MHVRA

INFORMED DISASTER MANAGEMENT PLAN 2023-2032

DISTRICT LARKANA

DEVELOPED BY
PDMA SINDH

THROUGH
SUPARCO

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 Larkana 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 Larkana 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 Larkana 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.

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- - 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.

INTRODUCTION TO DISASTER MANAGEMENT PLAN OF DISTRICT LARKANA

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

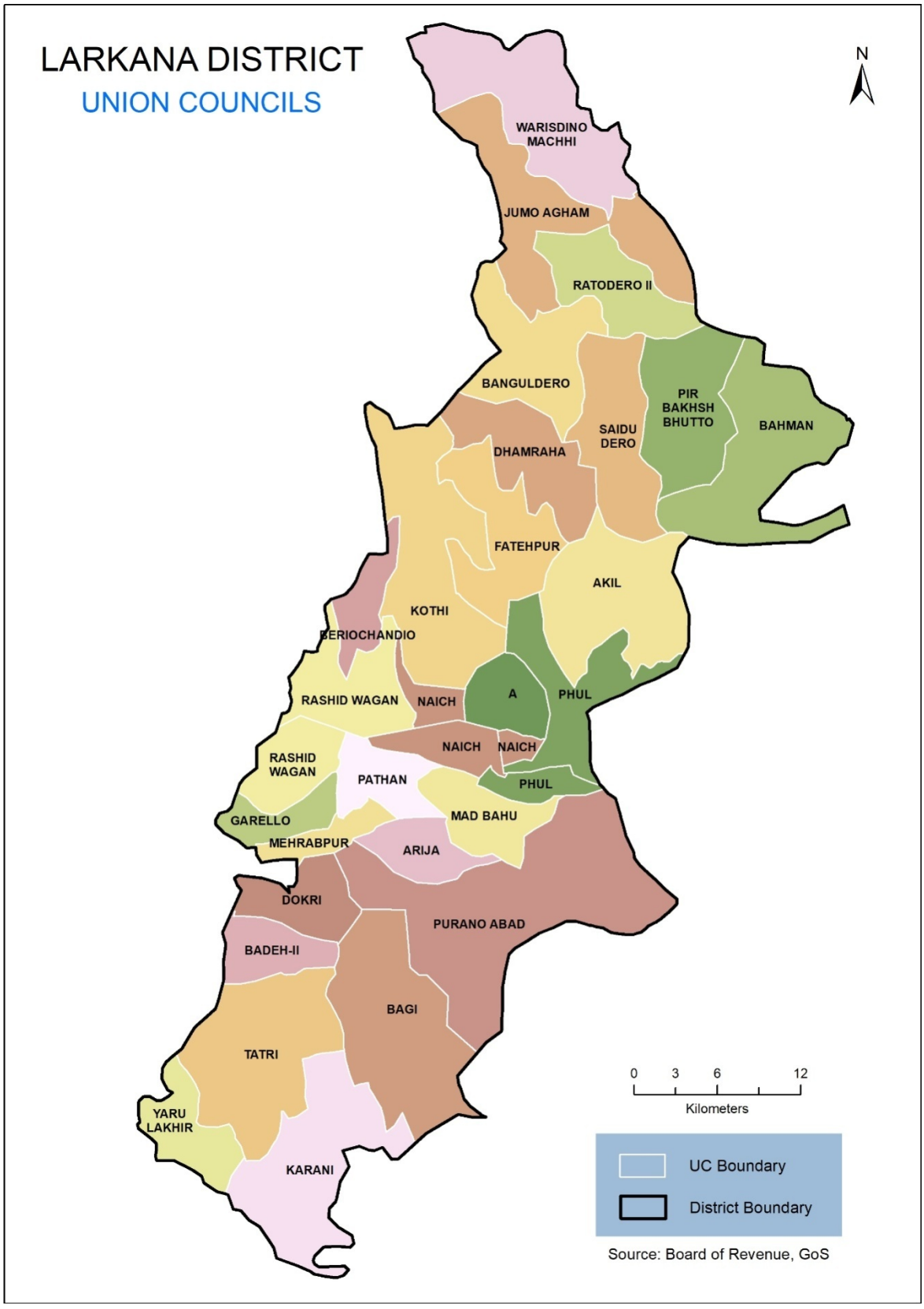
MODES OF REVIEW

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 LARKANA

DISTRICT LARKANA AT A GLANCE



District area in Sq. Km	1,812	
Coordinates	Longitude 68° 8' 10" to 68° 5' 41" East Latitude 27° 7' 42' to 27° 56" 7' North	
Surrounding Districts	Shikarpur and Khairpur in the East Jacobabad in the North Kambar Shahdadkot and Dadu in the West Naushahro Feroze in the South	
Climate Conditions	Hot and Arid	
Coldest Month Hottest Month	January June	
Seasonal Temperatures	Max Mean (°C)	Min Mean (°C)
Spring (March and April)	37.87	20.53
Dry Summer (May and June)	45.92	29.88
Wet Summer (July to September)	43.01	29.64
Autumn (October to November)	35.29	18.99
Winter (December to February)	26.25	10.38
Average Rainfall	73.78 mm/year	
Physiographic Features	Indus River flows along the Eastern Border of the District Moen-Jo-Daro or the Mound of the Dead located West of the Indus River In Larkana District	

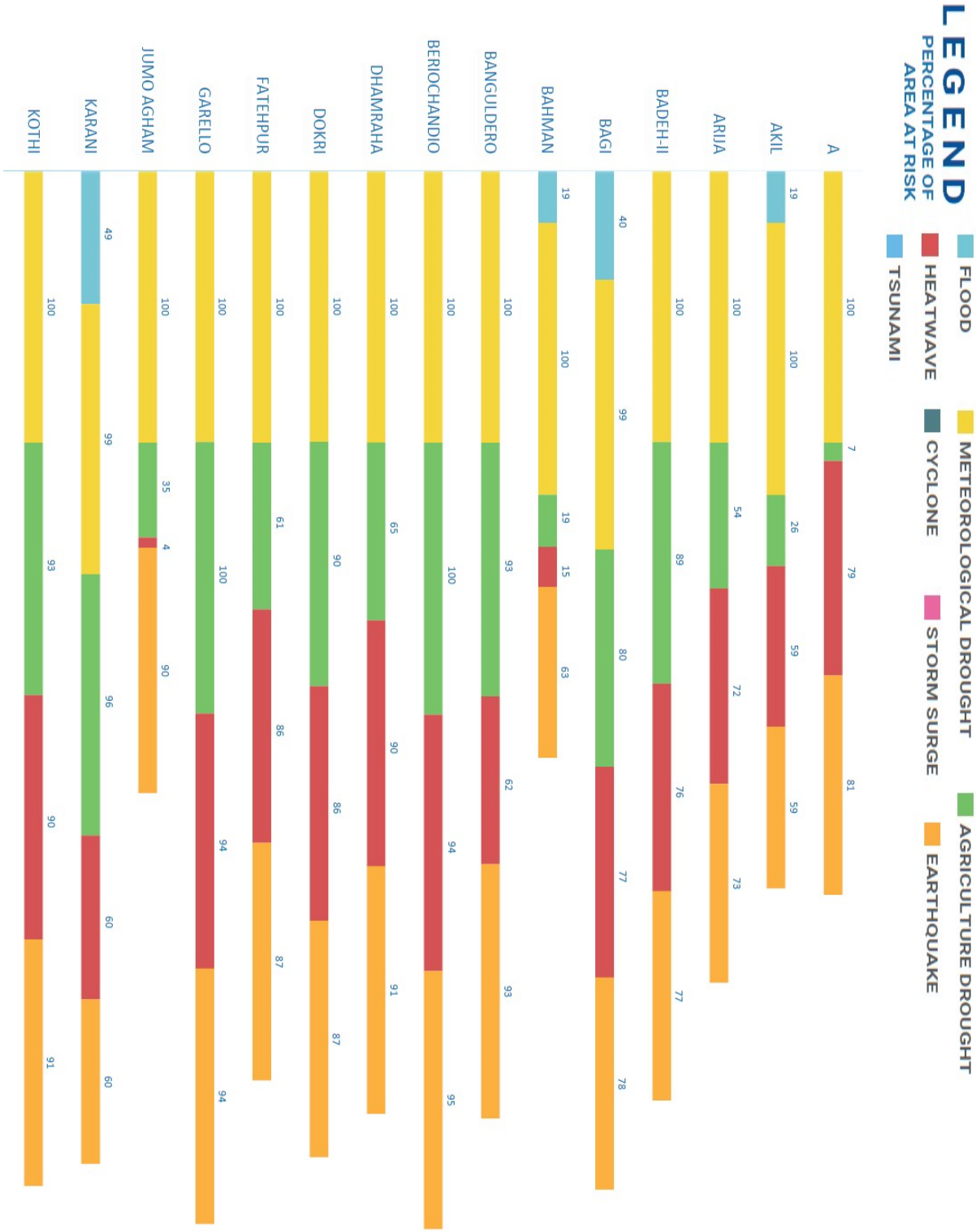
DEMOGRAPHY

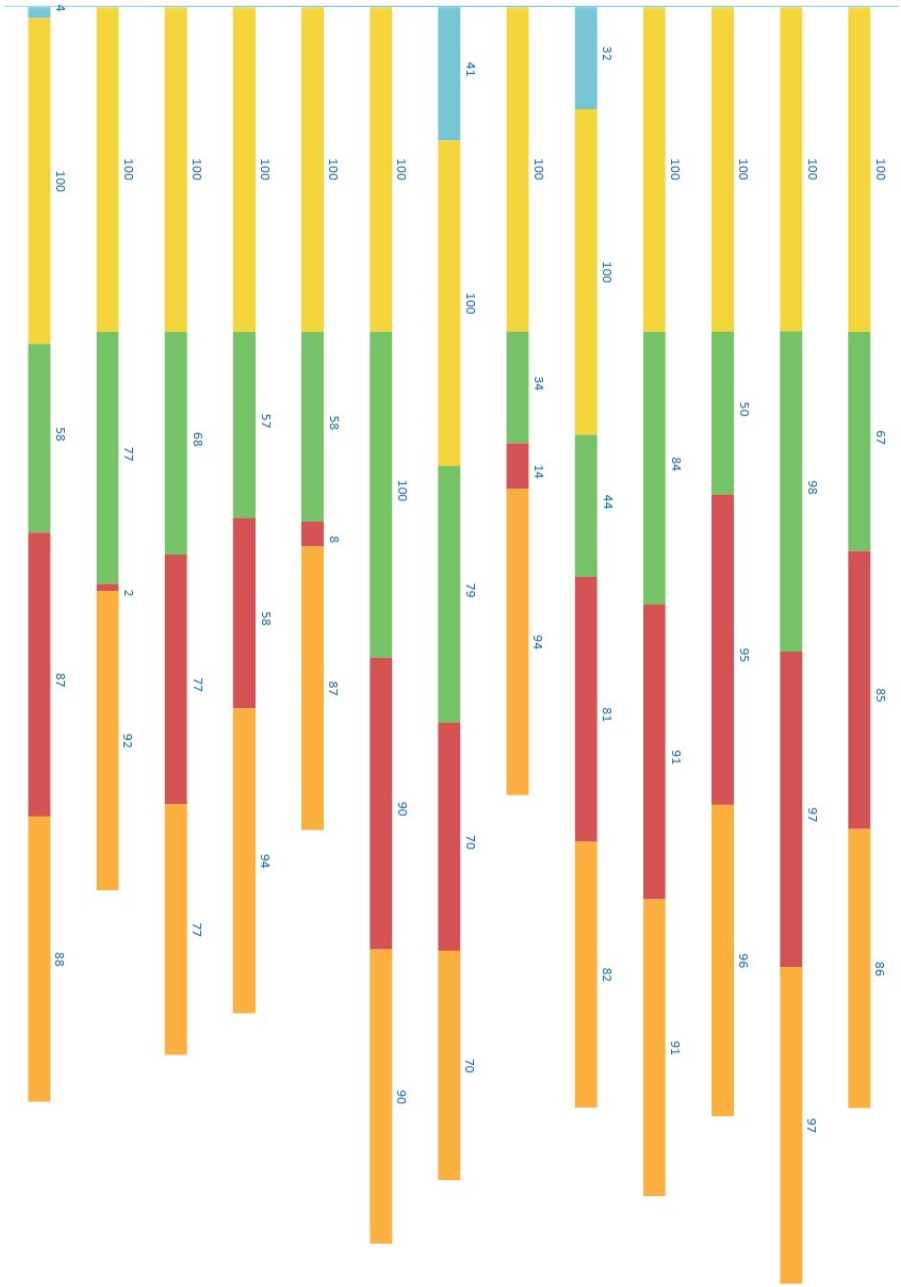
	Year-1998	Year-2017
Population	1,001,608	1,521,786
Urban	390,063	698,898
Rural	611,545	822,888
No. of Household	-	261,331
Average Annual Growth Rate 1998-2017	2.22 %	

ECONOMY

Industries	Agriculture, textile, sugar manufacturing, rice husking, ice, oil, processed foods, plastics & candle making factories etc.
Agriculture	Production in M.tons as per (2016-17)
Major Crops	
Rice	409,725
Wheat	137,025
Sugarcane	80,138
Cotton	1,729
Minor Crops	
Rapeseed and Mustard	4,616
Gram	2,061
Sesame	1,413
Barley	1,318

TALUKA NAMES	UC NAMES
1. Bakrani Taluka 2. Dokri Taluka 3. Larkana Taluka 4. Ratodero Taluka	1. A 2. Akil 3. Arija 4. Badeh-II 5. Bagi 6. Bahman 7. Banguldero 8. Beriochandio 9. Dhamraha 10. Dokri 11. Fatehpur 12. Garello 13. Jumo Agham 14. Karani 15. Kothi 16. Mad Bahu 17. Mehrabpur 18. Naich 19. Pathan 20. Phul 21. Pir Bakhsh Bhutto 22. Purano Abad 23. Rashid Wagan 24. Ratodero II 25. Saidu Dero 26. Tatri 27. Warisdino Machhi 28. Yaru Lakhir


LEGEND
PERCENTAGE OF AREA AT RISK
FLOOD
HEATWAVE
TSUNAMI
METEOROLOGICAL DROUGHT
CYCLONE
STORM SURGE
AGRICULTURE DROUGHT
EARTHQUAKE
A
AKIL
ARIJA
BADEH-II
BAGI
BAHMAN
BANGULDERO
BERIOCHANDIO
DHAMRAHA
DOKRI
FATEHPUR
GARELLO
JUMO AGHAM
KARANI
KOTHI


MAD BAHU
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PIR BAKHSH BHUTTO
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PURANO ABAD
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RASHID WAGAN
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RATODERO II
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SAIDU DERO
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WARISDINO MACHHI
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YARU LAKHIR
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UC WISE RISK PROFILE

A			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	19.994 sq km
		Pakka Planned Area	0.39 sq km
		Pakka Unplanned Area	1.206 sq km
		Bridges	1
		Bus Stops	4
		Education Facilities	22
		Health Facilities	2
		Mobile Towers	2
		Petrol Pumps	8
		Police Stations	1
		Settlements	41
		Irrigation and Drainage Network	9.654 km
		Railway Line	3.432 km
		Road Network	80.851 km
		Population	26990
		Household	4669
Meteorological Drought	Medium - Extreme	Settlements	41
		Agriculture Area	20.073 sq km
		Water Body	1.665 sq km
		Wet Area	0.003 sq km
		Population	27244
		Household	4710
Agricultural Drought	Low	Agriculture Area	0.334 sq km
		Water Body	2.036 sq km
		Population	352
		Household	60
Heatwave	Low - High	Settlements	37
		Population	26990
		Household	4668
		Agriculture Area	19.954 sq km
		Pakka Planned Area	0.391 sq km
		Pakka Unplanned Area	1.206 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

Akil			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	49.231 sq km
		Kachcha Area	0.292 sq km
		Natural Vegetation in Wet Areas	0.078 sq km
		Pakka Planned Area	0.04 sq km
		Pakka Unplanned Area	1.613 sq km
		Range Land	0.000077 sq km
		Bridges	3
		Education Facilities	34
		Health Facilities	2
		Mobile Towers	4
		Petrol Pumps	2
		Police Stations	1
		Power Plants	1
		Settlements	42
		Irrigation and Drainage Network	24.074 km
		Railway Line	2.187 km
		Road Network	159.66 km
		Population	35479
		Household	5949
Meteorological Drought	Medium - Extreme	Settlements	42
		Agriculture Area	49.49 sq km
		Natural Vegetation in Wet Areas	20.7 sq km
		Range Land	0.298 sq km
		Water Body	4.566 sq km
		Wet Area	0.724 sq km
		Population	35781
		Household	5998
Agricultural Drought	Low - Medium	Settlements	2
		Agriculture Area	13.382 sq km
		Natural Vegetation in Wet Areas	14.395 sq km
		Range Land	0.375 sq km
		Water Body	0.504 sq km

		Wet Area	0.006 sq km
		Population	2362
		Household	396
Heatwave	Low - High	Settlements	41
		Population	35531
		Household	5955
		Agriculture Area	49.145 sq km
		Kachcha Area	0.292 sq km
		Pakka Planned Area	0.04 sq km
		Pakka Unplanned Area	1.615 sq km
Riverine Flood	Low - Extreme	Agriculture Area	15.161 sq km
		Kachcha Area	0.292 sq km
		Natural Vegetation in Wet Areas	1.196 sq km
		Range Land	0.000214 sq km
		Settlements	3
		Irrigation and Drainage Network	0.051 km
		Road Network	2.538 km
		Population	5257
		Household	880
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	

Arija			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	17.964 sq km
		Pakka Unplanned Area	1.618 sq km
		Range Land	0.002 sq km
		Education Facilities	12
		Mobile Towers	1
		Settlements	16
		Irrigation and Drainage Network	7.806 km
		Railway Line	0.212 km
		Road Network	50.609 km
		Population	18504
		Household	3248

Meteorological Drought	Medium - Extreme	Settlements	16
		Agriculture Area	18.06 sq km
		Range Land	0.147 sq km
		Water Body	0.39 sq km
		Wet Area	6.815 sq km
		Population	18650
		Household	3274
Agricultural Drought	Low - Medium	Settlements	9
		Agriculture Area	11.424 sq km
		Range Land	0.186 sq km
		Water Body	0.49 sq km
		Wet Area	4.625 sq km
		Population	14303
		Household	2510
Heatwave	Low - High	Settlements	16
		Population	18516
		Household	3251
		Agriculture Area	17.928 sq km
		Pakka Unplanned Area	1.62 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	

Badeh-II			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	19.093 sq km
		Pakka Planned Area	1.556 sq km
		Pakka Unplanned Area	1.014 sq km
		Ambulance Services	1
		Bridges	4
		Bus Stops	1
		Education Facilities	26
		Health Facilities	2
		Petrol Pumps	3
		Police Stations	1
		Post Offices	1
		Settlements	16

		Irrigation and Drainage Network	14.397 km
		Railway Line	4.937 km
		Road Network	70.04 km
		Population	48672
		Household	8522
Meteorological Drought	Medium - Extreme	Settlements	16
		Agriculture Area	19.187 sq km
		Water Body	3.374 sq km
		Wet Area	2.371 sq km
		Population	49136
		Household	8604
Agricultural Drought	Low - High	Settlements	14
		Agriculture Area	21.061 sq km
		Water Body	4.247 sq km
		Wet Area	3.003 sq km
		Population	40444
		Household	7091
Heatwave	Low - High	Settlements	16
		Population	48724
		Household	8532
		Agriculture Area	19.058 sq km
		Pakka Planned Area	1.557 sq km
		Pakka Unplanned Area	1.015 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	

Bagi			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	77.278 sq km
		Natural Vegetation in Wet Areas	0.017 sq km
		Pakka Planned Area	0.545 sq km
		Pakka Unplanned Area	3.874 sq km
		Range Land	0.012 sq km

		Bridges	2
		Education Facilities	47
		Grid Stations	1
		Health Facilities	2
		Petrol Pumps	1
		Settlements	46
		Tourist Places	3
		Irrigation and Drainage Network	19.413 km
		Road Network	138.232 km
		Population	52860
		Household	8944
Meteorological Drought	Medium - Extreme	Settlements	46
		Agriculture Area	77.588 sq km
		Natural Vegetation in Wet Areas	2.837 sq km
		Range Land	0.737 sq km
		Water Body	3.195 sq km
		Wet Area	1.893 sq km
		Population	53438
		Household	9039
Agricultural Drought	Low - High	Settlements	30
		Agriculture Area	84.051 sq km
		Natural Vegetation in Wet Areas	3.342 sq km
		Range Land	0.931 sq km
		Water Body	3.96 sq km
		Wet Area	2.386 sq km
		Population	37616
		Household	6365
Heatwave	Low - High	Settlements	43
		Population	52954
		Household	8958
		Agriculture Area	77.157 sq km
		Pakka Planned Area	0.544 sq km
		Pakka Unplanned Area	3.882 sq km
Riverine Flood	Low - Extreme	Agriculture Area	41.362 sq km
		Natural Vegetation in Wet Areas	0.68 sq km
		Pakka Unplanned Area	0.311 sq km
		Range Land	0.01 sq km
		Education Facilities	5

		Settlements	6
		Irrigation and Drainage Network	0.011 km
		Road Network	25.027 km
		Population	4021
		Household	677
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	

Bahman			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	61.023 sq km
		Natural Vegetation in Wet Areas	0.093 sq km
		Pakka Unplanned Area	2.126 sq km
		Range Land	0.021 sq km
		Education Facilities	39
		Health Facilities	2
		Petrol Pumps	1
		Settlements	38
		Tourist Places	1
		Irrigation and Drainage Network	25.006 km
		Railway Line	6.304 km
		Road Network	164.338 km
		Population	34768
		Household	6005
Meteorological Drought	Medium - Extreme	Settlements	38
		Agriculture Area	61.222 sq km
		Natural Vegetation in Wet Areas	26.862 sq km
		Range Land	0.579 sq km
		Water Body	0.488 sq km
		Wet Area	0.866 sq km
		Population	35211
		Household	6084
Agricultural Drought	Low - Medium	Settlements	1
		Agriculture Area	8.033 sq km
		Natural Vegetation in Wet Areas	16.224 sq km

		Range Land	0.147 sq km
		Water Body	0.107 sq km
		Wet Area	0.001 sq km
		Population	284
		Household	47
Heatwave	Low - High	Settlements	36
		Population	34625
		Household	5982
		Agriculture Area	12.726 sq km
		Pakka Unplanned Area	2.118 sq km
Riverine Flood	Low - Extreme	Agriculture Area	17.999 sq km
		Natural Vegetation in Wet Areas	1.183 sq km
		Pakka Unplanned Area	0.098 sq km
		Range Land	0.001 sq km
		Education Facilities	1
		Irrigation and Drainage Network	0.005 km
		Road Network	15.959 km
		Population	1592
		Household	275
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	

Banguldero			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	58.062 sq km
		Pakka Unplanned Area	2.031 sq km
		Bridges	2
		Education Facilities	41
		Health Facilities	2
		Mobile Towers	1
		Settlements	46
		Irrigation and Drainage Network	53.975 km
		Road Network	192.62 km
		Population	33637
		Household	5779

Meteorological Drought	Medium - Extreme	Settlements	46
		Agriculture Area	58.145 sq km
		Water Body	0.588 sq km
		Wet Area	3.747 sq km
		Population	33760
		Household	5801
Agricultural Drought	Low - Medium	Settlements	43
		Agriculture Area	70.326 sq km
		Water Body	0.75 sq km
		Wet Area	3.133 sq km
		Population	32962
		Household	5662
Heatwave	Low - High	Settlements	41
		Population	33390
		Household	5739
		Agriculture Area	37.875 sq km
		Pakka Unplanned Area	2.027 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	

Beriochandio			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	21.504 sq km
		Kachcha Area	0.02 sq km
		Natural Vegetation in Wet Areas	0.002 sq km
		Pakka Unplanned Area	0.824 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	21
		Health Facilities	1
		Petrol Pumps	1
		Settlements	30
		Irrigation and Drainage Network	17.367 km
		Road Network	51.642 km

		Population	15222
		Household	2544
Meteorological Drought	Medium - Extreme	Settlements	30
		Agriculture Area	21.562 sq km
		Natural Vegetation in Wet Areas	0.043 sq km
		Water Body	0.725 sq km
		Wet Area	0.21 sq km
		Population	15330
		Household	2563
Agricultural Drought	Low - Medium	Settlements	30
		Agriculture Area	27.417 sq km
		Natural Vegetation in Wet Areas	0.054 sq km
		Water Body	0.922 sq km
		Wet Area	0.267 sq km
		Population	15330
		Household	2563
Heatwave	Low - High	Settlements	28
		Population	15219
		Household	2545
		Agriculture Area	21.478 sq km
		Kachcha Area	0.02 sq km
		Pakka Unplanned Area	0.824 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	

Dhamraha			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	50.936 sq km
		Pakka Unplanned Area	1.483 sq km
		Range Land	0.02 sq km
		Bridges	5
		Education Facilities	31
		Health Facilities	1

		Industries	1
		Mobile Towers	4
		Petrol Pumps	1
		Police Stations	1
		Settlements	46
		Tourist Places	1
		Irrigation and Drainage Network	45.787 km
		Railway Line	1.289 km
		Road Network	158.983 km
		Population	26742
		Household	4473
Meteorological Drought	Medium - Extreme	Settlements	46
		Agriculture Area	51.048 sq km
		Range Land	0.439 sq km
		Water Body	1.012 sq km
		Wet Area	3.982 sq km
		Population	27020
		Household	4519
Agricultural Drought	Low - Medium	Settlements	26
		Agriculture Area	40.868 sq km
		Range Land	0.533 sq km
		Water Body	1.116 sq km
		Wet Area	5.074 sq km
		Population	10328
		Household	1726
Heatwave	Low - High	Settlements	41
		Population	26794
		Household	4479
		Agriculture Area	50.886 sq km
		Pakka Unplanned Area	1.486 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	

Dokri			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	27.553 sq km
		Pakka Planned Area	0.944 sq km
		Pakka Unplanned Area	1.36 sq km
		Bridges	1
		Bus Stops	3
		Education Facilities	22
		Health Facilities	4
		Mobile Towers	3
		Petrol Pumps	1
		Police Stations	1
		Settlements	33
		Irrigation and Drainage Network	18.96 km
		Railway Line	5.933 km
		Road Network	86.145 km
		Population	34459
		Household	5819
Meteorological Drought	Medium - Extreme	Settlements	33
		Agriculture Area	27.653 sq km
		Water Body	3.233 sq km
		Wet Area	0.376 sq km
		Population	34720
		Household	5862
Agricultural Drought	Low - Medium	Settlements	25
		Agriculture Area	32.927 sq km
		Water Body	4.083 sq km
		Wet Area	0.477 sq km
		Population	17880
		Household	3023
Heatwave	Low - High	Settlements	30
		Population	34463
		Household	5817
		Agriculture Area	27.511 sq km
		Pakka Planned Area	0.944 sq km
		Pakka Unplanned Area	1.361 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

Fatehpur			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	41.344 sq km
		Pakka Planned Area	5.445 sq km
		Pakka Unplanned Area	3.768 sq km
		Ambulance Services	1
		Bridges	18
		Bus Stops	6
		Education Facilities	81
		Grain Mandi	1
		Grid Stations	1
		Health Facilities	15
		Industries	6
		Mobile Towers	24
		Petrol Pumps	23
		Police Stations	3
		Post Offices	3
		Power Plants	2
		Settlements	74
		Tourist Places	1
		Irrigation and Drainage Network	41.952 km
		Railway Line	5.121 km
		Road Network	208.109 km
		Population	212032
		Household	36606
Meteorological Drought	Medium - Extreme	Settlements	74
		Agriculture Area	41.517 sq km
		Water Body	3.593 sq km
		Wet Area	1.064 sq km
		Population	212997
		Household	36771
Agricultural Drought	Low - Medium	Settlements	39
		Agriculture Area	37.729 sq km
		Water Body	3.487 sq km
		Wet Area	1.354 sq km
		Population	37933
		Household	6445

Heatwave	Low - High	Settlements	67
		Population	212006
		Household	36602
		Agriculture Area	41.241 sq km
		Pakka Planned Area	5.442 sq km
		Pakka Unplanned Area	3.769 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	

Garello			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	20.277 sq km
		Natural Vegetation in Wet Areas	0.001 sq km
		Pakka Unplanned Area	0.923 sq km
		Range Land	0.001 sq km
		Education Facilities	17
		Health Facilities	1
		Settlements	15
		Irrigation and Drainage Network	12.82 km
		Road Network	41.412 km
		Population	19058
		Household	3289
Meteorological Drought	Medium - Extreme	Settlements	15
		Agriculture Area	20.312 sq km
		Natural Vegetation in Wet Areas	0.091 sq km
		Range Land	0.053 sq km
		Water Body	0.559 sq km
		Wet Area	0.312 sq km
		Population	19215
		Household	3316
Agricultural Drought	Low - Medium	Settlements	15
		Agriculture Area	25.761 sq km
		Natural Vegetation in	0.116 sq km

		Wet Areas	
		Range Land	0.068 sq km
		Water Body	0.709 sq km
		Wet Area	0.395 sq km
		Population	19215
		Household	3316
Heatwave	Low - High	Settlements	15
		Population	19033
		Household	3283
		Agriculture Area	20.26 sq km
		Pakka Unplanned Area	0.923 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	

Jumo Agham			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	77.626 sq km
		Forest Area	0.004 sq km
		Natural Vegetation in Wet Areas	0.042 sq km
		Pakka Planned Area	0.851 sq km
		Pakka Unplanned Area	2.426 sq km
		Bridges	6
		Education Facilities	76
		Health Facilities	8
		Mobile Towers	6
		Petrol Pumps	5
		Police Stations	1
		Settlements	59
		Irrigation and Drainage Network	52.914 km
		Road Network	211.095 km
		Population	54410
		Household	9071
Meteorological Drought	Medium - Extreme	Settlements	59
		Agriculture Area	77.805 sq km

		Forest Area	0.061 sq km
		Natural Vegetation in Wet Areas	0.808 sq km
		Water Body	1.172 sq km
		Wet Area	6.784 sq km
		Population	53981
		Household	8998
Agricultural Drought	Low - Medium	Settlements	13
		Agriculture Area	36.287 sq km
		Forest Area	0.075 sq km
		Natural Vegetation in Wet Areas	1.013 sq km
		Water Body	1.466 sq km
		Wet Area	1 sq km
		Population	4894
		Household	848
Heatwave	Low - Medium	Settlements	46
		Population	53112
		Household	8852
		Agriculture Area	0.18 sq km
		Pakka Planned Area	0.847 sq km
		Pakka Unplanned Area	2.4 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	

Karani			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	55.232 sq km
		Natural Vegetation in Wet Areas	0.241 sq km
		Pakka Unplanned Area	1.874 sq km
		Education Facilities	22
		Settlements	20
		Irrigation and Drainage Network	15.743 km
		Road Network	93.804 km
		Population	24212

		Household	4090
Meteorological Drought	Medium - Extreme	Settlements	20
		Agriculture Area	55.457 sq km
		Natural Vegetation in Wet Areas	27.827 sq km
		Water Body	1.595 sq km
		Wet Area	1.786 sq km
		Population	24408
		Household	4122
Agricultural Drought	Low - High	Settlements	18
		Agriculture Area	67.721 sq km
		Natural Vegetation in Wet Areas	35.105 sq km
		Water Body	2.006 sq km
		Wet Area	2.032 sq km
		Population	23020
		Household	3888
Heatwave	Low - High	Settlements	19
		Population	24246
		Household	4095
		Agriculture Area	55.157 sq km
		Pakka Unplanned Area	1.877 sq km
Riverine Flood	Low - Extreme	Agriculture Area	43.317 sq km
		Natural Vegetation in Wet Areas	2.668 sq km
		Pakka Unplanned Area	0.591 sq km
		Education Facilities	8
		Settlements	9
		Irrigation and Drainage Network	4.18 km
		Road Network	58.255 km
		Population	7640
		Household	1292
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	

Kothi			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	89.509 sq km
		Natural Vegetation in Wet Areas	0.002 sq km
		Pakka Planned Area	2.289 sq km
		Pakka Unplanned Area	6.713 sq km
		Bridges	13
		Education Facilities	114
		Grain Mandi	2
		Health Facilities	2
		Mobile Towers	16
		Petrol Pumps	17
		Police Stations	5
		Settlements	121
		Tourist Places	1
		Irrigation and Drainage Network	54.572 km
		Railway Line	4.414 km
		Road Network	330.694 km
		Population	234453
		Household	40265
Meteorological Drought	Medium - Extreme	Settlements	121
		Agriculture Area	89.841 sq km
		Natural Vegetation in Wet Areas	0.115 sq km
		Water Body	6.469 sq km
		Wet Area	0.937 sq km
		Population	235505
		Household	40438
Agricultural Drought	Low - Medium	Settlements	114
		Agriculture Area	111.542 sq km
		Natural Vegetation in Wet Areas	0.147 sq km
		Water Body	8.215 sq km
		Wet Area	1.192 sq km
		Population	102816
		Household	17388
Heatwave	Low - High	Settlements	117
		Population	234641
		Household	40295
		Agriculture Area	89.351 sq km
		Pakka Planned Area	2.291 sq km

		Pakka Unplanned Area	6.72 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	

Mad Bahu			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	28.986 sq km
		Pakka Unplanned Area	2.413 sq km
		Range Land	0.011 sq km
		Bridges	5
		Bus Stops	4
		Education Facilities	36
		Health Facilities	1
		Mobile Towers	4
		Petrol Pumps	1
		Post Offices	1
		Settlements	29
		Irrigation and Drainage Network	13.267 km
		Road Network	73.312 km
		Population	27427
		Household	4814
Meteorological Drought	Medium - Extreme	Settlements	29
		Agriculture Area	29.068 sq km
		Range Land	0.255 sq km
		Water Body	0.501 sq km
		Wet Area	4.023 sq km
		Population	27694
		Household	4860
Agricultural Drought	Low - Medium	Settlements	13
		Agriculture Area	22.786 sq km
		Range Land	0.323 sq km
		Water Body	0.628 sq km
		Wet Area	5.101 sq km
		Population	17294
		Household	3035

Heatwave	Low - High	Settlements	28
		Population	27467
		Household	4819
		Agriculture Area	28.954 sq km
		Pakka Unplanned Area	2.416 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	

Mehrabpur			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	16.245 sq km
		Pakka Planned Area	0.188 sq km
		Pakka Unplanned Area	0.518 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	9
		Settlements	12
		Tourist Places	1
		Irrigation and Drainage Network	19.088 km
		Railway Line	3.012 km
		Road Network	43.092 km
		Population	5920
		Household	1042
Meteorological Drought	Medium - Extreme	Settlements	12
		Agriculture Area	16.27 sq km
		Water Body	0.179 sq km
		Wet Area	0.246 sq km
		Population	5969
		Household	1049
Agricultural Drought	Low - Medium	Settlements	11
		Agriculture Area	20.325 sq km
		Water Body	0.225 sq km
		Wet Area	0.312 sq km
		Population	5935

		Household	1043
Heatwave	Low - High	Settlements	12
		Population	5923
		Household	1043
		Agriculture Area	16.234 sq km
		Pakka Planned Area	0.189 sq km
		Pakka Unplanned Area	0.518 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	

Naich			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	38.022 sq km
		Kachcha Area	0.012 sq km
		Pakka Planned Area	0.148 sq km
		Pakka Unplanned Area	2.016 sq km
		Bridges	2
		Education Facilities	48
		Health Facilities	1
		Mobile Towers	2
		Petrol Pumps	1
		Settlements	61
		Irrigation and Drainage Network	24.63 km
		Railway Line	5.346 km
		Road Network	146.52 km
		Population	25011
		Household	4386
Meteorological Drought	Medium - Extreme	Settlements	61
		Agriculture Area	38.137 sq km
		Water Body	1.586 sq km
		Wet Area	0.024 sq km
		Population	25328
		Household	4441
Agricultural Drought	Low - Medium	Settlements	27

		Agriculture Area	23.593 sq km
		Water Body	1.959 sq km
		Wet Area	0.03 sq km
		Population	9739
		Household	1707
Heatwave	Low - High	Settlements	59
		Population	25039
		Household	4393
		Agriculture Area	37.973 sq km
		Kachcha Area	0.012 sq km
		Pakka Planned Area	0.148 sq km
		Pakka Unplanned Area	2.018 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	

Pathan			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	25.348 sq km
		Natural Vegetation in Wet Areas	0.003 sq km
		Pakka Unplanned Area	1.832 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	27
		Settlements	30
		Irrigation and Drainage Network	13.211 km
		Railway Line	4.458 km
		Road Network	90.993 km
		Population	21419
		Household	3748
Meteorological Drought	Medium - Extreme	Settlements	30
		Agriculture Area	25.454 sq km
		Natural Vegetation in Wet Areas	0.267 sq km
		Water Body	2.374 sq km
		Wet Area	0.015 sq km

		Population	21674
		Household	3792
Agricultural Drought	Low - Medium	Settlements	19
		Agriculture Area	26.692 sq km
		Natural Vegetation in Wet Areas	0.339 sq km
		Water Body	3.002 sq km
		Wet Area	0.019 sq km
		Population	17270
		Household	3019
Heatwave	Low - High	Settlements	30
		Population	21459
		Household	3754
		Agriculture Area	25.309 sq km
		Pakka Unplanned Area	1.836 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	

Phul			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	50.335 sq km
		Natural Vegetation in Wet Areas	0.015 sq km
		Pakka Planned Area	0.81 sq km
		Pakka Unplanned Area	6.117 sq km
		Range Land	0.024 sq km
		Bridges	1
		Bus Stops	4
		Education Facilities	85
		Grain Mandi	1
		Grid Stations	1
		Health Facilities	5
		Mobile Towers	18
		Petrol Pumps	6
		Police Stations	2
		Post Offices	5

		Power Plants	1
		Settlements	58
		Tourist Places	4
		Irrigation and Drainage Network	17.398 km
		Railway Line	2.128 km
		Road Network	123.226 km
		Population	185512
		Household	32253
Meteorological Drought	Medium - Extreme	Settlements	58
		Agriculture Area	50.483 sq km
		Natural Vegetation in Wet Areas	5.362 sq km
		Range Land	1.525 sq km
		Water Body	0.676 sq km
		Wet Area	0.571 sq km
		Population	185995
		Household	32336
Agricultural Drought	Low - Medium	Settlements	2
		Agriculture Area	31.18 sq km
		Natural Vegetation in Wet Areas	5.529 sq km
		Range Land	1.623 sq km
		Water Body	0.522 sq km
		Wet Area	0.435 sq km
		Population	529
		Household	91
Heatwave	Low - High	Settlements	56
		Population	185388
		Household	32233
		Agriculture Area	50.265 sq km
		Pakka Planned Area	0.809 sq km
		Pakka Unplanned Area	6.117 sq km
Riverine Flood	Low - High	Agriculture Area	21.716 sq km
		Natural Vegetation in Wet Areas	0.688 sq km
		Pakka Unplanned Area	0.001 sq km
		Range Land	0.016 sq km
		Education Facilities	2
		Settlements	1
		Road Network	5.328 km
		Population	10

		Household	2
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	

Pir Bakhsh Bhutto			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	58.546 sq km
		Pakka Planned Area	1.575 sq km
		Pakka Unplanned Area	2.609 sq km
		Range Land	0.02 sq km
		Ambulance Services	2
		Bridges	13
		Bus Stops	1
		Education Facilities	67
		Health Facilities	8
		Industries	2
		Mobile Towers	8
		Petrol Pumps	7
		Police Stations	1
		Post Offices	1
		Power Plants	1
		Settlements	63
		Tourist Places	2
		Irrigation and Drainage Network	59.553 km
		Railway Line	6.544 km
		Road Network	242.592 km
		Population	86285
		Household	14809
Meteorological Drought	Medium - Extreme	Settlements	63
		Agriculture Area	58.696 sq km
		Range Land	0.226 sq km
		Water Body	1.944 sq km
		Wet Area	0.316 sq km
		Population	87215
		Household	14967
Agricultural Drought	Low - Medium	Settlements	8
		Agriculture Area	26.339 sq km

		Range Land	0.288 sq km
		Water Body	2.128 sq km
		Wet Area	0.177 sq km
		Population	7910
		Household	1370
Heatwave	Low - High	Settlements	58
		Population	85900
		Household	14741
		Agriculture Area	5.207 sq km
		Pakka Planned Area	1.571 sq km
		Pakka Unplanned Area	2.592 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	

Purano Abad			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	116.049 sq km
		Kachcha Area	0.181 sq km
		Natural Vegetation in Wet Areas	0.267 sq km
		Pakka Planned Area	0.296 sq km
		Pakka Unplanned Area	4.546 sq km
		Range Land	0.1 sq km
		Ambulance Services	1
		Bridges	1
		Bus Stops	1
		Education Facilities	46
		Health Facilities	1
		Mobile Towers	1
		Petrol Pumps	1
		Post Offices	1
		Settlements	58
		Irrigation and Drainage Network	31.101 km
		Railway Line	1.897 km
		Road Network	153.441 km
		Population	60591

		Household	10551
Meteorological Drought	Medium - Extreme	Settlements	58
		Agriculture Area	116.49 sq km
		Natural Vegetation in Wet Areas	26.782 sq km
		Range Land	2.387 sq km
		Water Body	1.076 sq km
		Wet Area	4.829 sq km
		Population	61143
		Household	10644
Agricultural Drought	Low - Medium	Settlements	28
		Agriculture Area	126.459 sq km
		Natural Vegetation in Wet Areas	32.908 sq km
		Range Land	3.026 sq km
		Water Body	1.32 sq km
		Wet Area	3.906 sq km
		Population	27720
		Household	4853
Heatwave	Low - High	Settlements	56
		Population	60682
		Household	10565
		Agriculture Area	115.918 sq km
		Kachcha Area	0.182 sq km
		Pakka Planned Area	0.294 sq km
		Pakka Unplanned Area	4.555 sq km
Riverine Flood	Low - Extreme	Agriculture Area	67.56 sq km
		Kachcha Area	0.181 sq km
		Natural Vegetation in Wet Areas	2.285 sq km
		Pakka Unplanned Area	1.093 sq km
		Range Land	0.004 sq km
		Education Facilities	7
		Settlements	14
		Road Network	20.414 km
		Population	14766
		Household	2576
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

Rashid Wagan			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	71.671 sq km
		Kachcha Area	0.133 sq km
		Natural Vegetation in Wet Areas	0.03 sq km
		Pakka Unplanned Area	2.31 sq km
		Education Facilities	47
		Petrol Pumps	4
		Police Stations	1
		Settlements	64
		Irrigation and Drainage Network	44.261 km
		Road Network	179.442 km
		Population	39081
		Household	6610
Meteorological Drought	Medium - Extreme	Settlements	64
		Agriculture Area	71.866 sq km
		Natural Vegetation in Wet Areas	0.634 sq km
		Water Body	3.519 sq km
		Wet Area	3.36 sq km
		Population	39551
		Household	6687
Agricultural Drought	Low - High	Settlements	64
		Agriculture Area	91.249 sq km
		Natural Vegetation in Wet Areas	0.805 sq km
		Water Body	4.469 sq km
		Wet Area	4.267 sq km
		Population	39551
		Household	6687
Heatwave	Low - High	Settlements	64
		Population	39108
		Household	6614
		Agriculture Area	71.581 sq km
		Kachcha Area	0.133 sq km
		Pakka Unplanned Area	2.313 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

Ratodero II			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	39.182 sq km
		Natural Vegetation in Wet Areas	0.004 sq km
		Pakka Planned Area	1.468 sq km
		Pakka Unplanned Area	2.125 sq km
		Ambulance Services	1
		Bridges	5
		Education Facilities	40
		Health Facilities	5
		Mobile Towers	9
		Petrol Pumps	4
		Settlements	44
		Irrigation and Drainage Network	31.12 km
		Road Network	131.846 km
		Population	71232
		Household	11564
Meteorological Drought	Medium - Extreme	Settlements	44
		Agriculture Area	39.353 sq km
		Natural Vegetation in Wet Areas	0.067 sq km
		Water Body	0.477 sq km
		Wet Area	4.442 sq km
		Population	71786
		Household	11654
Agricultural Drought	Low - Medium	Settlements	24
		Agriculture Area	27.5 sq km
		Natural Vegetation in Wet Areas	0.086 sq km
		Water Body	0.599 sq km
		Wet Area	4.121 sq km
		Population	43137
		Household	6939

Heatwave	Low – Medium	Settlements	43
		Population	71103
		Household	11540
		Agriculture Area	0.096 sq km
		Pakka Planned Area	1.467 sq km
		Pakka Unplanned Area	2.118 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	

Saidu Dero			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	58.829 sq km
		Pakka Unplanned Area	2.183 sq km
		Range Land	0.017 sq km
		Bridges	5
		Education Facilities	47
		Health Facilities	2
		Mobile Towers	2
		Settlements	35
		Irrigation and Drainage Network	57.735 km
		Railway Line	5.116 km
		Road Network	191.769 km
		Population	33633
		Household	5790
Meteorological Drought	Medium - Extreme	Settlements	35
		Agriculture Area	58.987 sq km
		Range Land	0.229 sq km
		Water Body	2.898 sq km
		Wet Area	1.359 sq km
		Population	32231
		Household	5545
Agricultural Drought	Low - Medium	Settlements	14
		Agriculture Area	41.776 sq km
		Range Land	0.292 sq km
		Water Body	2.506 sq km

		Wet Area	1.721 sq km
		Population	15734
		Household	2724
Heatwave	Low - High	Settlements	34
		Population	31840
		Household	5480
		Agriculture Area	36.012 sq km
		Pakka Unplanned Area	2.177 sq km
Riverine Flood	Low - Medium	Agriculture Area	0.326 sq km
		Road Network	0.249 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	

Tatri			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	72.921 sq km
		Kachcha Area	0.174 sq km
		Natural Vegetation in Wet Areas	0.018 sq km
		Pakka Planned Area	0.036 sq km
		Pakka Unplanned Area	3.04 sq km
		Range Land	0.002 sq km
		Bridges	3
		Bus Stops	1
		Education Facilities	47
		Health Facilities	3
		Settlements	41
		Irrigation and Drainage Network	54.839 km
		Railway Line	8.651 km
		Road Network	173.613 km
		Population	42257
		Household	7140
Meteorological Drought	Medium - Extreme	Settlements	41
		Agriculture Area	73.27 sq km
		Natural Vegetation in Wet Areas	0.868 sq km
		Range Land	0.042 sq km

		Water Body	6.675 sq km
		Wet Area	15.423 sq km
		Population	42699
		Household	7214
Agricultural Drought	Low - High	Settlements	25
		Agriculture Area	59.369 sq km
		Natural Vegetation in Wet Areas	1.096 sq km
		Range Land	0.053 sq km
		Water Body	8.342 sq km
		Wet Area	14.806 sq km
		Population	25471
		Household	4304
Heatwave	Low - High	Settlements	39
		Population	42302
		Household	7150
		Agriculture Area	72.81 sq km
		Kachcha Area	0.173 sq km
		Pakka Planned Area	0.036 sq km
		Pakka Unplanned Area	3.044 sq km
Riverine Flood	Low - Medium	Agriculture Area	0.087 sq km
		Natural Vegetation in Wet Areas	0.012 sq km
		Irrigation and Drainage Network	0.947 km
		Road Network	0.721 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	

Warisdino Machhi			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	89.611 sq km
		Natural Vegetation in Wet Areas	0.057 sq km
		Pakka Unplanned Area	2.102 sq km
		Bridges	4
		Education Facilities	42
		Health Facilities	2

		Mobile Towers	2
		Petrol Pumps	3
		Settlements	50
		Irrigation and Drainage Network	49.608 km
		Road Network	221.367 km
		Population	31650
		Household	5481
Meteorological Drought	Medium - Extreme	Settlements	50
		Agriculture Area	89.71 sq km
		Bare Area with sparse Natural Vegetation	0.022 sq km
		Natural Vegetation in Wet Areas	0.792 sq km
		Water Body	0.338 sq km
		Wet Area	7.266 sq km
		Population	31324
		Household	5427
Agricultural Drought	Low - Medium	Settlements	39
		Agriculture Area	89.507 sq km
		Bare Area with sparse Natural Vegetation	0.028 sq km
		Natural Vegetation in Wet Areas	1.008 sq km
		Water Body	0.431 sq km
		Wet Area	6.769 sq km
		Population	17206
		Household	2980
Heatwave	Medium	Settlements	37
		Population	30835
		Household	5340
		Agriculture Area	0.123 sq km
		Pakka Unplanned Area	2.084 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	

Yaru Lakhir			
Hazard Type	**Risk**	**Elements at Risk**	
Earthquake	Low	Agriculture Area	29.63 sq km
		Pakka Unplanned Area	0.919 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	23
		Health Facilities	1
		Mobile Towers	1
		Settlements	14
		Irrigation and Drainage Network	26.201 km
		Railway Line	5.316 km
		Road Network	80.115 km
		Population	11877
		Household	2006
Meteorological Drought	Medium - Extreme	Settlements	14
		Agriculture Area	29.723 sq km
		Water Body	1.541 sq km
		Wet Area	2.753 sq km
		Population	11975
		Household	2022
Agricultural Drought	Low - High	Settlements	7
		Agriculture Area	22.521 sq km
		Water Body	1.916 sq km
		Wet Area	0.639 sq km
		Population	4881
		Household	824
Heatwave	Low - High	Settlements	14
		Population	11908
		Household	2011
		Agriculture Area	29.595 sq km
		Pakka Unplanned Area	0.922 sq km
Riverine Flood	Low - Medium	Irrigation and Drainage Network	3.764 km
		Road Network	1.369 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	

ORGANIZATION STRUCTURE FOR DISASTER MANAGEMENT AT DISTRICT LEVEL

INTRODUCTION

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

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

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

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

Table 2: District Disaster Management Authority

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

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

Table 3: TDMC Taluka Disaster Management Committee

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

Table 4: UCDMC Union Council Disaster Management Committee

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

RESPONSIBILITY OF DISTRICT DISASTER MANAGEMENT AUTHORITY

- The DDMA shall work as a coordinating body of all government agencies and non-government organizations operating in the district and act as a focal authority in the 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 filed arm of PEOC for execution and implementation of instructions passed on by PEOC. The center is equipped with modern tools and techniques for management and operation activities in pre, during and post disaster events. The center works under the management of DDMA with 24/7 operation during disasters.

FUNCTION OF DEOC

The functions of DEOC are appended below;

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

SECTOR WISE ROLES AND RESPONSIBILITIES OF GOVERNMENT FUNCTIONARIES

AGRICULTURE AND LIVESTOCK DEPARTMENT

Pre-Disaster

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

During-Disaster

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

Post-Disaster

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

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

PROVINCIAL DISASTER MANAGEMENT AUTHORITY (PDMA)

Pre-Disaster

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

During-Disaster

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

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

Post-Disaster

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

DISTRICT DISASTER MANAGEMENT AUTHORITY (DDMA)

Pre-Disaster

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

During-Disaster

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

Post-Disaster

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

CIVIL DEFENSE

Pre-Disaster

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

During-Disaster

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

Post-Disaster

- Assist in rehabilitation process if required

EDUCATION DEPARTMENT

Pre-Disaster

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

During-Disaster

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

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

Post-Disaster

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

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 Larkana 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	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 Larkana 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

	Punjab, Federal Flood Commission and Pakistan Meteorological Department (PMD) be conducted. 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.
Earthquake	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 Larkana 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-Jhimpir, (c) Pab Fault (d) Hub Fault and (e) Allah Bund-Rann of

	Kutch faults. 3. Though risk of geophysical hazards in Larkana 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 Larkana 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	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	1. Larkana is a moderately populated district with closely spaced homes in major cities. Climatic condition of the district can be categorized as Hot and Arid (Climate Classification of Pakistan (Khan et al., 2010).

	Average annual rainfall received during a year across the district is 73.78 mm. Agriculture is practiced in the district which is mainly dependent on canal irrigation. 2. Drought is also forecastable hazard and can be predicted well in advance. Though drought may not bring any prominent or famine like conditions in the districts, however, it may cause 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	According to MHVRA Study 2022, there is no Cyclone Hazard in Larkana district.
Tsunami	According to MHVRA Study 2022, there is no Tsunami Hazard in Larkana district.

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, 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

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 8: 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 Larkana 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 (9)	**Akil, Bagi, Bahman, Karani, Phul, Purano Abad, Saidu Dero, Tatri, Yaru Lakhir**
UCs not at Risk (19)	**A, Arija, Badeh-II, Banguldero, Beriochandio, Dhamraha, Dokri, Fatehpur, Garello, Jumo Agham, Kothi, Mad Bahu, Mehrabpur, Naich, Pathan, Pir Bakhsh Bhutto, Rashid Wagan, Ratodero II, Warisdino Machhi**
General Description	1. Larkana district is located on the right bank of River Indus. 2. District's main city Larkana is located on the south bank of the Ghar canal, about 64 km south of the town Shikarpur, and 58km northeast of Mehar. 3. Due to well-established canal system, most of the lands in Larkana district are irrigated croplands. 4. District Larkana is vulnerable to riverine and flash floods. River Indus runs down on the eastern side of the district, making this part of the district vulnerable to riverine floods. Also the district's western part is vulnerable to flash floods because of the presence of Khirthar mountain ranges. 5. Year-2010 flood resulted in significant damages and accounted for an economic loss of about 11.425 billion Pakistani rupees (93 million US dollars in 2010) by destroying 247,973 tons of rice crop in Larkana Division. 6. Weak and damaged parts of the canals and protection Bund on the river Indus can, unexpectedly, create a disaster like situation in the district. In monsoon season they can overflow, break and have breaches 7. 20% of the population in Larkana lives in low-lying areas. The ground water table in these areas remains very high; consequently, runoff rain water accumulates in a very short time to make these places flood-prone. 8. According to MHVRA study 2022, Flood hazard in the district is of intensity "**Low to Very High**". 9. According to MHVRA study 2022, Flood risk in the district is "**Low to High**".
Disaster Management Measures	
Preparedness	
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	1. An earthquake is a sudden shaking of the ground caused by two chunks of earth's crust sliding past one another. 2. Although earthquakes are short-lived, usually not lasting more than a minute, they can leave behind incredible damage. 3. Identifying potential hazards ahead of time and advance planning can reduce the dangers of serious injury or loss of life from an earthquake. 4. According to MHVRA study 2022, Earthquake hazard in the district is of intensity "**Low**". 5. According to MHVRA study 2022, Earthquake risk in the district is "**Low**".

Disaster Management Measures

Preparedness

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

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.

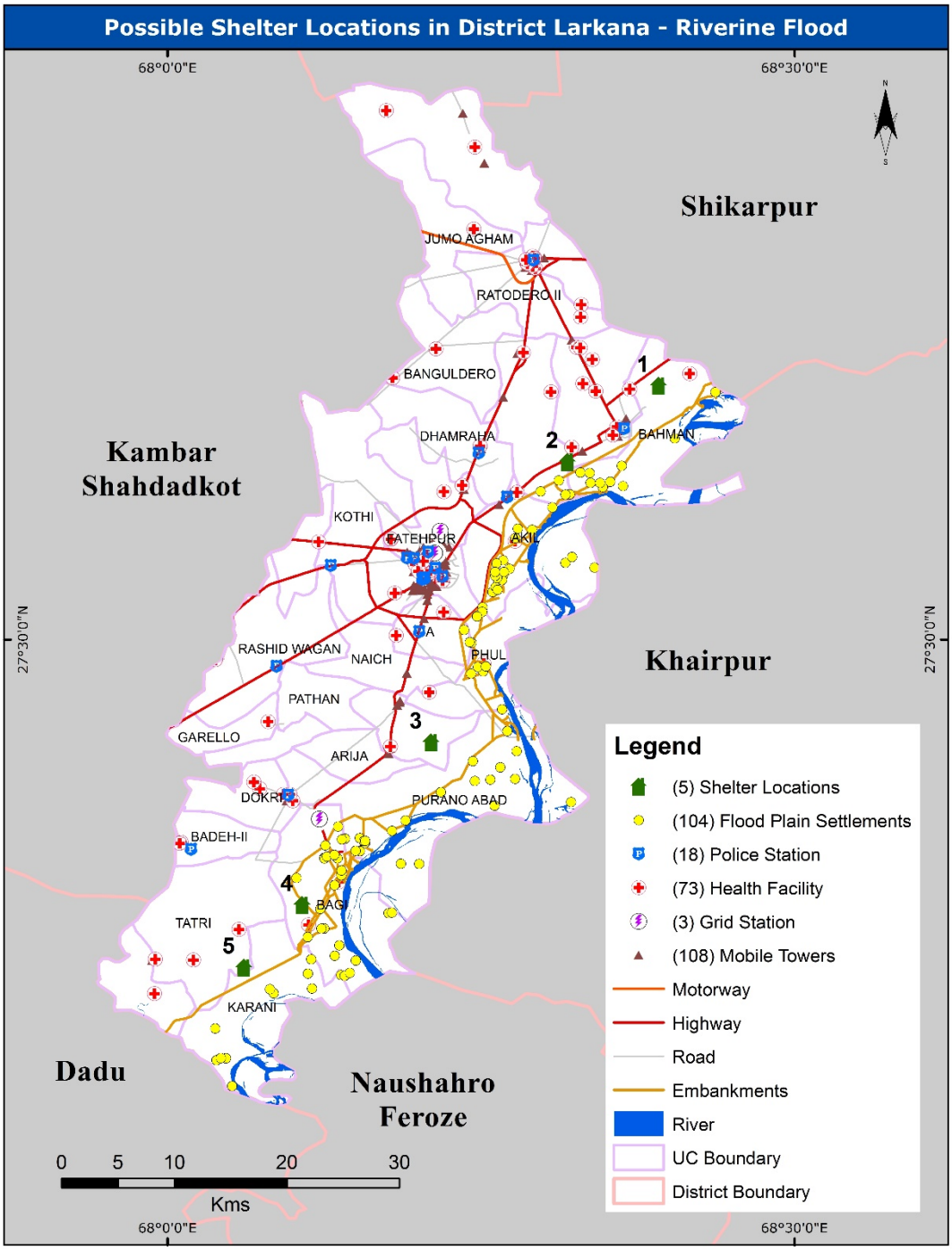
Heatwave	
UCs at Risk	**All UCs**
General Description	1. The climate of district Larkana is Hot and Arid. (Climate Classification of Pakistan (Khan et al., 2010)) with warm conditions year-round. 2. The district has extreme climate in summers and moderate in winters. 3. The annual average rainfall across the district is about 73.78mm. 4. The period from mid-April to late June (before the onset of the monsoon) is the hottest of the year. During this time, winds that blow usually bring along clouds of dust, and people prefer staying indoors in the daytime. 5. The highest recorded temperature is 53 °C (127 °F), and the lowest recorded temperature is −4 °C (25 °F). 6. The hottest month is May and coldest month is January during a year. 7. The mean maximum and minimum temperature in summer season is approximately 46 °C and 30 °C respectively while that of the winter season is 25 °C and 9.5 °C respectively. 8. According to MHVRA study 2022, Heatwave hazard in the district is of intensity "**High to Severe**". 9. According to MHVRA study 2022, Heatwave risk in the district is "**Low to High**".
Disaster Management Measures	
Preparedness	
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	
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	
1. Post event review of heatwave plan and modifications if required.	

Cyclone/Tsunami	
UCs at Risk	**Nil**
General Description	According to MHVRA study 2022, there is no risk of Cyclone/Tsunami in Larkana district

Drought	
UCs at Risk	**All UCs**
General Description	1. Climatic condition of the district can be categorized as Hot and Arid (Climate Classification of Pakistan (Khan et al., 2010)) 2. Rainfall is very scant, average annual rainfall received during a year across the district is 73.78 mm. 3. River Indus is flowing along the eastern boundary of the district. 4. Irrigated crop fields are mostly found across the district from north to south. 5. Agricultural water needs are mostly being catered through canal irrigation system, beside, River Indus also plays an important role 6. Like other districts in Sindh, majority of the economy of Larkana is based on agriculture and pastoral farming but it also has a well-established industrial base. 7. According to MHVRA study 2022. a. Meteorological drought hazard for district Larkana is "**Extreme**" b. Meteorological drought risk for district Larkana is "**Medium to Extreme**" c. Agricultural drought hazard for district Larkana is "**Mild to Severe**" d. Agricultural drought risk for district Larkana is "**Low to High**"
Disaster Management Measures	
Preparedness	
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.	
Response	
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	
1. Cash and in-kind support to farmers for next cropping. 2. Awareness and encouragement of farmers on best irrigation practices and water saving.	

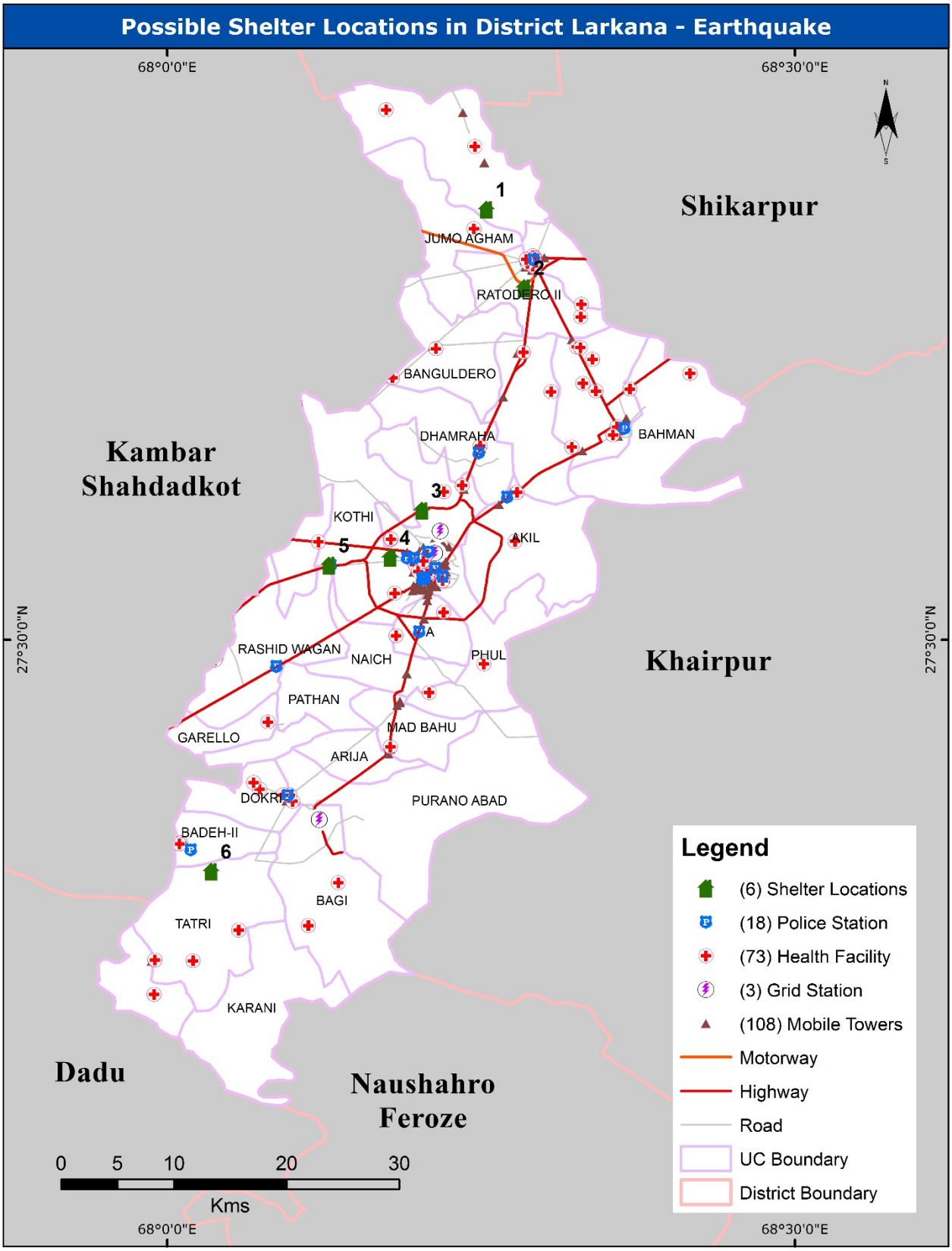
SHELTER LOCATION MAP

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 Larkana. 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 Flood	
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.	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. 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.)

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 – LARKANA DISTRICT

The existing nature of disasters in Larkana district can be categorized as low to Extreme. The prominent hazards in the district is heatwave, drought and flood. The meteorological drought risk in the district ranges from medium to extreme while agricultural drought risk ranges from low to high. There is no risk of storm surge, and Tsunami in the district. The risk of earthquake is determined to be low. As far as Heatwave is concerned Larkana district is at low to high 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 Larkana

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 Larkana, 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 heaven for those without the financial means to take other protective measures.
2.	Monitoring / Strengthening of flood protection embankments	Pre-emptive monitoring activity to check the wellness and structural integrity of flood protection embankments before the onset of monsoon season. This would allow identification of embankments that are in need of repairs and would help identify areas where new embankments are required. Following this activity, assets can be mobilized to enhance the flood protection embankments prior to the occurrence of high flow in rivers.	Timely identification of weak embankments and repairs would prevent flood water from breaching the river floodplains and thereby save millions of acres of crop land, settlements and infrastructure from inundation, possibly saving life and property. This would also reduce the burden on emergency services during hazard and the government can concentrate efforts on severely affected areas. Less damage to communication lines including roads and power lines would improve disaster response and outreach. This would also result in reduced number of internally displaced people (IDPs).
3.	Early warning system for heatwave	Dissemination of forecast of heatwaves from the meteorological department through public radio announcements, print and digital media increases the preparedness of local populace against the 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.

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

ANNEX – A – VULNERABLE SETTLEMENTS PRONE TO RIVERINE FLOOD

List of Vulnerable Settlements (104) within flood Plains Prone to Riverine Flood

S.No	Name	Longitude	Latitude	Area (acres)
1	Asootkot	68.247	27.518	39.26
2	Balhrejee	68.133	27.304	113.43
3	Fateh Awan	68.122	27.285	33.57
4	Goth Abdullah	68.279	27.588	59.21
5	Goth Agani	68.298	27.618	70.74
6	Goth Akil	68.277	27.581	57.57
7	Goth Alam	68.353	27.626	3.82
8	Goth Babu Bhutto	68.347	27.622	27.86
9	Goth Bahan	68.153	27.331	41.17
10	Goth Baidi Lashari	68.047	27.166	8.10
11	Goth Baji Khan	68.273	27.556	3.22
12	Goth Chakaro	68.141	27.232	30.14
13	Goth Chhatal Mumtaz Ji Wand	68.404	27.660	44.20
14	Goth Chochal	68.242	27.473	2.91
15	Goth Daro	68.038	27.190	16.80
16	Goth Dinpur	68.052	27.144	50.20
17	Goth Dodo	68.261	27.542	13.70
18	Goth Fateh Pur	68.150	27.244	7.27
19	Goth Gaji Dero	68.125	27.270	115.64
20	Goth Ghulam Mohammad	68.186	27.321	22.02
21	Goth Gulab Jatoi	68.265	27.398	7.56
22	Goth Haji Mashori	68.139	27.340	40.61
23	Goth Hakim	68.176	27.282	25.50
24	Goth Hakro	68.190	27.356	120.71
25	Goth Hamza Jatoi	68.267	27.548	12.70
26	Goth Hassan Wahan	68.158	27.339	31.95
27	Goth Hatri Ghulam Shah	68.277	27.389	39.06
28	Goth Husain Aro	68.137	27.256	6.29
29	Goth Jahan Kahan	68.437	27.697	37.04
30	Goth Jatoi	68.252	27.474	81.22
31	Goth Jumman Chandio	68.291	27.587	-
32	Goth Karani	68.112	27.263	95.86
33	Goth Kathi Kalhoro	68.362	27.638	4.21
34	Goth Khachar Pur	68.115	27.245	10.60
35	Goth Malah	68.139	27.316	72.92
36	Goth Mangria	68.244	27.403	33.70
37	Goth Mithal	68.245	27.387	23.38
38	Goth Mohammad Hassan Behan	68.150	27.331	41.17
39	Goth Mohammad Qasim	68.201	27.321	34.15

S.No	Name	Longitude	Latitude	Area (acres)
40	Goth Moria Faqir	68.337	27.625	14.00
41	Goth Mulan Usman Jatoi	68.267	27.551	5.33
42	Goth Nanga Shah	68.112	27.234	80.46
43	Goth Palijo	68.247	27.519	39.26
44	Goth Paro	68.321	27.616	12.69
45	Goth Purani Gud	68.179	27.347	120.71
46	Goth Sanhiree	68.259	27.538	5.16
47	Goth Sono Jatoi	68.247	27.478	32.09
48	Goth Tagar	68.312	27.627	12.94
49	Goth Zangi Jatoi	68.267	27.444	-
50	Jhut Malangi	68.268	27.563	8.56
51	Khohara	68.218	27.378	17.19
52	Meeraboz	68.262	27.561	4.14
53	Mehar Nandro	68.241	27.498	10.25
54	Mitho Khuhro	68.363	27.622	36.18
55	Moen Jo Daro	68.136	27.325	-
56	Nao Abad	68.254	27.479	81.22
57	Pir Rajan Shah	68.251	27.522	39.26
58	Purana Mahar Wada	68.237	27.508	12.17
59	Purano Abad	68.271	27.427	67.82
60	Untitled Settlement	68.138	27.232	1.50
61	Untitled Settlement	68.243	27.497	2.21
62	Untitled Settlement	68.251	27.526	3.55
63	Untitled Settlement	68.341	27.557	38.44
64	Untitled Settlement	68.142	27.341	13.62
65	Untitled Settlement	68.158	27.338	-
66	Untitled Settlement	68.153	27.342	-
67	Untitled Settlement	68.157	27.338	-
68	Untitled Settlement	68.153	27.342	0.01
69	Untitled Settlement	68.157	27.338	0.12
70	Untitled Settlement	68.157	27.339	2.45
71	Untitled Settlement	68.139	27.312	-
72	Untitled Settlement	68.039	27.164	8.04
73	Untitled Settlement	68.042	27.166	9.48
74	Untitled Settlement	68.085	27.218	17.06
75	Untitled Settlement	68.082	27.221	16.61
76	Untitled Settlement	68.115	27.222	15.98
77	Untitled Settlement	68.145	27.234	13.83
78	Untitled Settlement	68.133	27.248	19.41
79	Untitled Settlement	68.179	27.282	22.14
80	Untitled Settlement	68.103	27.310	4.72
81	Untitled Settlement	68.261	27.367	20.58
82	Untitled Settlement	68.322	27.370	24.89

S.No	Name	Longitude	Latitude	Area (acres)
83	Untitled Settlement	68.257	27.388	36.97
84	Untitled Settlement	68.278	27.411	23.90
85	Untitled Settlement	68.263	27.549	1.52
86	Untitled Settlement	68.261	27.551	2.74
87	Untitled Settlement	68.268	27.554	0.92
88	Untitled Settlement	68.261	27.554	8.52
89	Untitled Settlement	68.317	27.561	10.65
90	Untitled Settlement	68.323	27.566	23.29
91	Untitled Settlement	68.307	27.605	4.31
92	Untitled Settlement	68.317	27.616	2.95
93	Untitled Settlement	68.345	27.625	7.66
94	Untitled Settlement	68.337	27.633	3.73
95	Untitled Settlement	68.329	27.633	14.73
96	Untitled Settlement	68.136	27.351	19.71
97	Untitled Settlement	68.125	27.326	-
98	Untitled Settlement	68.125	27.326	0.06
99	Untitled Settlement	68.125	27.325	0.70
100	Untitled Settlement	68.126	27.336	11.70
101	Untitled Settlement	68.127	27.327	24.46
102	Untitled Settlement	68.133	27.328	48.20
103	Untitled Settlement	68.123	27.269	3.22
104	Untitled Settlement	68.263	27.540	7.67

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: Upper left corner: Lower right corner: Lower left corner:	27°42'19.40"N 27°42'7.03"N 27°42'10.40"N 27°41'53.57"N	68°23'34.46"E 68°23'14.94"E 68°23'46.90"E 68°23'21.54"E	82.6	~3,700	183
2	Upper right corner: Upper left corner: Lower right corner: Lower left corner:	27°38'47.54"N 27°38'25.06"N 27°38'28.72"N 27°38'7.77"N	68°19'29.86"E 68°18'42.91"E 68°19'32.25"E 68°18'49.01"E	180	~8,000	180
3	Upper right corner: Upper left corner: Lower right corner: Lower left corner:	27°25'29.30"N 27°25'24.02"N 27°24'53.36"N 27°24'35.39"N	68°12'34.99"E 68°12'15.63"E 68°13'13.72"E 68°12'23.33"E	370	~16,000	167
4	Upper right corner: Upper left corner: Lower right corner: Lower left corner:	27°17'39.47"N 27°17'35.37"N 27°17'0.75"N 27°16'55.59"N	68° 6'16.25"E 68° 6'6.16"E 68° 6'50.89"E 68° 6'29.80"E	158	~7,000	156
5	Upper right corner: Upper left corner: Lower right corner: Lower left corner:	27°14'36.50"N 27°14'19.55"N 27°14'17.72"N 27°13'58.48"N	68° 3'57.05"E 68° 3'16.09"E 68° 4'2.69"E 68° 3'20.96"E	194	~8,700	153

A total of 5 shelter locations have been selected as Flood shelter places across district Larkana. 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 43,400 tents (tent with size of 45 sq. m each) can be set up within the demarcated shelter places.

ANNEX – C – SHELTER LOCATIONS DESCRIPTION – EARTHQUAKE

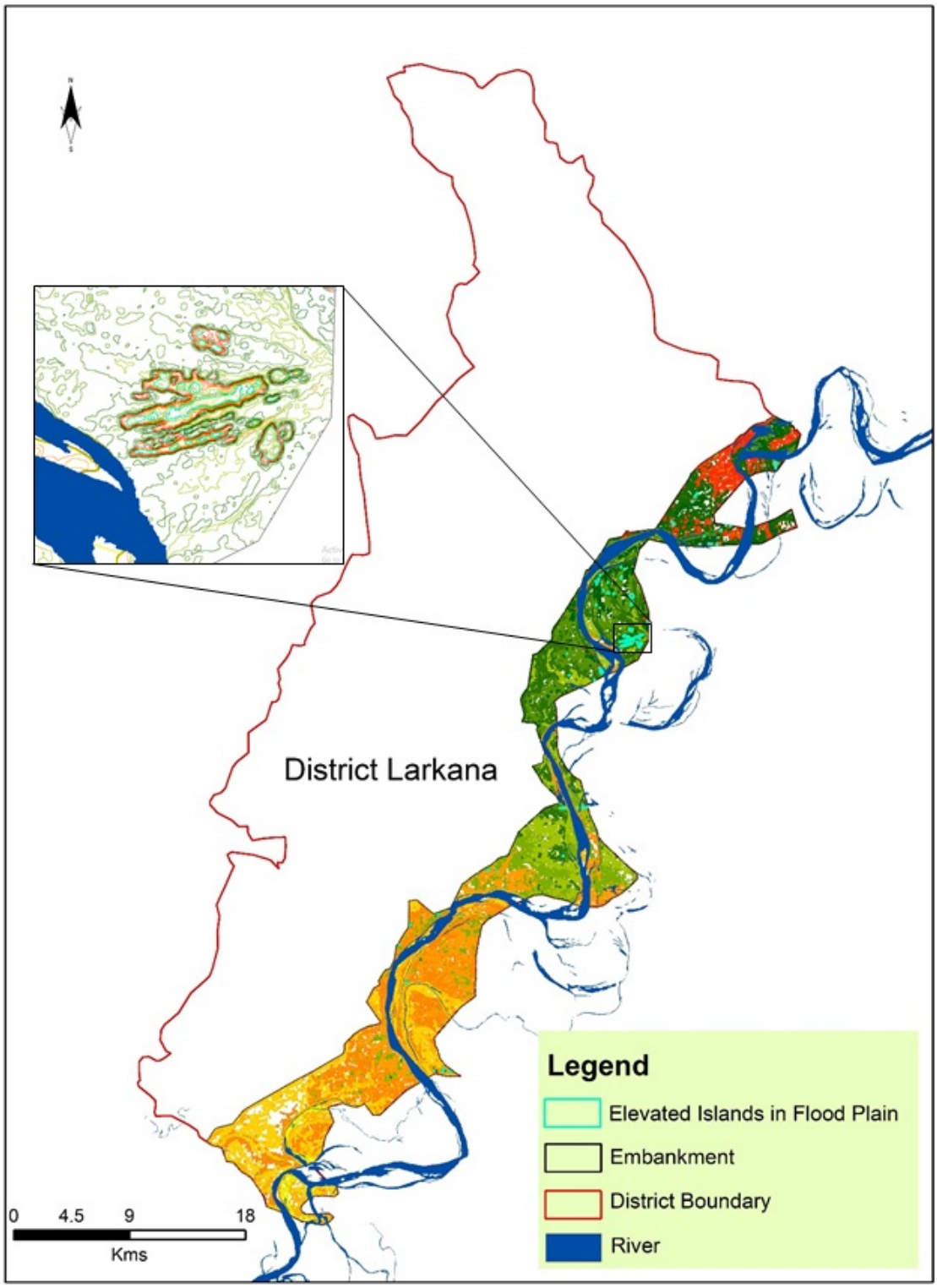
The given shelter locations for earthquake are proposed on the findings of the MHVRA 2022 study and information obtained through satellite technology and online verifiable sources. It is recommended to conduct on ground physical surveys to evaluate their suitability.

Shelter location	Co-ordinates			Area (acres)	Estimated Tents (numbers)	Avg. Elevation (ft)
1	Upper right corner:	27°50'47.90"N	68°15'35.20"E	199	~8,900	172
	Upper left corner:	27°50'47.28"N	68°14'59.76"E			
	Lower right corner:	27°50'19.10"N	68°15'33.54"E			
	Lower left corner:	27°50'22.48"N	68°14'58.34"E			
2	Upper right corner:	27°46'59.53"N	68°17'18.39"E	113	~5,000	174
	Upper left corner:	27°47'1.66"N	68°17'1.18"E			
	Lower right corner:	27°46'34.50"N	68°17'8.53"E			
	Lower left corner:	27°46'35.53"N	68°16'45.24"E			
3	Upper right corner:	27°36'16.58"N	68°12'25.82"E	129	~5,700	168
	Upper left corner:	27°36'22.54"N	68°11'57.27"E			
	Lower right corner:	27°35'58.77"N	68°12'26.33"E			
	Lower left corner:	27°35'59.51"N	68°12'0.00"E			
4	Upper right corner:	27°34'15.52"N	68°11'1.21"E	139	~6,200	170
	Upper left corner:	27°34'17.29"N	68°10'45.94"E			
	Lower right corner:	27°33'30.42"N	68°10'29.77"E			
	Lower left corner:	27°33'34.70"N	68°10'18.77"E			
5	Upper right corner:	27°33'31.52"N	68° 7'59.87"E	134	~6,000	169
	Upper left corner:	27°33'52.31"N	68° 7'31.93"E			
	Lower right corner:	27°33'9.80"N	68° 7'57.33"E			
	Lower left corner:	27°33'13.46"N	68° 7'48.80"E			
6	Upper right corner:	27°19'11.66"N	68° 2'37.06"E	385	~17,000	159
	Upper left corner:	27°19'10.29"N	68° 1'35.91"E			
	Lower right corner:	27°18'43.94"N	68° 2'43.11"E			
	Lower left corner:	27°18'41.79"N	68° 1'33.68"E			

A total of 6 shelter locations have been selected as Earthquake shelter places across district Larkana. 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 48,800 tents approximately (tent with size of 45 sq. m each) can be set up within the demarcated shelter places.

ANNEX – D – ELEVATED ISLANDS WITHIN EMBANKMENTS IN LARKANA

Total 78 elevated islands have been identified within the embankments in district Larkana, with a cumulative area of approximately 200.98 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 Larkana 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 andto compare it with the cost of making and maintenance of loop bunds to avoid meandering of the river. If the proposed conceptual model is financially and technically viable than it can be taken as project. If this conceptual model is implemented than damaged losses (life and material) due to breaching scenarios may be minimized or even reduced to zero.

ANNEX – F – LIST OF EQUIPMENT AVAILABLE IN DISTRICT LARKANA

Equipment	Quantity
De-watering Machine	5
Buildozers / Dozers	14
Excavator	4
Fire Brigade / Engine / Tender	5
Vehicle / Bus/ Van/Truck/	71
Diesel / Petrol Engine	2
Ambulances	56
Boats	52
Life Saving Jackets	10
Rope	2
Search Lights	5
Power Generators	3
First Aid Box	10
Sucker Machine	2

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