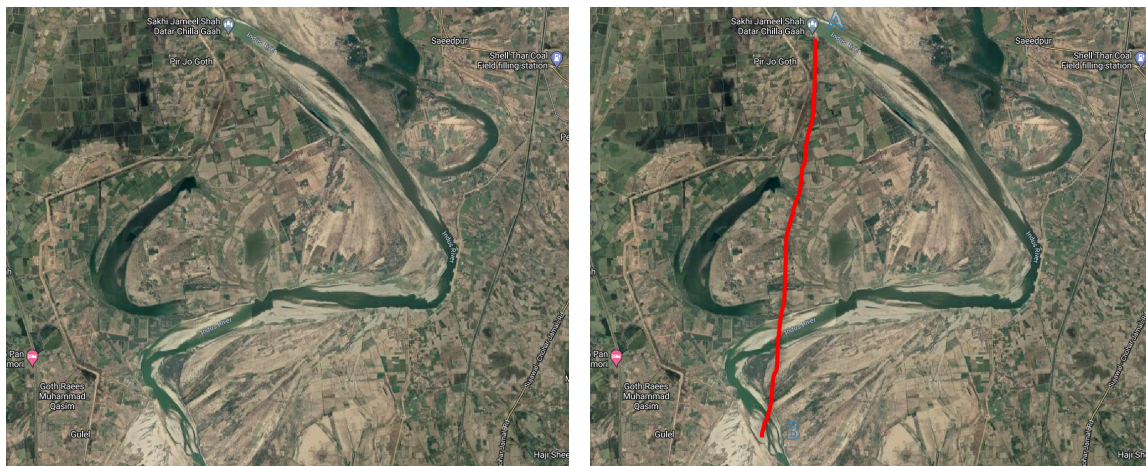
ANNEX – E – RIVER TRAINING AND STRAIGHTENING

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 Jamshoro 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 loses (life and material) due to breaching scenarios may be minimized or even reduced to zero.

ANNEX – F – LIST OF EQUIPMENT AVAILABLE IN DISTRICT JAMSHORO

Equipment	Quantity
De-watering Machine	25
Fire Brigade / Engine / Tender	8
Tractor / Trolley / Blade	4
Ambulances	25
Garbage Van	1
Riksha Container	5

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