

MHVRA

INFORMED DISASTER MANAGEMENT PLAN

2023-2032

DISTRICT GHOTKI



DEVELOPED BY
PDMA SINDH



THROUGH
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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 Ghotki 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 Ghotki 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 Ghotki is comprehensive and covers guidelines on the complete spectrum of disaster management and standard operating procedures to efficiently cope with disasters and emergencies in the district.

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

ACKNOWLEDGEMENTS

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

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

- - Disclaimer - -

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

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INTRODUCTION TO DISASTER MANAGEMENT PLAN OF DISTRICT GHOTKI

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
Representatives from Business Committee	Member
Representatives from Chamber of Agriculture	Member
Any other member as deemed appropriate (Need Basis)	Member

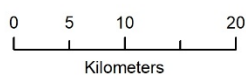
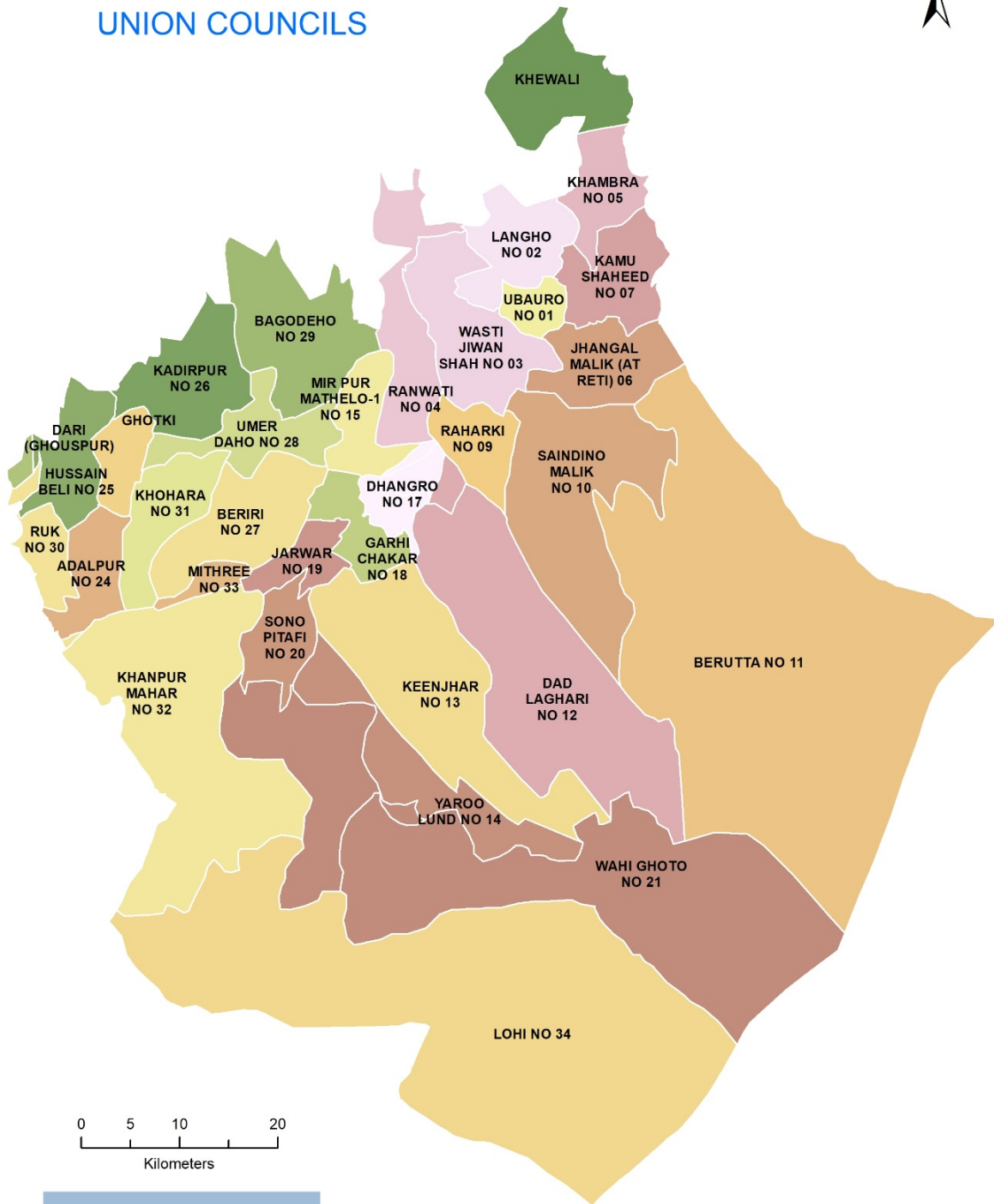
MODES OF REVIEW

Preferred modes of review of plan are;

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

DISASTER RISK PROFILE OF DISTRICT GHOTKI

GHOTKI DISTRICT UNION COUNCILS



	UC Boundary
	District Boundary

Source: Board of Revenue, GoS

District area in Sq. Km	6,357	
Coordinates	Longitude 69° 10' 12" to 70° 11' 20" East Latitude 27° 19' 35" to 28° 19' 35"North	
Surrounding Districts	District Rahim Yar Khan (Punjab) North East Sukkur In West And South West Kashmore In West And North West Rajhistan (India) In South East	
Climate Conditions	Hot and Arid	
Coldest Month	January	
Hottest Month	May	
Seasonal Temperatures	Max Mean (°C)	Min Mean (°C)
Spring (March and April)	37.25	20.72
Dry Summer (May and June)	44.42	29.47
Wet Summer (July to September)	41.33	29.23
Autumn (October to November)	34.74	19.16
Winter (December to February)	25.86	10.54
Average Rainfall	93.98 mm/year	
Physiographic Features	Pitafi Water Lake	

DEMOGRAPHY

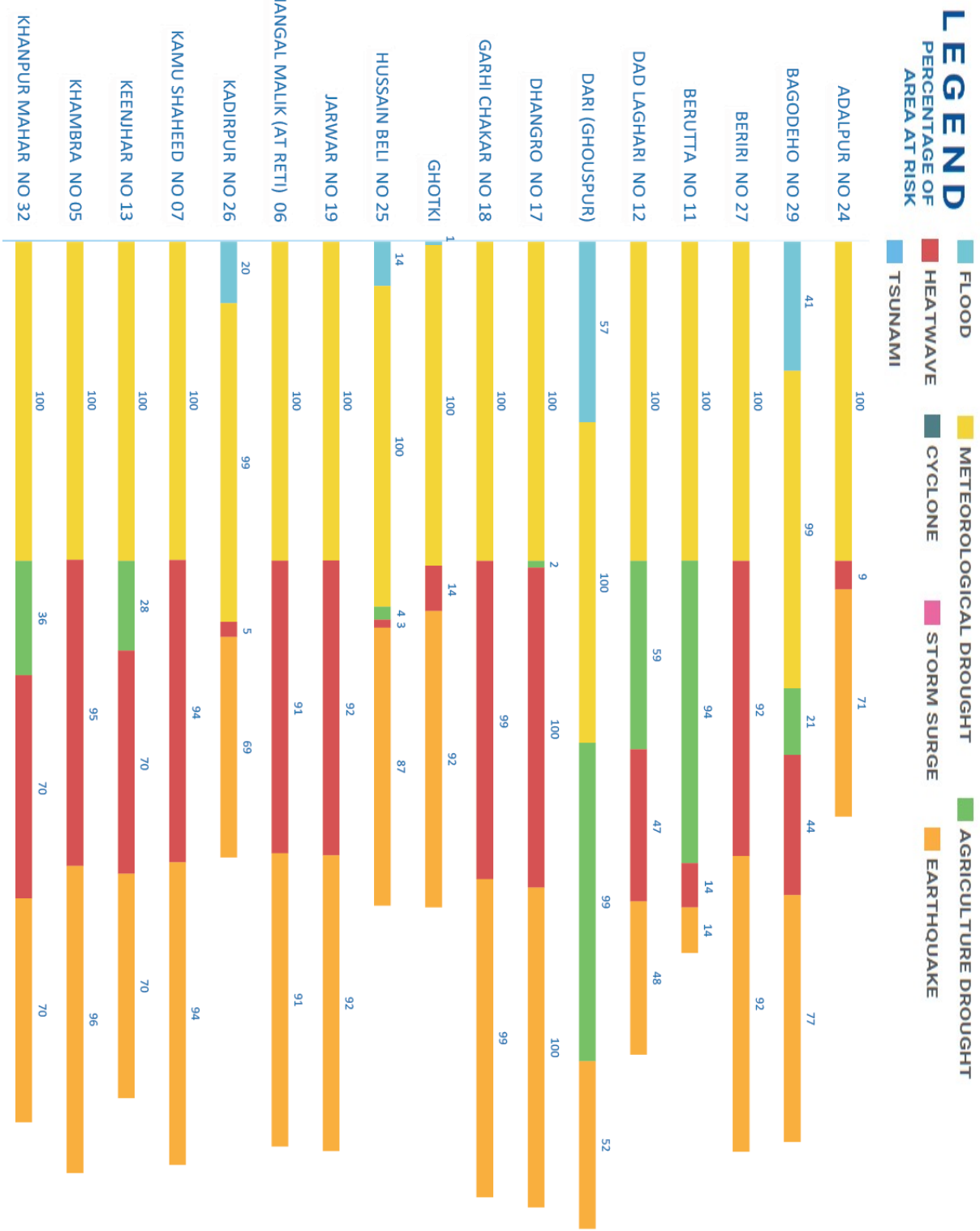
	Year-1998	Year-2017
Population	968,797	1,648,708
Urban	158,501	360,821
Rural	810,296	1,287,887
No. of Household	-	296,830
Average Annual Growth Rate 1998-2017	2.83 %	

ECONOMY

Industries	Agriculture, Food Products and Beverages, Textile, Chemical and Chemical products
Agriculture	Production in M.tons as per (2016-17)
Major Crops	
Sugarcane	3,538,507
Cotton	96,250
Wheat	376,970
Minor Crops	
Bajra	12
Rapeseed And Mustard	239
Barley	18
Sesame	50
Maize	40
Gram	177
Jowar	2,096
Tobacco	26

TALUKA NAMES	UC NAMES
<ol style="list-style-type: none"> 1. Daharki Taluka 2. Ghotki Taluka. 3. Khangarh Taluka 4. Mirpur Mathelo Taluka 5. Ubauro Taluka 	<ol style="list-style-type: none"> 1. Adalpur No 24 2. Bagodeho No 29 3. Beriri No 27 4. Berutta No 11 5. Dad Laghari No 12 6. Dari (Ghouspur) 7. Dhangro No 17 8. Garhi Chakar No 18 9. Ghotki 10. Hussain Beli No 25 11. Jarwar No 19 12. Jhangal Malik (At Reti) 06 13. Kadirpur No 26 14. Kamu Shaheed No 07 15. Keenjhar No 13 16. Khambra No 05 17. Khanpur Mahar No 32 18. Khewali 19. Khohara No 31 20. Langho No 02 21. Lohi No 34 22. Mir Pur Mathelo-1 No 15 23. Mithree No 33 24. Raharki No 09 25. Ranwati No 04 26. Ruk No 30 27. Saindino Malik No 10 28. Sono Pitafi No 20 29. Ubauro No 01 30. Umer Daho No 28 31. Wahi Ghoto No 21 32. Wasti Jiwan Shah No 03 33. Yaroo Lund No 14

GHOTKI DISTRICT MULTI-HAZARD RISK PROFILES





UC WISE RISK PROFILE

ADALPUR NO-24			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	43.579 sq km
		Forest Area	0.075 sq km
		Kachcha Area	1.734 sq km
		Pakka Planned	0.176 sq km
		Pakka Unplanned Area	0.449 sq km
		Range Land	0.189 sq km
		Education Facilities	28
		Health Facilities	2
		Industries	2
		Mobile Towers	1
		Petrol Pumps	5
		Police Stations	1
		Settlements	58
		Irrigation and Drainage Network	13.54 km
		Railway Line	5.121 km
		Road Network	76.436 km
		Population	33213
Household	6001		
Meteorological Drought	Medium - Extreme	Settlements	58
		Agriculture Area	43.79 sq km
		Forest Area	3.802 sq km
		Range Land	11.881 sq km
		Wet Area	3.129 sq km
		Population	26059
		Household	4705
Heatwave	Low - Medium	Settlements	51
		Population	25643
		Household	4632
		Agriculture Area	4.164 sq km
		Kachcha Area	1.713 sq km
		Pakka Planned Area	0.174 sq km
		Pakka Unplanned Area	0.444 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	

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

BAGODEHO - NO 29			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	124.109 sq km
		Forest Area	0.116 sq km
		Kachcha Area	2.705 sq km
		Natural Vegetation in Wet Areas	0.276 sq km
		Pakka Planned	0.366 sq km
		Pakka Unplanned Area	0.669 sq km
		Range Land	0.042 sq km
		Bridges	3
		Education Facilities	30
		Health Facilities	1
		Settlements	77
		Irrigation and Drainage Network	38.947 km
		Road Network	131.703 km
		Population	53786
Household	9710		
Meteorological Drought	Medium - Extreme	Settlements	77
		Agriculture Area	124.474 sq km
		Forest Area	3.669 sq km
		Natural Vegetation in Wet Areas	21.893 sq km
		Range Land	1.521 sq km
		Water Body	3.659 sq km
		Wet Area	3.714 sq km
		Population	42091
		Household	7604
Agricultural Drought	Low	Agriculture Area	37.261 sq km
		Natural Vegetation in Wet Areas	6.713 sq km
		Water Body	0.324 sq km
		Wet Area	0.017 sq km
		Population	13
		Household	2
Heatwave	Low - High	Settlements	76
		Population	41784
		Household	7544

		Agriculture Area	69.484 sq km
		Kachcha Area	2.697 sq km
		Pakka Planned Area	0.366 sq km
		Pakka Unplanned Area	0.669 sq km
Riverine Flood	Low - High	Agriculture Area	65.32 sq km
		Kachcha Area	1.214 sq km
		Natural Vegetation in Wet Areas	0.976 sq km
		Education Facilities	4
		Settlements	27
		Road Network	0.174 km
		Population	17467
		Household	3155
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

BERIRI NO -27			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	115.81 sq km
		Forest Area	0.009 sq km
		Kachcha Area	3.044 sq km
		Pakka Planned	0.664 sq km
		Pakka Unplanned Area	0.412 sq km
		Range Land	0.007 sq km
		Education Facilities	55
		Petrol Pumps	1
		Settlements	89
		Tourist Places	1
		Irrigation and Drainage Network	39.36 km
		Road Network	208.678 km
		Population	52445
		Household	9570
Meteorological Drought	Medium - Extreme	Settlements	89
		Agriculture Area	116.043 sq km
		Forest Area	0.189 sq km
		Range Land	0.193 sq km
		Water Body	0.913 sq km
		Wet Area	8.373 sq km
		Population	41233

		Household	7525
Heatwave	Low - High	Settlements	88
		Population	40992
		Household	7475
		Agriculture Area	115.736 sq km
		Kachcha Area	3.05 sq km
		Pakka Planned Area	0.664 sq km
		Pakka Unplanned Area	0.412 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

BERUTTA NO -11			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	147.266 sq km
		Kachcha Area	2.543 sq km
		Natural Vegetation in Wet Areas	0.039 sq km
		Pakka Planned	0.029 sq km
		Range Land	0.157 sq km
		Bridges	1
		Education Facilities	15
		Health Facilities	1
		Police Stations	1
		Settlements	110
		Irrigation and Drainage Network	70.969 km
		Railway Line	6.936 km
		Road Network	437.413 km
		Population	32466
Household	5717		
Meteorological Drought	Medium - Extreme	Settlements	109
		Agriculture Area	147.976 sq km
		Bare Area with sparse Natural Vegetation	877.316 sq km
		Natural Vegetation in Wet Areas	30.899 sq km
		Range Land	4.876 sq km

		Water Body	22.174 sq km
		Wet Area	2.366 sq km
		Population	25779
		Household	4540
Agricultural Drought	Low - Extreme	Settlements	64
		Agriculture Area	124.976 sq km
		Bare Area with sparse Natural Vegetation	1108.216 sq km
		Natural Vegetation in Wet Areas	39.418 sq km
		Range Land	6.236 sq km
		Water Body	28.317 sq km
		Wet Area	2.788 sq km
		Population	20563
		Household	3625
Heatwave	Low - High	Settlements	105
		Population	25424
		Household	4475
		Agriculture Area	147.029 sq km
		Kachcha Area	2.552 sq km
		Pakka Planned Area	0.029 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

DAD LAGHARI NO - 12			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	194.252 sq km
		Kachcha Area	3.745 sq km
		Natural Vegetation in Wet Areas	0.026 sq km
		Pakka Planned	0.8 sq km
		Pakka Unplanned Area	0.144 sq km
		Education Facilities	125
		Health Facilities	6
		Police Stations	1
		Post Offices	1
		Settlements	114
		Irrigation and Drainage Network	60.321 km

		Road Network	363.224 km
		Population	59107
		Household	10701
Meteorological Drought	Medium - Extreme	Settlements	114
		Agriculture Area	194.814 sq km
		Bare Area with sparse Natural Vegetation	213.285 sq km
		Natural Vegetation in Wet Areas	1.425 sq km
		Water Body	2.421 sq km
		Wet Area	2.256 sq km
		Population	46464
		Household	8408
Agricultural Drought	Low - Extreme	Settlements	7
		Agriculture Area	50.118 sq km
		Bare Area with sparse Natural Vegetation	254.769 sq km
		Natural Vegetation in Wet Areas	1.819 sq km
		Water Body	3.086 sq km
		Wet Area	2.098 sq km
		Population	6552
		Household	1166
Heatwave	Low - High	Settlements	111
		Population	46244
		Household	8372
		Agriculture Area	194.044 sq km
		Kachcha Area	3.752 sq km
		Pakka Planned Area	0.8 sq km
		Pakka Unplanned Area	0.144 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

DARI (GHOUSPUR)			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	q km
		Natural Vegetation in Wet Areas	q km

Meteorological Drought	Medium - Extreme	Agriculture Area	4.026 sq km
		Natural Vegetation in Wet Areas	3.624 sq km
Agricultural Drought	Low - Medium	Agriculture Area	5.159 sq km
		Natural Vegetation in Wet Areas	4.644 sq km
Riverine Flood	Low - Extreme	Agriculture Area	3.994 sq km
		Natural Vegetation in Wet Areas	0.376 sq km
Heatwave	Nil	The UC falls out of vulnerable zone for Agricultural Heatwave	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

DHANGRO NO - 17			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	48.056 sq km
		Kachcha Area	1.089 sq km
		Pakka Planned	0.609 sq km
		Pakka Unplanned Area	0.319 sq km
		Education Facilities	23
		Industries	1
		Settlements	37
		Irrigation and Drainage Network	22.042 km
		Railway Line	3.453 km
		Road Network	58.482 km
		Population	24112
Household	4590		
Meteorological Drought	Medium - Extreme	Settlements	37
		Agriculture Area	48.069 sq km
		Water Body	0.039 sq km
		Population	18889
		Household	3600
Agricultural Drought	Low	Agriculture Area	1.325 sq km
		Population	213
		Household	41

Heatwave	Low - High	Settlements	37
		Population	18840
		Household	3589
		Agriculture Area	48.05 sq km
		Kachcha Area	1.092 sq km
		Pakka Planned Area	0.61 sq km
		Pakka Unplanned Area	0.319 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

GARHI CHAKAR NO - 18			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	54.635 sq km
		Kachcha Area	1.343 sq km
		Pakka Planned	0.246 sq km
		Pakka Unplanned Area	0.272 sq km
		Education Facilities	48
		Health Facilities	2
		Settlements	41
		Irrigation and Drainage Network	26.381 km
		Road Network	118.006 km
		Population	22900
		Household	4365
Meteorological Drought	Medium - Extreme	Settlements	41
		Agriculture Area	54.656 sq km
		Wet Area	0.283 sq km
		Population	17951
		Household	3418
Heatwave	Low - High	Settlements	41
		Population	17908
		Household	3412
		Agriculture Area	54.627 sq km
		Kachcha Area	1.345 sq km
		Pakka Planned Area	0.247 sq km
		Pakka Unplanned Area	0.272 sq km

Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami

GHOTKI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	36.29 sq km
		Forest Area	0.001 sq km
		Kachcha Area	1.302 sq km
		Natural Vegetation in Wet Areas	0 sq km
		Pakka Planned	1.279 sq km
		Pakka Unplanned Area	1.45 sq km
		Bridges	3
		Bus Stops	1
		Education Facilities	25
		Grain Mandi	1
		Industries	5
		Mobile Towers	6
		Petrol Pumps	11
		Settlements	60
		Tourist Places	2
		Irrigation and Drainage Network	26.34 km
		Railway Line	2.691 km
Road Network	114.776 km		
Population	59757		
Household	10841		
Meteorological Drought	Medium - Extreme	Settlements	60
		Agriculture Area	36.409 sq km
		Forest Area	0.052 sq km
		Natural Vegetation in Wet Areas	0.04 sq km
		Water Body	0.249 sq km
		Wet Area	2.608 sq km
		Population	46805
Household	8493		
Heatwave	Low - Medium	Settlements	53
		Population	46357

		Household	8413
		Agriculture Area	1.221 sq km
		Kachcha Area	1.283 sq km
		Pakka Planned Area	1.275 sq km
		Pakka Unplanned Area	1.449 sq km
Riverine Flood	Low - High	Agriculture Area	0.636 sq km
		Kachcha Area	0.014 sq km
		Settlements	1
		Road Network	0.375 km
		Population	206
		Household	37
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

HUSSAIN BELI NO - 25			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	66.036 sq km
		Kachcha Area	1.559 sq km
		Natural Vegetation in Wet Areas	0.048 sq km
		Pakka Planned	0.04 sq km
		Pakka Unplanned Area	0.21 sq km
		Bridges	2
		Education Facilities	18
		Petrol Pumps	1
		Police Stations	1
		Settlements	60
		Irrigation and Drainage Network	26.511 km
		Road Network	163.051 km
		Population	26003
Household	4697		
Meteorological Drought	Medium - Extreme	Settlements	60
		Agriculture Area	66.147 sq km
		Natural Vegetation in Wet Areas	1.881 sq km
		Water Body	0.371 sq km
		Population	20400
		Household	3682

Agricultural Drought	Low - Medium	Agriculture Area	4.075 sq km
		Natural Vegetation in Wet Areas	0.002 sq km
Heatwave	Low - Medium	Settlements	53
		Population	20020
		Household	3616
		Agriculture Area	0.684 sq km
		Kachcha Area	1.539 sq km
		Pakka Planned Area	0.039 sq km
		Pakka Unplanned Area	0.207 sq km
Riverine Flood	Low - Extreme	Agriculture Area	10.755 sq km
		Kachcha Area	0.198 sq km
		Natural Vegetation in Wet Areas	0.108 sq km
		Settlements	7
		Irrigation and Drainage Network	1.767 km
		Road Network	1.06 km
		Population	2841
		Household	513
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

JARWAR NO - 19			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	39.644 sq km
		Kachcha Area	1.145 sq km
		Pakka Planned	0.331 sq km
		Pakka Unplanned Area	0.077 sq km
		Education Facilities	30
		Settlements	34
		Irrigation and Drainage Network	17.947 km
		Road Network	61.071 km
		Population	18768
		Household	3560
Meteorological Drought	Medium - Extreme	Settlements	34
		Agriculture Area	39.714 sq km
		Water Body	0.352 sq km
		Wet Area	2.698 sq km

		Population	14752
		Household	2799
Heatwave	Low - High	Settlements	33
		Population	14681
		Household	2785
		Agriculture Area	39.621 sq km
		Kachcha Area	1.146 sq km
		Pakka Planned Area	0.332 sq km
		Pakka Unplanned Area	0.077 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

JHANGAL MALIK (AT RETI) NO - 6			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	86.785 sq km
		Kachcha Area	1.568 sq km
		Natural Vegetation in Wet Areas	0.003 sq km
		Pakka Planned	0.022 sq km
		Pakka Unplanned Area	1.541 sq km
		Range Land	0.03 sq km
		Bridges	1
		Education Facilities	37
		Health Facilities	3
		Mobile Towers	2
		Petrol Pumps	1
		Police Stations	1
		Settlements	103
		Irrigation and Drainage Network	41.963 km
		Road Network	182.47 km
		Population	44970
Household	7789		
Meteorological Drought	Medium - Extreme	Settlements	103
		Agriculture Area	86.959 sq km
		Bare Area with sparse Natural	0.611 sq km

		Vegetation	
		Natural Vegetation in Wet Areas	0.025 sq km
		Range Land	0.153 sq km
		Water Body	4.658 sq km
		Wet Area	2.623 sq km
		Population	35253
		Household	6103
Heatwave	Low - High	Settlements	100
		Population	35024
		Household	6063
		Agriculture Area	86.705 sq km
		Kachcha Area	1.567 sq km
		Pakka Planned Area	0.022 sq km
		Pakka Unplanned Area	1.542 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KADIRPUR NO - 26			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	76.729 sq km
		Forest Area	0.027 sq km
		Kachcha Area	1.257 sq km
		Natural Vegetation in Wet Areas	0.073 sq km
		Pakka Planned	1.835 sq km
		Pakka Unplanned Area	1.948 sq km
		Range Land	0.006 sq km
		Bridges	3
		Education Facilities	16
		Health Facilities	2
		Power Plant	1
		Settlements	90
		Irrigation and Drainage Network	37.612 km
		Road Network	111.047 km
		Population	47157
Household	8523		

Meteorological Drought	Medium - Extreme	Settlements	90
		Agriculture Area	77.024 sq km
		Forest Area	3.646 sq km
		Natural Vegetation in Wet Areas	5.557 sq km
		Range Land	0.558 sq km
		Water Body	8.245 sq km
		Wet Area	1.994 sq km
		Population	37052
		Household	6693
Agricultural Drought	Low - Medium	Agriculture Area	0.488 sq km
		Natural Vegetation in Wet Areas	0.512 sq km
		Population	121
		Household	22
Heatwave	Low - Medium	Settlements	78
		Population	36298
		Household	6557
		Agriculture Area	0.975 sq km
		Kachcha Area	1.24 sq km
		Pakka Planned Area	1.832 sq km
		Pakka Unplanned Area	1.926 sq km
Riverine Flood	Low - Extreme	Agriculture Area	21.851 sq km
		Forest Area	0 sq km
		Kachcha Area	0.546 sq km
		Natural Vegetation in Wet Areas	0.744 sq km
		Pakka Planned Area	0.007 sq km
		Pakka Unplanned Area	0.037 sq km
		Education Facilities	3
		Settlements	14
		Irrigation and Drainage Network	5.228 km
		Road Network	21.95 km
		Population	8493
		Household	1534
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KAMU SHAHEED NO - 07			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	82.782 sq km
		Forest Area	0.004 sq km
		Kachcha Area	2.434 sq km
		Natural Vegetation in Wet Areas	0.006 sq km
		Pakka Planned	0.95 sq km
		Pakka Unplanned Area	0.781 sq km
		Range Land	0.012 sq km
		Bridges	6
		Bus Stops	3
		Education Facilities	44
		Grid Stations	1
		Health Facilities	1
		Industries	2
		Petrol Pumps	5
		Settlements	159
		Irrigation and Drainage Network	38.183 km
		Road Network	255.57 km
		Population	65888
Household	11352		
Meteorological Drought	Medium - Extreme	Settlements	159
		Agriculture Area	82.807 sq km
		Forest Area	0.027 sq km
		Natural Vegetation in Wet Areas	0.102 sq km
		Range Land	0.102 sq km
		Water Body	0.784 sq km
		Wet Area	3.745 sq km
		Population	51569
Household	8885		
Heatwave	Low - High	Settlements	158
		Population	51230
		Household	8828
		Agriculture Area	82.68 sq km
		Kachcha Area	2.433 sq km
		Pakka Planned Area	0.95 sq km
		Pakka Unplanned Area	0.781 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	

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

KEENJHAR NO - 13			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	199.377 sq km
		Kachcha Area	3.579 sq km
		Pakka Planned	0.959 sq km
		Education Facilities	70
		Health Facilities	3
		Police Stations	1
		Settlements	85
		Irrigation and Drainage Network	103.58 km
		Road Network	399.847 km
		Population	56090
		Household	10580
Meteorological Drought	Medium - Extreme	Settlements	85
		Agriculture Area	199.768 sq km
		Bare Area with sparse Natural Vegetation	83.969 sq km
		Water Body	1.4 sq km
		Wet Area	2.817 sq km
		Population	44152
		Household	8329
Agricultural Drought	Low - Extreme	Settlements	2
		Agriculture Area	16.327 sq km
		Bare Area with sparse Natural Vegetation	84.629 sq km
		Water Body	1.688 sq km
		Wet Area	1.306 sq km
		Population	1494
		Household	284
Heatwave	Low - Medium	Settlements	77
		Population	43951
		Household	8293
		Agriculture Area	199.244 sq km
		Kachcha Area	3.586 sq km
		Pakka Planned Area	0.959 sq km

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

KHAMBRA NO - 05			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	61.67 sq km
		Kachcha Area	1.297 sq km
		Natural Vegetation in Wet Areas	0.005 sq km
		Pakka Planned	1.478 sq km
		Pakka Unplanned Area	0.349 sq km
		Range Land	0.004 sq km
		Bridges	1
		Education Facilities	37
		Industries	1
		Petrol Pumps	1
		Settlements	101
		Irrigation and Drainage Network	68.749 km
		Road Network	266.278 km
		Population	49412
Household	8519		
Meteorological Drought	Medium - Extreme	Settlements	101
		Agriculture Area	61.632 sq km
		Natural Vegetation in Wet Areas	0.098 sq km
		Range Land	0.054 sq km
		Water Body	0.958 sq km
		Wet Area	1.509 sq km
		Population	38452
Household	6623		
Agricultural Drought	Low	Agriculture Area	0.519 sq km
		Wet Area	0.001 sq km
Heatwave	Low - High	Settlements	101
		Population	38390
		Household	6612
		Agriculture Area	61.616 sq km
		Kachcha Area	1.298 sq km

		Pakka Planned Area	1.479 sq km
		Pakka Unplanned Area	0.35 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KHANPUR MAHAR NO - 32

Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	274.442 sq km
		Forest Area	0.005 sq km
		Kachcha Area	6.341 sq km
		Pakka Planned	1.033 sq km
		Pakka Unplanned Area	0.682 sq km
		Range Land	0.066 sq km
		Education Facilities	86
		Health Facilities	6
		Mobile Towers	3
		Petrol Pumps	7
		Police Stations	1
		Settlements	152
		Tourist Places	1
		Irrigation and Drainage Network	88.51 km
		Road Network	460.378 km
Population	113007		
Household	21043		
Meteorological Drought	Medium - Extreme	Settlements	152
		Agriculture Area	275.612 sq km
		Bare Area with sparse Natural Vegetation	94.494 sq km
		Forest Area	0.232 sq km
		Range Land	2.607 sq km
		Water Body	1.49 sq km
		Wet Area	23.598 sq km
		Population	88981
Household	16567		
Agricultural Drought	Low - Extreme	Agriculture Area	73.001 sq km
		Bare Area with sparse Natural	103.991 sq km

		Vegetation	
		Range Land	1.619 sq km
		Water Body	0.476 sq km
		Wet Area	4.801 sq km
		Population	4668
		Household	863
Heatwave	Low - High	Settlements	146
		Population	88539
		Household	16492
		Agriculture Area	273.613 sq km
		Kachcha Area	6.346 sq km
		Pakka Planned Area	1.035 sq km
		Pakka Unplanned Area	0.684 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KHEWALI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	98.602 sq km
		Kachcha Area	1.139 sq km
		Natural Vegetation in Wet Areas	0.356 sq km
		Pakka Planned	0.842 sq km
		Pakka Unplanned Area	0.278 sq km
		Bridges	4
		Education Facilities	32
		Grid Stations	1
		Petrol Pumps	2
		Settlements	75
		Irrigation and Drainage Network	44.992 km
		Road Network	246.079 km
		Population	34940
Household	6022		
Meteorological Drought	Medium - Extreme	Settlements	75
		Agriculture Area	98.638 sq km
		Natural Vegetation in Wet Areas	11.987 sq km
		Water Body	3.45 sq km

		Wet Area	0.496 sq km
		Population	27286
		Household	4702
Agricultural Drought	Low - Extreme	Agriculture Area	9.215 sq km
		Natural Vegetation in Wet Areas	5.115 sq km
		Water Body	0.093 sq km
		Population	0
		Household	0
Heatwave	Low - High	Settlements	75
		Population	27138
		Household	4679
		Agriculture Area	98.484 sq km
		Kachcha Area	1.141 sq km
		Pakka Planned Area	0.843 sq km
		Pakka Unplanned Area	0.278 sq km
Riverine Flood	Low - Extreme	Agriculture Area	57.604 sq km
		Kachcha Area	0.822 sq km
		Natural Vegetation in Wet Areas	0.323 sq km
		Education Facilities	18
		Settlements	44
		Irrigation and Drainage Network	0.146 km
		Road Network	82.98 km
		Population	12451
		Household	2148
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

KHOHARA NO - 31			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	68.141 sq km
		Forest Area	0.004 sq km
		Kachcha Area	2.518 sq km
		Pakka Planned	1.307 sq km
		Pakka Unplanned Area	3.649 sq km
		Range Land	0.02 sq km
		Ambulance Services	1
		Bridges	6

		Bus Stops	1
		Education Facilities	104
		Grain Mandi	1
		Health Facilities	11
		Industries	2
		Mobile Towers	15
		Petrol Pumps	18
		Police Stations	2
		Post Offices	3
		Settlements	93
		Tourist Places	1
		Irrigation and Drainage Network	20.002 km
		Railway Line	7.701 km
		Road Network	137.16 km
		Population	138322
		Household	25225
Meteorological Drought	Medium - Extreme	Settlements	93
		Agriculture Area	68.318 sq km
		Forest Area	0.101 sq km
		Range Land	1.827 sq km
		Water Body	0.675 sq km
		Wet Area	6.789 sq km
		Population	108240
		Household	19738
Heatwave	Low - High	Settlements	86
		Population	107546
		Household	19611
		Agriculture Area	31.969 sq km
		Kachcha Area	2.5 sq km
		Pakka Planned Area	1.301 sq km
		Pakka Unplanned Area	3.638 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

LANGHO NO - 2			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	78.208 sq km
		Forest Area	0.002 sq km
		Kachcha Area	1.632 sq km
		Natural Vegetation in Wet Areas	0.02 sq km
		Pakka Planned	0.06 sq km
		Pakka Unplanned Area	0.029 sq km
		Range Land	0.011 sq km
		Bridges	4
		Education Facilities	28
		Settlements	96
		Irrigation and Drainage Network	48.675 km
		Road Network	154.601 km
		Population	25729
		Household	4440
Meteorological Drought	Medium - Extreme	Settlements	95
		Agriculture Area	78.216 sq km
		Forest Area	0.045 sq km
		Natural Vegetation in Wet Areas	0.787 sq km
		Range Land	0.333 sq km
		Water Body	2.687 sq km
		Wet Area	7.114 sq km
		Population	20143
		Household	3472
Agricultural Drought	Low	Settlements	2
		Agriculture Area	6.603 sq km
		Natural Vegetation in Wet Areas	0.098 sq km
		Population	24
		Household	4
Heatwave	Low - High	Settlements	95
		Population	20044
		Household	3461
		Agriculture Area	78.13 sq km
		Kachcha Area	1.637 sq km
		Pakka Planned Area	0.06 sq km
		Pakka Unplanned Area	0.029 sq km
Riverine Flood	Low - Extreme	Agriculture Area	8.029 sq km
		Kachcha Area	0.137 sq km
		Natural Vegetation in Wet Areas	0.023 sq km

		Education Facilities	1
		Settlements	9
		Road Network	7.345 km
		Population	2172
		Household	373
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

LOHI NO - 34			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	48.603 sq km
		Kachcha Area	0.016 sq km
		Pakka Planned	0.005 sq km
		Range Land	0.285 sq km
		Education Facilities	2
		Settlements	3
		Irrigation and Drainage Network	55.462 km
		Road Network	332.643 km
		Population	229
		Household	42
Meteorological Drought	Medium - Extreme	Settlements	3
		Agriculture Area	49.571 sq km
		Bare Area with sparse Natural Vegetation	972.585 sq km
		Range Land	7.645 sq km
		Water Body	6.907 sq km
		Wet Area	2.122 sq km
		Population	184
		Household	34
Agricultural Drought	Low - Extreme	Settlements	3
		Agriculture Area	63.052 sq km
		Bare Area with sparse Natural Vegetation	1232.403 sq km
		Range Land	9.727 sq km
		Water Body	8.778 sq km
		Wet Area	2.301 sq km
		Population	184
		Household	34

Heatwave	Low - Medium	Settlements	3
		Population	181
		Household	34
		Agriculture Area	48.269 sq km
		Kachcha Area	0.016 sq km
		Pakka Planned Area	0.005 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

MIRPUR MATHELO – 01 NO -15			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	50.692 sq km
		Forest Area	0.103 sq km
		Kachcha Area	0.509 sq km
		Pakka Planned	1.449 sq km
		Pakka Unplanned Area	2.945 sq km
		Range Land	0.002 sq km
		Ambulance Services	1
		Bridges	5
		Bus Stops	1
		Education Facilities	48
		Grain Mandi	1
		Grid Stations	1
		Health Facilities	13
		Industries	3
		Mobile Towers	7
		Petrol Pumps	9
		Police Stations	2
		Post Offices	2
		Settlements	41
		Tourist Places	2
Irrigation and Drainage Network	26.079 km		
Railway Line	7.814 km		
Road Network	64.784 km		
Population	125938		
Household	24168		

Meteorological Drought	Medium - Extreme	Settlements	41
		Agriculture Area	50.789 sq km
		Forest Area	2.895 sq km
		Range Land	0.075 sq km
		Water Body	0.046 sq km
		Wet Area	0.689 sq km
		Population	98425
		Household	18886
Heatwave	Low - High	Settlements	41
		Population	98297
		Household	18861
		Agriculture Area	50.654 sq km
		Kachcha Area	0.51 sq km
		Pakka Planned Area	1.449 sq km
		Pakka Unplanned Area	2.947 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

MITHRE NO - 33			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	16.111 sq km
		Kachcha Area	0.398 sq km
		Education Facilities	6
		Settlements	12
		Irrigation and Drainage Network	14.852 km
		Road Network	40.606 km
		Population	4289
		Household	795
Meteorological Drought	Medium - Extreme	Settlements	12
		Agriculture Area	16.159 sq km
		Water Body	0.057 sq km
		Wet Area	2.87 sq km
		Population	3378
		Household	625

Heatwave	Low - Medium	Settlements	12
		Population	3360
		Household	623
		Agriculture Area	16.1 sq km
		Kachcha Area	0.399 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

RAHARKI NO - 09			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	49.428 sq km
		Kachcha Area	1.042 sq km
		Pakka Planned	4.566 sq km
		Pakka Unplanned Area	3.223 sq km
		Ambulance Services	1
		Bridges	2
		Bus Stops	2
		Education Facilities	50
		Health Facilities	6
		Industries	5
		Mobile Towers	8
		Petrol Pumps	9
		Post Offices	3
		Power Plant	2
		Settlements	73
		Irrigation and Drainage Network	23.896 km
		Railway Line	8.479 km
		Road Network	121.17 km
		Population	114148
Household	19976		
Meteorological Drought	Medium - Extreme	Settlements	73
		Agriculture Area	49.512 sq km
		Water Body	1.691 sq km
		Wet Area	0.164 sq km

		Population	89194
		Household	15609
Agricultural Drought	Low	Agriculture Area	0 sq km
		Water Body	0.009 sq km
		Population	25
		Household	5
Heatwave	Low - High	Settlements	73
		Population	89052
		Household	15585
		Agriculture Area	49.382 sq km
		Kachcha Area	1.044 sq km
		Pakka Planned Area	4.57 sq km
		Pakka Unplanned Area	3.225 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

RANWATI NO - 04			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	102.088 sq km
		Forest Area	0.001 sq km
		Kachcha Area	2.098 sq km
		Natural Vegetation in Wet Areas	0.166 sq km
		Pakka Planned	0.201 sq km
		Pakka Unplanned Area	0.655 sq km
		Range Land	0.008 sq km
		Education Facilities	48
		Health Facilities	3
		Industries	1
		Mobile Towers	1
		Petrol Pumps	2
		Police Stations	1
		Settlements	76
		Irrigation and Drainage Network	44.432 km
		Road Network	140.102 km
Population	43397		
Household	7674		

Meteorological Drought	Medium - Extreme	Settlements	76
		Agriculture Area	102.113 sq km
		Forest Area	0.049 sq km
		Natural Vegetation in Wet Areas	4.93 sq km
		Range Land	0.258 sq km
		Water Body	3.445 sq km
		Wet Area	0.786 sq km
		Population	33944
		Household	6003
Agricultural Drought	Low - Medium	Settlements	2
		Agriculture Area	44.861 sq km
		Natural Vegetation in Wet Areas	6.069 sq km
		Wet Area	0.002 sq km
		Population	215
		Household	37
Heatwave	Low - High	Settlements	76
		Population	33840
		Household	5981
		Agriculture Area	98.357 sq km
		Kachcha Area	2.1 sq km
		Pakka Planned Area	0.201 sq km
		Pakka Unplanned Area	0.657 sq km
Riverine Flood	Low - High	Agriculture Area	35.277 sq km
		Kachcha Area	0.165 sq km
		Natural Vegetation in Wet Areas	0.572 sq km
		Settlements	5
		Irrigation and Drainage Network	1.123 km
		Road Network	3.372 km
		Population	2611
		Household	450
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

RUK NO - 30			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	41.262 sq km

		Forest Area	0.059 sq km
		Kachcha Area	1.2 sq km
		Natural Vegetation in Wet Areas	0.038 sq km
		Pakka Unplanned Area	0.616 sq km
		Range Land	0.08 sq km
		Bridges	8
		Education Facilities	24
		Industries	1
		Mobile Towers	5
		Petrol Pumps	5
		Settlements	50
		Irrigation and Drainage Network	21.212 km
		Railway Line	4.726 km
		Road Network	92.092 km
		Population	26118
		Household	4718
Meteorological Drought	Medium - Extreme	Settlements	50
		Agriculture Area	41.384 sq km
		Forest Area	1.784 sq km
		Natural Vegetation in Wet Areas	0.629 sq km
		Range Land	2.657 sq km
		Water Body	0.029 sq km
		Wet Area	1.203 sq km
		Population	20502
		Household	3700
Agricultural Drought	Low - Medium	Settlements	1
		Agriculture Area	5.766 sq km
		Natural Vegetation in Wet Areas	0.765 sq km
Heatwave	Low - Medium	Settlements	46
		Population	20136
		Household	3637
		Agriculture Area	1.154 sq km
		Kachcha Area	1.18 sq km
		Pakka Unplanned Area	0.612 sq km
Riverine Flood	Low - High	Agriculture Area	4.846 sq km
		Kachcha Area	0.006 sq km
		Natural Vegetation in Wet Areas	0.266 sq km
		Settlements	1
		Irrigation and Drainage Network	0.137 km
		Road Network	0.441 km

		Population	82
		Household	15
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

SAINDINO MALIK NO - 10			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	224.023 sq km
		Forest Area	0.006 sq km
		Kachcha Area	3.905 sq km
		Natural Vegetation in Wet Areas	0.001 sq km
		Pakka Planned	1.675 sq km
		Pakka Unplanned Area	2.102 sq km
		Range Land	0.046 sq km
		Education Facilities	91
		Grain Mandi	2
		Health Facilities	10
		Mobile Towers	6
		Petrol Pumps	7
		Police Stations	1
		Settlements	176
		Tourist Places	2
		Irrigation and Drainage Network	49.875 km
		Railway Line	12.185 km
		Road Network	424.902 km
Population	108701		
Household	18975		
Meteorological Drought	Medium - Extreme	Settlements	175
		Agriculture Area	224.56 sq km
		Bare Area with sparse Natural Vegetation	39.997 sq km
		Forest Area	0.006 sq km
		Natural Vegetation in Wet Areas	0.031 sq km
		Range Land	0.511 sq km
		Water Body	0.468 sq km
		Wet Area	2.529 sq km
		Population	85119
Household	14852		

Agricultural Drought	Low - Extreme	Settlements	49
		Agriculture Area	88.655 sq km
		Bare Area with sparse Natural Vegetation	40.279 sq km
		Forest Area	0.007 sq km
		Range Land	0.627 sq km
		Water Body	0.344 sq km
		Wet Area	0.425 sq km
		Population	22540
		Household	3963
Heatwave	Low - High	Settlements	164
		Population	84913
		Household	14816
		Agriculture Area	223.829 sq km
		Kachcha Area	3.915 sq km
		Pakka Planned Area	1.675 sq km
		Pakka Unplanned Area	2.101 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

SONO PITAFI NO - 20			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	58.07 sq km
		Kachcha Area	1.593 sq km
		Pakka Planned	1.041 sq km
		Pakka Unplanned Area	0.126 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	36
		Grid Stations	1
		Health Facilities	1
		Mobile Towers	2
		Petrol Pumps	3
		Police Stations	1
		Post Offices	1
		Settlements	48
Irrigation and Drainage Network	27.518 km		

		Road Network	83.809 km
		Population	32136
		Household	6057
Meteorological Drought	Medium - Extreme	Settlements	48
		Agriculture Area	58.124 sq km
		Water Body	0.222 sq km
		Wet Area	1.087 sq km
		Population	25274
		Household	4760
Agricultural Drought	Low	Agriculture Area	0.072 sq km
		Population	889
		Household	169
Heatwave	Low - High	Settlements	47
		Population	25149
		Household	4738
		Agriculture Area	58.048 sq km
		Kachcha Area	1.593 sq km
		Pakka Planned Area	1.041 sq km
		Pakka Unplanned Area	0.126 sq km
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

UBUARO NO - 01			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	22.482 sq km
		Forest Area	0.002 sq km
		Kachcha Area	0.59 sq km
		Pakka Planned	0.36 sq km
		Pakka Unplanned Area	1.779 sq km
		Bridges	2
		Bus Stops	1
		Education Facilities	39
		Health Facilities	5
		Mobile Towers	5
		Petrol Pumps	10

		Police Stations	1
		Post Offices	1
		Settlements	24
		Irrigation and Drainage Network	11.549 km
		Road Network	70.597 km
		Population	61800
		Household	10195
Meteorological Drought	Medium - Extreme	Settlements	24
		Agriculture Area	22.561 sq km
		Forest Area	0.06 sq km
		Water Body	0.771 sq km
		Wet Area	3.192 sq km
		Population	48214
		Household	7953
Heatwave	High	Settlements	24
		Population	48097
		Household	7935
		Agriculture Area	22.452 sq km
		Kachcha Area	0.591 sq km
		Pakka Planned Area	0.36 sq km
		Pakka Unplanned Area	1.779 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

UMER DAHO NO - 28			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	70.764 sq km
		Forest Area	0.096 sq km
		Kachcha Area	2.066 sq km
		Pakka Planned	1.06 sq km
		Pakka Unplanned Area	1.851 sq km
		Range Land	0.495 sq km
		Bridges	11
		Education Facilities	51

		Grain Mandi	1
		Grid Stations	1
		Health Facilities	8
		Industries	3
		Mobile Towers	11
		Petrol Pumps	7
		Police Stations	1
		Post Offices	2
		Power Plant	1
		Settlements	80
		Irrigation and Drainage Network	31.243 km
		Railway Line	14.56 km
		Road Network	163.086 km
		Population	75256
		Household	13630
Meteorological Drought	Medium - Extreme	Settlements	80
		Agriculture Area	70.914 sq km
		Forest Area	3.135 sq km
		Range Land	4.049 sq km
		Water Body	0.529 sq km
		Wet Area	2.051 sq km
		Population	58998
		Household	10686
Heatwave	High	Settlements	77
		Population	58455
		Household	10585
		Agriculture Area	47.899 sq km
		Kachcha Area	2.054 sq km
		Pakka Planned Area	1.056 sq km
		Pakka Unplanned Area	1.849 sq km
Riverine Flood	Low	Agriculture Area	0.009 sq km
Agricultural Drought	Nil	The UC falls out of vulnerable zone for Agricultural Drought	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

WAHI GHOTO NO - 21			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	173.795 sq km
		Kachcha Area	1.974 sq km
		Pakka Planned	0.384 sq km
		Range Land	0.077 sq km
		Education Facilities	38
		Health Facilities	1
		Settlements	71
		Irrigation and Drainage Network	77.742 km
		Road Network	375.462 km
		Population	28078
		Household	5311
Meteorological Drought	Medium - Extreme	Settlements	71
		Agriculture Area	174.831 sq km
		Bare Area with sparse Natural Vegetation	570.746 sq km
		Range Land	2.595 sq km
		Water Body	6.226 sq km
		Wet Area	1.764 sq km
		Population	22219
		Household	4207
Agricultural Drought	Low - Extreme	Settlements	14
		Agriculture Area	82.293 sq km
		Bare Area with sparse Natural Vegetation	712.497 sq km
		Range Land	3.284 sq km
		Water Body	7.929 sq km
		Wet Area	0.442 sq km
		Population	10483
		Household	1976
Heatwave	Low - Medium	Settlements	65
		Population	22059
		Household	4171
		Agriculture Area	173.452 sq km
		Kachcha Area	1.976 sq km
		Pakka Planned Area	0.386 sq km
Riverine Flood	Low	Agriculture Area	0.009 sq km
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

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

WASTI JIWAN SHAH NO - 03			
Hazard Type	Risk	Elements at Risk	
Earthquake		Agriculture Area	121.605 sq km
		Forest Area	0.005 sq km
		Kachcha Area	2.331 sq km
		Natural Vegetation in Wet Areas	0.077 sq km
		Pakka Planned	0.886 sq km
		Pakka Unplanned Area	0.366 sq km
		Range Land	0.049 sq km
		Bridges	4
		Education Facilities	50
		Health Facilities	2
		Industries	1
		Mobile Towers	3
		Police Stations	1
		Settlements	109
		Tourist Places	1
		Irrigation and Drainage Network	56.154 km
		Road Network	189.417 km
Population	53874		
Household	9323		
Meteorological Drought	Medium - Extreme	Settlements	108
		Agriculture Area	121.966 sq km
		Bare Area with sparse Natural Vegetation	1.369 sq km
		Forest Area	0.162 sq km
		Natural Vegetation in Wet Areas	2.569 sq km
		Range Land	0.619 sq km
		Water Body	3.992 sq km
		Wet Area	5.893 sq km
		Population	42273
		Household	7314
Agricultural Drought	Low - Medium	Settlements	1
		Agriculture Area	18.326 sq km
		Bare Area with sparse Natural Vegetation	0.001 sq km
		Forest Area	0.092 sq km
		Natural Vegetation in Wet Areas	2.583 sq km

		Range Land	0.073 sq km
		Wet Area	0.001 sq km
		Population	320
		Household	57
Heatwave	Low - High	Settlements	108
		Population	42012
		Household	7267
		Agriculture Area	121.479 sq km
		Kachcha Area	2.336 sq km
		Pakka Planned Area	0.886 sq km
		Pakka Unplanned Area	0.367 sq km
Riverine Flood	Low - High	Agriculture Area	16.022 sq km
		Forest Area	0.005 sq km
		Kachcha Area	0.02 sq km
		Natural Vegetation in Wet Areas	0.572 sq km
		Settlements	1
		Irrigation and Drainage Network	1.626 km
		Road Network	5.34 km
		Population	322
		Household	55
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

YARO LUND NO - 14			
Hazard Type	Risk	Elements at Risk	
Earthquake			68.337 sq km
		Kachcha Area	0.439 sq km
		Range Land	0.01 sq km
		Education Facilities	11
		Health Facilities	1
		Settlements	9
		Irrigation and Drainage Network	31.701 km
		Road Network	89.65 km
		Population	5406
		Household	1030
Meteorological	Medium - Extreme	Settlements	9
		Agriculture Area	68.659 sq km

Drought		Bare Area with sparse Natural Vegetation	62.695 sq km
		Range Land	0.391 sq km
		Water Body	1.243 sq km
		Wet Area	0.312 sq km
		Population	4261
		Household	811
Agricultural Drought	Low - Extreme	Settlements	1
		Agriculture Area	18.179 sq km
		Bare Area with sparse Natural Vegetation	70.341 sq km
		Range Land	0.075 sq km
		Water Body	1.584 sq km
		Wet Area	0.172 sq km
		Population	255
		Household	48
Heatwave	Low - Medium	Settlements	9
		Population	4238
		Household	808
		Agriculture Area	68.233 sq km
		Kachcha Area	0.44 sq km
Riverine Flood	Low	Agriculture Area	0.009 sq km
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	

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, UCDCMs and private sectors
- To share initial damage and needs assessment reports to DDMA and subsequently to PDMA
- To carry out relief, rehabilitation and reconstruction activities in the affected areas in accordance with the DDMA and PDMA

RESPONSIBILITY OF UNION COUNCIL DISASTER MANAGEMENT COMMITTEE

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

FUNCTION OF UCDCM

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

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

ESTABLISHMENT OF EMERGENCY OPERATION CENTERS

PROVINCIAL EMERGENCY OPERATION CENTER (PEOC)

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

The functions of PEOC are summarized below;

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

DISTRICT EMERGENCY OPERATION CENTER (DEOC)

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

FUNCTION OF DEOC

The functions of DEOC are appended below;

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

SECTOR WISE ROLES AND RESPONSIBILITIES OF GOVERNMENT FUNCTIONARIES

Pre-Disaster

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

During-Disaster

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

Post-Disaster

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

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

PROVINCIAL DISASTER MANAGEMENT AUTHORITY (PDMA)

Pre-Disaster

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

During-Disaster

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

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

Post-Disaster

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

DISTRICT DISASTER MANAGEMENT AUTHORITY (DDMA)

Pre-Disaster

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

During-Disaster

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

Post-Disaster

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

CIVIL DEFENSE

Pre-Disaster

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

During-Disaster

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

Post-Disaster

- Assist in rehabilitation process if required

EDUCATION DEPARTMENT

Pre-Disaster

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

During-Disaster

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

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

Post-Disaster

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

FINANCE DEPARTMENT

Pre-Disaster

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

During-Disaster

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

Post-Disaster

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

HEALTH DEPARTMENT

Pre-Disaster

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

During-Disaster

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

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

Post-Disaster

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

IRRIGATION DEPARTMENT

Pre-Disaster

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

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

During-Disaster

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

Post-Disaster

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

INFORMATION DEPARTMENT

Pre-Disaster

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

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

During-Disaster

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

Post-Disaster

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

PAKISTAN METEOROLOGICAL DEPARTMENT (PMD)

Pre-Disaster

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

During-Disaster

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

Post-Disaster

- Technical assistance in rescue and rehabilitation process

POLICE DEPARTMENT

Pre-Disaster

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

During-Disaster

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

Post-Disaster

- Assist in relief and rehabilitation process

REVENUE DEPARTMENT

Pre-Disaster

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

During-Disaster

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

Post-Disaster

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

ARMED FORCES

Pre-Disaster

- Coordinate with the DDMA in the pre-disaster planning

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

During-Disaster

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

Post-Disaster

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

SOCIAL WELFARE AND COMMUNITY DEVELOPMENT

Pre-Disaster

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

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

During-Disaster

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

Post-Disaster

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

NGOs / INGOs

Pre-Disaster

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

- Resource mobilization at local and international level

During-Disaster

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

Post-Disaster

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

DISASTER MANAGEMENT GUIDELINES

INTRODUCTION

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

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

Riverine Floods	<ol style="list-style-type: none">1. River Indus in Sindh can be segmented in three broad reaches Guddu to Sukkur, Sukkur to Kotri and Kotri to Arabian Sea. 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 Ghotki adjoining river Indus are at high vulnerability 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
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	<p>level in coordination with irrigation department, the government of Punjab, Federal Flood Commission and Pakistan Meteorological Department (PMD) be conducted.</p> <ol style="list-style-type: none"> 5. Timely alerts be issued to people living in low lying areas within flood plain. 6. In case of high anticipated flows evacuation of people and livestock be carried out. 7. Soaking and compacting of embankments before arrival of flood water. 8. Reinforcement and stone pitching of high-risk embankments. 9. Use alternative eco-friendly options like use of bamboo wood etc. to minimize erosion impact on high-risk embankments. 10. Where necessary and possible, erection of guide embankments and spur before arrival of high flood water. 11. 24/7 vigilance of high-risk embankments by Sindh Irrigation Department. 12. Readily availability of breach filling stock and machinery at high risk embankments. 13. Restoration of natural eco-system within flood plain such as revival of braided/Yazoo channels and natural lakes within flood plain to disperse and distribute flood water across the plain. 14. Removal of possible congestion factors within the flood plain. 15. Public participation comprising local people be encouraged in pre and during flood periods.
Earthquake	<ol style="list-style-type: none"> 1. The geology of Sindh is divisible in three main regions, the mountain ranges of Kirthar, Pab containing a chain of minor hills in the west and in east it is covered by the Thar Desert and part of Indian Platform where the main exposure is of Karoonjhar Mountains, which is famous for Nagar Parkar Granite. District Ghotki 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)

	<p>Surjan-Jhimpir, (c) Pab Fault (d) Hub Fault and (e) Allah Bund-Rann of Kutch faults.</p> <ol style="list-style-type: none"> 3. Though risk of geophysical hazards in Ghotki district is low but still some actions must be taken to avoid losses in case of minor jolts. It is recommended to identify old and weak buildings in 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 Ghotki district is situated. 5. Local government departments must be strengthened to manage situation arisen from earthquake jolts. Strengthening must include capacity building to act as first responder in any likely situation.
Heatwave	<ol style="list-style-type: none"> 1. The district has witnessed rapidly increased severity of heatwave in the past five years. The district is moderately populated, which significantly increases the chances of moderate heatwave impacts. 2. Heatwaves are forecastable hazards and actions can be taken well before occurrence of heatwaves. The most suitable action is issuance of warnings and alerts in public for precautions and safety. Suitable media for the purpose is social media and SMS. 3. Scientific studies suggest that, frequency and intensity of heatwaves is increased due to climate change. Though climate change is global phenomena, however, its impacts can be minimized through local interventions. The most efficient and cost-effective solution is tree plantation. Tree plantation must be encouraged at different levels including government functionaries, NGOs, community and individual levels. 4. Additionally, introduction of reduced Urban Heat Islands (UHI) through policies and implementation in infrastructure development will significantly reduce impacts of heatwaves.
Drought	<ol style="list-style-type: none"> 1. Ghotki is a moderately populated district with closely spaced homes in major cities. Climatic condition of the district can be categorized as Hot

	<p>and Arid (Climate Classification of Pakistan (Khan et al., 2010). Average annual rainfall received during a year across the district is 93.81mm. Agriculture is practiced in the district which is mainly dependent on rainfall.</p> <p>2. Drought is also forecastable hazard and can be predicted well in advance. Though drought does not bring any prominent or famine like conditions in the districts, however, it causes reduction in agricultural production and some extent disturb food supply for the animals and livestock. The best practice to manage drought related impacts is storage of food supplies for both humans and animals.</p> <p>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.</p>
Cyclone	According to MHVRA Study 2022, there is no Cyclone Hazard in Ghotki district.
Tsunami	According to MHVRA Study 2022, there is no Tsunami Hazard in Ghotki district.

STANDARD OPERATING PROCEDURES

INTRODUCTION

Overall, disaster risk reduction is collective responsibility of concerned departments, associated line departments, private sector and communities. Synergized and coherence 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 Ghotki 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 (12)	Bagodeho No 29, Dari (Ghouspur), Ghotki, Hussain Beli No 25, Kadirpur No 26, Khambra No 05, Khewali, Langho No 02, Ranwati No 04, Ruk No 30, Umer Daho No 28, Wasti Jiwan Shah No 03
UCs not at Risk (21)	Adalpur No 24, Beriri No 27, Berutta No 11, Dad Laghari No 12, Dhangro No 17, Garhi Chakar No 18, Jarwar No 19, Jhagal Malik (At Reti) 06, Kamu Shaheed No 07, Keenjhar No 13, Khanpur Mahar No 32, Khohara No 31, Lohi No 34, Mir Pur Mathelo-1 No 15, Mithree No 33, Raharki No 09, Saindino Malik No 10, Sono Pitafi No 20, Ubauro No 01, Wahi Ghoto No 21, Yaroo Lund No 14
General Description	<ol style="list-style-type: none"> 1. Flooding is a major threat to the people living especially in Katcha areas of two Talukas namely Ghotki and Ubauro. The 49,067 people living in the Katcha areas of these talukas are most at risk. 2. One of the peculiar features of this area is the nomadic living style, poverty, low literacy rate and a tribal setup that is common among these people, this aids to the problem at hand and makes the people more vulnerable to harm from any potential disasters. 3. The district has seen some of the worst flooding multiple times in the past decades, including the floods in 2012, 2011, 2012, and 2013. 4. According to MHVRA study 2022, flood hazard intensity for district Ghotki is “Low to Very High” 5. According to MHVRA study 2022, flood risk for district Ghotki is “Low to Extreme”
Disaster Management Measures	
Preparedness	
<ul style="list-style-type: none"> • Recording of daily river discharge at barrages in Sindh, and regular dissemination among stakeholders. 	

- In case of high discharge, dissemination of warnings and alerts to masses living in flood plain.
- Identification and inspection of vulnerable embankments likely to be affected due to flooding during pre-monsoon season, as per “Bund Manual” of irrigation department.
- Inspection and readiness of flood fighting equipment available with district government departments prior to flooding season.
- Classify and map bunds based on their origin (Mud, Brick, Stone, Concrete, Boulder, etc.)
- Readiness of flood camps in high riverine flood and breaching risk areas.
- Maintenance and strengthening of identified weak embankments.
- Awareness and motivation campaigns on construction of flood resilient buildings and infrastructures.
- Regular awareness campaigns on flood precautions and safe evacuations using various media platform.
- Inclusion and implementation of Disaster Risk Reduction (DRR) measures in development projects at planning stage for building flood resilient infrastructure.
- Conduct of satellite imagery based study for identification of vulnerable embankments before each monsoon and flooding period.
- Collection and management of contact information of area/village influential for alert and warning dissemination.
- Readiness of community-based volunteers and other related organizations / NGOs.
- Regular community-based flood fighting trainings through government departments or any other appropriate platforms.
- Installation of digital flood level gauges along embankments and dissemination of real-time flow level measurements to concerned authorities.
- Installation of surveillance cameras at safe places for consistent monitoring of structural integrity of vulnerable embankments.

Response

- Mobilization of rescue services, relevant NGOs, scouts and volunteers.
- Evacuation of people and livestock to shelters/camps.
- Camp management as per standard practices.
- Relief distribution.
- Precautionary measures for communicable diseases.
- Activation of mobile health and education services for flood affectees.

- Arrangements for early recovery including flood de-watering and early restoration of communication and essential services.

Recovery and Rehabilitation

- Damage assessment of flood affected areas.
- Resettlement of population on build back better basis.
- 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. The earthquake hazard intensity for district Ghotki is **"Low"**
5. The earthquake risk intensity for district Ghotki is **"Low"**

Disaster Management Measures

Preparedness

- Identifying and inventorying weak buildings and structures especially in urban settings of the district and situation demanding action by concerned departments.
- Preparation of landuse plans, town plans and implementation of building codes in new residential schemes, schools, public and private offices.
- Implementation of DRR measures in public infrastructure development schemes.
- Establishment of search and rescue infrastructure and services which can be mobilized as first responder in post-earthquake situation.
- Mobilize NGOs, INGOs, community development organizations and volunteers, and conduct earthquake safety awareness campaigns and drills especially in main urban settings.
- 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.

<ul style="list-style-type: none"> • Availability of alternative communication system in case if usual communication means are disturbed by earthquake. • Preparation of medical emergency plan to manage mass casualties in case of any major earthquake event.
Response
<ul style="list-style-type: none"> • Obtain firsthand information on intensity of earthquake and damages; prioritize areas for search and rescue operation. • Mobilize community-based volunteers, scouts and other trained personnel to hard hit areas to assess situation and help victims. • Establish emergency camps / shelters with necessary life support facilities. • Establish medical camps for provision of first aid and possible medical assistance to injured. • Evacuate people from damaged houses to safe places and shelters. • Provide security in affected areas and maintain law and order situation to prevent incidents of thefts and stampede. • Arrangement and conduct of aerial / drone survey of the affected areas. • Establish information and help desks for facilitation of affectees. • Restore essential services like power, water supply, and telecommunication of critical infrastructure like hospitals, control Rooms, etc. on priority basis.
Recovery and Rehabilitation
<ul style="list-style-type: none"> • Detailed damage and need assessment for recovery and rehabilitation. • Rehabilitation on build back better principle.

Heatwave	
UCs At Risk	All UCs
General Description	<ol style="list-style-type: none"> 1. Heatwave is a condition of atmospheric temperature that leads to physiological stress, which sometimes can claim human life. 2. Ghotki is known for its extremely hot summers. Ghotki has a hot and Arid climate, characterized by very hot and hazy summers which creates problem for the individuals like heat stroke, skin burn and sometimes death of a person. 3. Hottest month during a calendar year during last 19 years remain June and the coldest month is January. 4. Average maximum temperature during last 19 years remain 44.45 degrees and average minimum temperature remain 9 degrees in the district

	<p>5. Higher daily peak temperatures of longer duration and more intense heatwaves are becoming increasingly frequent globally due to climate change. Sindh too is feeling the impact of climate change in terms of increased instances of heat wave with each passing year.</p> <p>6. Very high temperature not only affects vegetation but also creates problem for the individuals like heat stroke, skin burn etc.</p> <p>7. According to MHVRA study 2022, heatwave hazard intensity for district Ghotki is “High to Severe”</p> <p>8. According to MHVRA study 2022, heatwave risk for district Ghotki is “Low to High”</p>
Disaster Management Measures	
Preparedness	
<ul style="list-style-type: none"> • Consistent future development strategy: Tree plantation, restoration of natural ecosystem, construction of environment friendly and well planned residential societies, offices, infrastructure and human dwellings. • Monitoring for hot weather alerts through local and international sources and issuance of timely Hot Day Advisories, and Hot Day Warnings. • Upgradation of major public health care facilities with necessary equipment and medicines to treat heatstroke patients. • Heatstroke awareness campaigns and wide public coverage through media, social media, SMS, NGOs and social welfare organizations. • Arrangements for uninterrupted supply of electricity and water in vulnerable areas. 	
Response	
<ul style="list-style-type: none"> • Mobilization of NGOs, social welfare organization and volunteers for arranging heatstroke facilitation camps and distribution of fresh drinking water in affected areas. • Local radio FM broadcasts to disseminate heatstroke safety and precautions. • Mobilize mobile medical teams for first-aid and other medical emergency support in affected area. • Record keeping of heatwave patients and fatalities. 	
Recovery and Rehabilitation	
<ul style="list-style-type: none"> • Post event review of heatwave plan and modifications if required. 	

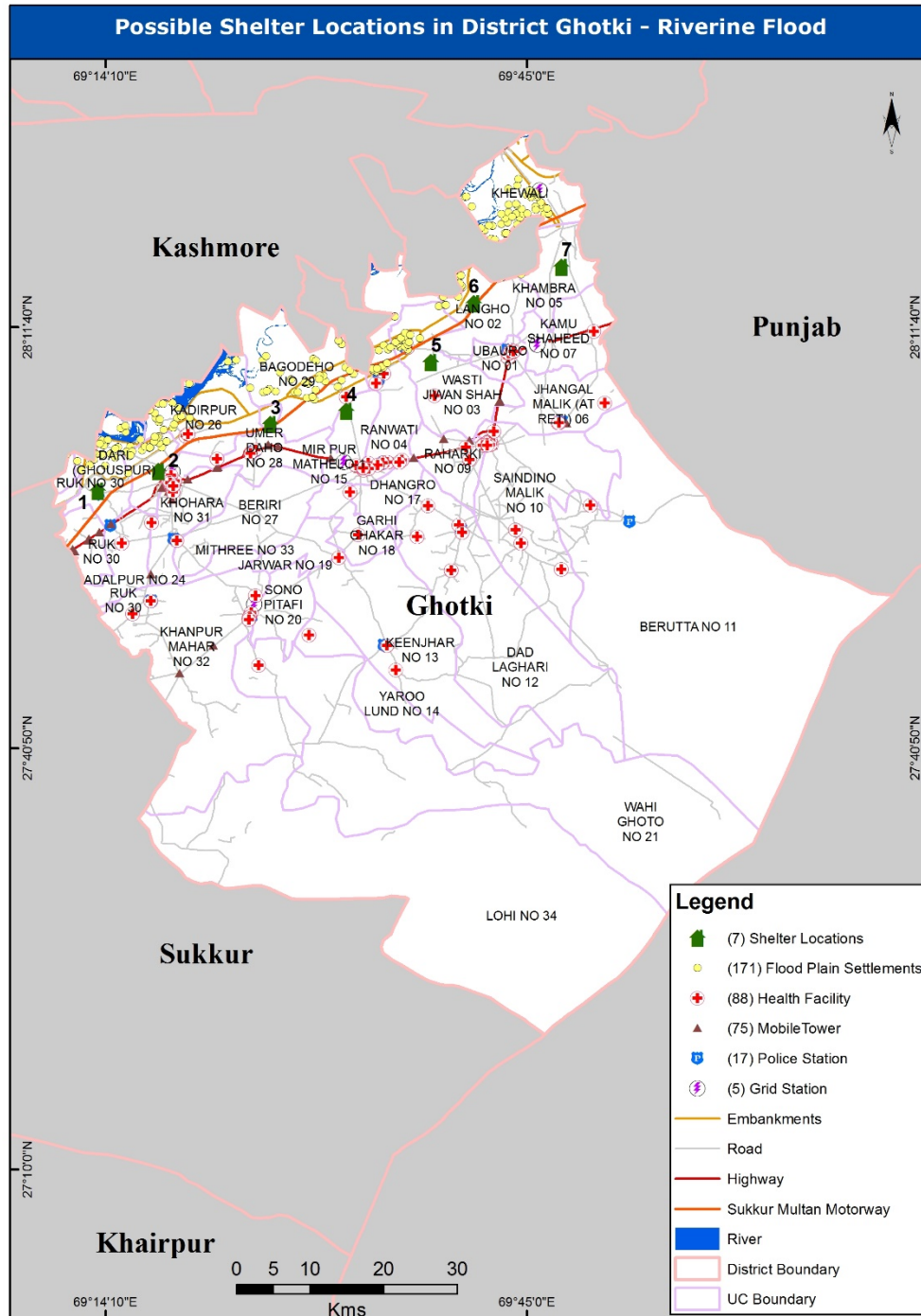
Cyclone	
UCs At Risk	Nil
General Description	According to MHVRA study 2022, there is no risk of Cyclone in Ghotki district.
Drought	
UCs at Risk	All UCs
General Description	<ol style="list-style-type: none"> 1. River Indus flows along north to south-western boundary of the district. 2. Climatic condition of the district can be categorized as Hot and Arid (Climate Classification of Pakistan (Khan et al., 2010) 3. Rainfall is very insufficient, average annual rainfall received during a year across the district is only 93.81 mm. 4. Irrigation water needs are mostly being catered through canal irrigation system and tube wells. Canal irrigation is prevalent, while river is also used for irrigation purpose 5. 58% of the total district area is covered with bare areas with sparse natural vegetation, part of Sindh's Achhro Thar, the white desert, at south of the district. 6. Orchards are mostly found at north-western corner of the district. Range lands with natural herbs and shrubs are mostly found along western boundary of the district. 7. According to MHVRA study 2022, <ol style="list-style-type: none"> a. Meteorological drought hazard for district Ghotki is "Extreme" b. Meteorological drought risk for district Ghotki is "Medium to Extreme" c. Agricultural drought hazard for district Ghotki is "Mild to Extreme" d. Agricultural drought risk for district Ghotki is "Low to Extreme"
Disaster Management Measures	
Preparedness	
<ul style="list-style-type: none"> • 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. • Implementation of water supply and demand management and encouragement of efficient irrigation systems in agriculture. • Research and promote drought resistant agriculture crops. • Resilience and improvement of adaptive capacity of farmers. • Monitoring of temperature, precipitation, potential evapotranspiration, soil moisture, stream flow, groundwater levels, lakes, and reservoirs for drought forecasting. • Control ground water extraction from upper and lower aquifers to be within the sustainable yield limits. 	

Response	
<ul style="list-style-type: none"> • Assess data about the nature of drought conditions and their impact. • Provision and installation of solar water pumps for availability of clean drinking water. • Public information campaign for water management and saving. 	
Recovery and Rehabilitation	
<ul style="list-style-type: none"> • Cash and in-kind support to farmers for next cropping. • Awareness and encouragement of farmers on best irrigation practices and water saving. 	

Tsunami	
UCs at Risk	Nil
General Description	<ul style="list-style-type: none"> • According to MHVRA study 2022, there is no risk of Tsunami in Ghotki district.

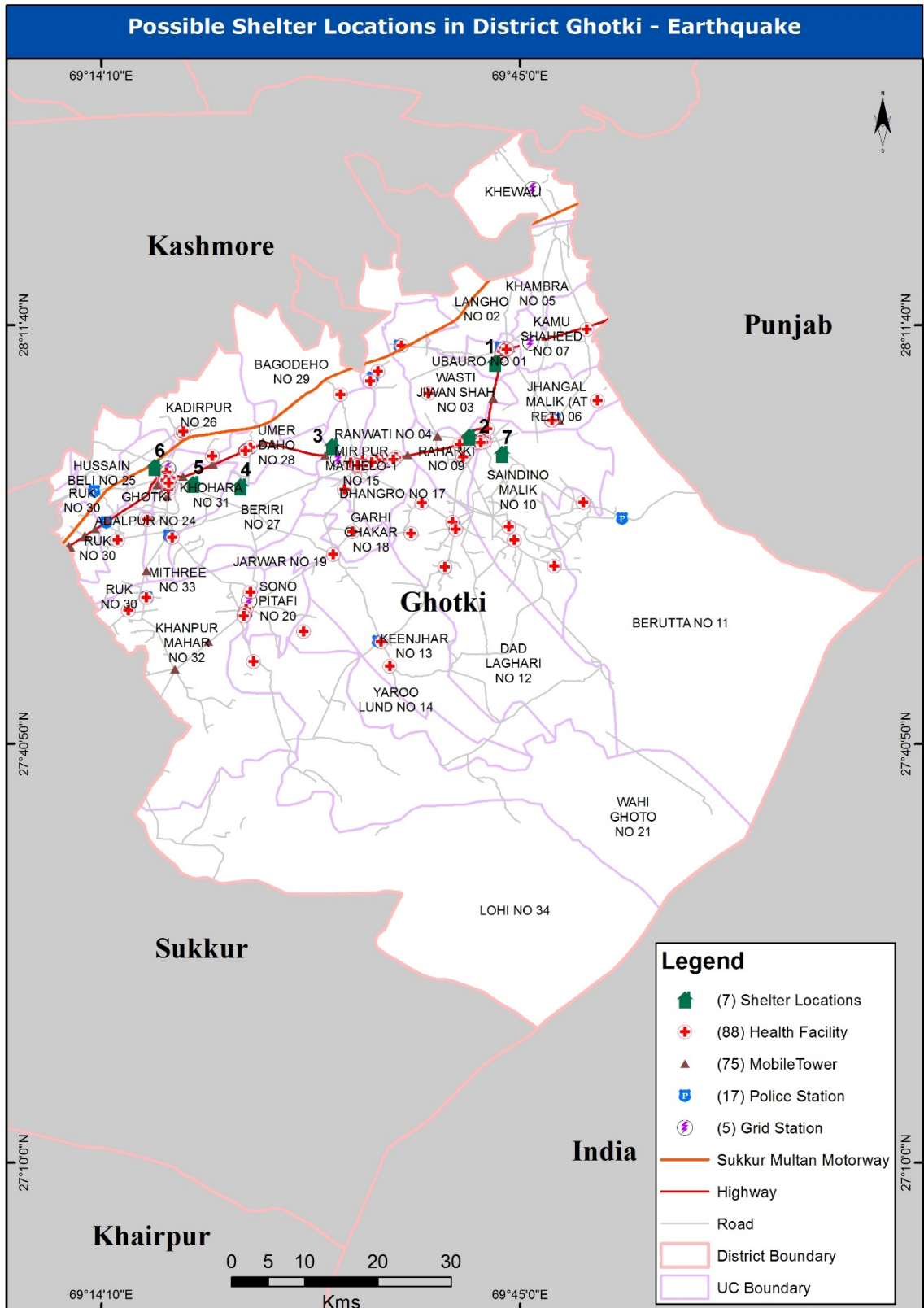
SHELTER LOCATION MAP

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 Ghotki. PDMA may identify suitable partnering agencies / line departments to carry out and prioritize each proposed project.

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

	plan should also details the rescue equipment available with concerned departments
Drought	
1. Conduct feasibility study for identification of suitable sites for rainwater harvesting and aquifer recharge in the district.	<p>The rainwater harvesting sites should be identified by using geospatial technologies and ancillary data, which can be used as clean water aquifers by communities, which in turn can use it for drinking, and irrigation purposes.</p> <p>Potential rainwater harvesting sites may be identified by using Analytical Hierarchy Process (AHP) and spatial analyst tool, with multiple thematic layers (rain data, population, digital elevation model, soil type, etc.)</p>

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 – GHOTKI DISTRICT

The existing nature of disasters in Ghotki district can be categorized as low to Extreme. The prominent hazards in the district is drought and flood. The drought risk in the district ranges from low to extreme. There is no risk of storm surge, cyclone and Tsunami in the district. The risk of earthquake is determined to be Low. As far as Heatwave is concerned Ghotki district is at low to high risk. As far as riverine flood is concerned the settled areas of few 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 9: Cost Benefit Analysis of Disaster Risk Measures in District Ghotki

S. no.	Soft resilience (Behavioral DRR)	Cost	Benefit
1.	Identification and management of shelters for earthquake and floods	Identification and management of shelter spaces is a cost-effective way to ensure rapid, and effective management of population at times of crisis. Government schools can serve as ideal cost-effective shelter spaces in district Ghotki, as these can accommodate large number of people during disasters. Gradually, permanent multi-purpose shelters specially in near river Indus and at safe location can be established in future to avoid use of education facilities.	Shelter places are highly beneficial at times of disaster as it offers a unified accommodation place for displaced people. Shelter place also help administration in effective management of displaced people and provide them with much needed relief. Shelter space keeps people off the highways during and after disaster. Shelters are often the only safe heaven for those without the financial means to take other protective measures.
2.	Early warning system for disasters	The international and regional early warning system for flood and drought can be used to cost-effectively disseminate warnings to vulnerable communities, minimize the impact of disaster and save precious lives, and crucial infrastructure.	Early warnings give people time to flee from a floods, or drought; enable local authorities to evacuate or shelter large numbers of people in advance; provide information on the occurrence of a public health hazard; and enable a faster response to problems of food and water insecurity. Warnings issues well before an event also enable people to protect some property and infrastructure. For example, reservoir operators could reduce the water levels gradually to accommodate incoming flood waters; local authorities could position equipment for emergency response; aid agencies can mobilize sooner; hospitals could be prepared to receive more patients. In general, the longer the lead time, the greater amount of property and infrastructure that can be protected.
3.	Awareness campaigns for disasters	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	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

		communities.	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.
4.	Strengthening of mobile health care facilities	In the aftermath of a natural disaster, most of medical functions are provided from temporary locations to avoid 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 treating the injured and handling outbreaks of disease. 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 (171) within flood Plains Prone to Riverine Flood

S.#	Name	Latitude	Longitude	Area (acres)
1	Alam Chachar	28.181	69.605	6.770
2	Allah Waraio	28.131	69.463	8.439
3	Anwar Shal Punjabi	28.025	69.236	3.000
4	Arbi Chachar	28.185	69.608	15.104
5	Basti Inayat Shah	28.115	69.470	40.796
6	Daulatpur	28.341	69.683	5.310
7	Daya	28.320	69.738	11.535
8	Dhanka	28.302	69.706	4.472
9	Dhing Chachar	28.142	69.534	52.175
10	Dino Shaikh	28.301	69.711	3.130
11	Ghulam Hussain Chachar	28.131	69.497	15.125
12	Goth Dabuli	28.167	69.581	9.576
13	Goth Ghunhian	28.046	69.248	18.121
14	Goth Ilahi Bux Silra	28.207	69.589	14.801
15	Goth Ismail Chachar	28.181	69.596	1.526
16	Goth Khairal	28.076	69.320	17.625
17	Goth Mehr Shah	28.056	69.232	8.345
18	Goth Salam	28.020	69.207	18.565

S.#	Name	Latitude	Longitude	Area (acres)
19	Goth Sardar Khan	28.052	69.229	12.556
20	Goth Shahdad	28.026	69.217	15.862
21	Goth Sohno	28.069	69.307	5.480
22	Goth Sumar	28.042	69.261	11.941
23	Gul Mohammad Lakhan	28.120	69.412	23.796
24	Gul Mohammad Machhi	28.329	69.732	2.688
25	Haji Hashim Ghota	28.049	69.266	8.000
26	Haji Saifal Chachar	28.058	69.279	4.771
27	Jan Mohammad Dahar	28.130	69.524	3.830
28	Jan Mohammad Kori	28.231	69.666	4.610
29	Jiwan Budha Machhi	28.231	69.648	5.768
30	Jiwan Lakhan	28.139	69.449	11.229
31	Juma Khan	28.144	69.567	18.173
32	Kaim Machhi	28.309	69.724	7.710
33	Lal Bhayo	28.170	69.584	9.306
34	Matar Chachar	28.173	69.605	17.313
35	Miranpur	28.061	69.296	3.636
36	Muhammad Chacher	28.054	69.295	11.954
37	Pir Bux Mazari	28.337	69.761	21.205
38	Piral	28.042	69.269	6.021

S.#	Name	Latitude	Longitude	Area (acres)
39	Quttub Din Shah	28.118	69.492	19.668
40	Rais Mohammad Ibrahim Chachar	28.057	69.239	6.561
41	Runwati	28.170	69.601	43.850
42	Sadiq Ghota	28.048	69.284	12.774
43	Saindad Chachar	28.179	69.606	4.311
44	Sona Chachar	28.187	69.602	2.100
45	Subho Chachar	28.071	69.318	6.000
46	Untitled Settlement	28.039	69.231	5.122
47	Untitled Settlement	28.047	69.304	4.575
48	Untitled Settlement	28.079	69.301	5.810
49	Untitled Settlement	28.081	69.339	5.598
50	Untitled Settlement	28.083	69.324	1.660
51	Untitled Settlement	28.084	69.339	3.089
52	Untitled Settlement	28.083	69.298	8.834
53	Untitled Settlement	28.086	69.328	7.250
54	Untitled Settlement	28.090	69.296	32.060
55	Untitled Settlement	28.101	69.300	9.141
56	Untitled Settlement	28.101	69.306	4.916
57	Untitled Settlement	28.116	69.444	7.030
58	Untitled Settlement	28.128	69.504	3.604

S.#	Name	Latitude	Longitude	Area (acres)
59	Untitled Settlement	28.135	69.502	3.558
60	Untitled Settlement	28.136	69.497	3.681
61	Untitled Settlement	28.137	69.539	41.743
62	Untitled Settlement	28.145	69.529	3.086
63	Untitled Settlement	28.153	69.428	14.468
64	Untitled Settlement	28.154	69.396	20.650
65	Untitled Settlement	28.152	69.386	9.921
66	Untitled Settlement	28.159	69.432	9.972
67	Untitled Settlement	28.166	69.569	5.660
68	Untitled Settlement	28.167	69.605	2.253
69	Untitled Settlement	28.170	69.595	2.179
70	Untitled Settlement	28.172	69.590	1.736
71	Untitled Settlement	28.172	69.576	9.211
72	Untitled Settlement	28.174	69.524	3.667
73	Untitled Settlement	28.174	69.593	1.508
74	Untitled Settlement	28.178	69.520	5.558
75	Untitled Settlement	28.179	69.595	2.508
76	Untitled Settlement	28.220	69.643	5.201
77	Untitled Settlement	28.221	69.650	14.996
78	Untitled Settlement	28.243	69.671	1.566

S.#	Name	Latitude	Longitude	Area (acres)
79	Untitled Settlement	28.245	69.670	2.198
80	Untitled Settlement	28.247	69.668	1.727
81	Untitled Settlement	28.256	69.668	4.762
82	Untitled Settlement	28.257	69.670	3.535
83	Untitled Settlement	28.309	69.723	2.199
84	Untitled Settlement	28.309	69.726	6.621
85	Untitled Settlement	28.312	69.698	1.752
86	Untitled Settlement	28.316	69.694	5.417
87	Untitled Settlement	28.318	69.708	1.966
88	Untitled Settlement	28.318	69.704	2.058
89	Untitled Settlement	28.320	69.719	6.075
90	Untitled Settlement	28.322	69.726	3.788
91	Untitled Settlement	28.327	69.724	3.924
92	Untitled Settlement	28.328	69.742	3.635
93	Untitled Settlement	28.332	69.772	1.918
94	Untitled Settlement	28.332	69.719	4.474
95	Untitled Settlement	28.333	69.737	1.621
96	Untitled Settlement	28.333	69.746	2.376
97	Untitled Settlement	28.333	69.751	2.967
98	Untitled Settlement	28.333	69.777	3.143

S.#	Name	Latitude	Longitude	Area (acres)
99	Untitled Settlement	28.334	69.727	2.671
100	Untitled Settlement	28.339	69.744	2.428
101	Untitled Settlement	28.340	69.766	7.256
102	Untitled Settlement	28.343	69.767	2.207
103	Untitled Settlement	28.343	69.738	2.891
104	Untitled Settlement	28.344	69.728	2.492
105	Untitled Settlement	28.345	69.737	3.083
106	Untitled Settlement	28.347	69.767	2.912
107	Untitled Settlement	28.353	69.755	3.193
108	Untitled Settlement	28.353	69.762	2.636
109	Untitled Settlement	28.353	69.675	2.834
110	Untitled Settlement	28.354	69.676	2.924
111	Untitled Settlement	28.355	69.750	6.644
112	Untitled Settlement	28.356	69.762	6.590
113	Untitled Settlement	28.358	69.758	1.965
114	Untitled Settlement	28.359	69.760	6.199
115	Untitled Settlement	28.360	69.755	7.053
116	Untitled Settlement	28.361	69.753	2.503
117	Untitled Settlement	28.363	69.727	15.930
118	Untitled Settlement	28.367	69.738	5.825

S.#	Name	Latitude	Longitude	Area (acres)
119	Untitled Settlement	28.375	69.740	23.952
120	Untitled Settlement	28.341	69.760	6.517
121	Untitled Settlement	28.339	69.775	3.270
122	Untitled Settlement	28.082	69.302	3.759
123	Untitled Settlement	28.101	69.318	3.092
124	Untitled Settlement	28.096	69.325	6.695
125	Untitled Settlement	28.071	69.260	3.409
126	Untitled Settlement	28.066	69.261	3.147
127	Untitled Settlement	28.071	69.255	2.864
128	Untitled Settlement	28.074	69.260	3.236
129	Untitled Settlement	28.053	69.301	10.393
130	Untitled Settlement	28.061	69.301	4.110
131	Untitled Settlement	28.059	69.300	2.112
132	Untitled Settlement	28.058	69.298	6.509
133	Untitled Settlement	28.048	69.291	4.131
134	Untitled Settlement	28.047	69.289	3.722
135	Untitled Settlement	28.044	69.281	5.455
136	Untitled Settlement	28.055	69.311	16.045
137	Untitled Settlement	28.115	69.429	19.988
138	Untitled Settlement	28.118	69.436	16.915

S.#	Name	Latitude	Longitude	Area (acres)
139	Untitled Settlement	28.016	69.264	10.297
140	Untitled Settlement	28.054	69.236	8.414
141	Untitled Settlement	28.053	69.232	8.045
142	Untitled Settlement	28.050	69.234	6.870
143	Untitled Settlement	28.048	69.251	2.046
144	Untitled Settlement	28.040	69.242	6.076
145	Untitled Settlement	28.044	69.264	4.486
146	Untitled Settlement	28.039	69.225	2.842
147	Untitled Settlement	28.037	69.266	11.356
148	Untitled Settlement	28.035	69.248	6.284
149	Untitled Settlement	28.020	69.206	1.411
150	Untitled Settlement	28.031	69.202	13.068
151	Untitled Settlement	28.125	69.338	12.934
152	Untitled Settlement	28.125	69.484	6.188
153	Untitled Settlement	28.108	69.481	3.692
154	Untitled Settlement	28.106	69.491	7.025
155	Untitled Settlement	28.109	69.488	1.708
156	Untitled Settlement	28.115	69.467	4.492
157	Untitled Settlement	28.155	69.490	14.360
158	Untitled Settlement	28.153	69.493	4.770

S.#	Name	Latitude	Longitude	Area (acres)
159	Untitled Settlement	28.140	69.566	9.434
160	Untitled Settlement	28.142	69.562	3.087
161	Untitled Settlement	28.142	69.571	1.903
162	Untitled Settlement	28.144	69.572	2.993
163	Untitled Settlement	28.145	69.574	5.001
164	Untitled Settlement	28.147	69.573	8.533
165	Untitled Settlement	28.151	69.579	4.424
166	Untitled Settlement	28.179	69.601	1.692
167	Untitled Settlement	28.176	69.590	5.363
168	Untitled Settlement	28.180	69.620	10.062
169	Village Dur Mohammad Khan Bhayo	28.121	69.519	16.796
170	Village Haji Ismail Chachar	28.126	69.479	17.021
171	Wazir Chachar	28.144	69.561	5.597

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: 27°59'44.09"N 69°13'42.51"E Upper left corner: 27°59'48.00"N 69°13'34.00"E Lower right corner: 27°59'32.36"N 69°13'40.01"E Lower left corner: 27°59'33.66"N 69°13'24.69"E	39.6	~1800	220
2	Upper right corner: 28° 1'10.30"N 69°18'5.79"E Upper left corner: 28° 1'9.64"N 69°17'55.99"E Lower right corner: 28° 0'58.95"N 69°18'3.82"E Lower left corner: 28° 1'3.82"N 69°17'53.91"E	24.3	~1200	225
3	Upper right corner: 28° 4'36.13"N 69°26'13.91"E Upper left corner: 28° 4'32.89"N 69°26'5.62"E Lower right corner: 28° 4'32.13"N 69°26'26.51"E Lower left corner: 28° 4'24.60"N 69°26'9.95"E	25.4	~1300	239
4	Upper right corner: 28° 5'46.86"N 69°31'51.93"E Upper left corner: 28° 5'48.30"N 69°31'26.06"E Lower right corner: 28° 5'11.96"N 69°31'55.04"E Lower left corner: 28° 4'56.92"N 69°31'34.26"E	248	~12500	245
5	Upper right corner: 28° 9'12.32"N 69°38'16.73"E Upper left corner: 28° 9'15.94"N 69°37'59.05"E Lower right corner: 28° 8'47.83"N 69°37'46.53"E Lower left corner: 28° 8'49.02"N 69°37'39.77"E	116	~6000	230
6	Upper right corner: 28°13'36.41"N 69°41'26.92"E Upper left corner: 28°13'34.28"N 69°41'9.41"E Lower right corner: 28°13'9.96"N 69°41'7.26"E Lower left corner: 28°13'22.65"N 69°40'54.94"E	84	~1700	240
7	Upper right corner: 28°16'6.58"N 69°47'36.71"E Upper left corner: 28°16'10.28"N 69°47'33.15"E Lower right corner: 28°15'58.95"N 69°47'27.48"E Lower left corner: 28°16'0.12"N 69°47'23.68"E	13	~700	240

A total of 7 shelter locations have been selected as Flood shelter places across district Ghotki. 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 25,200 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.

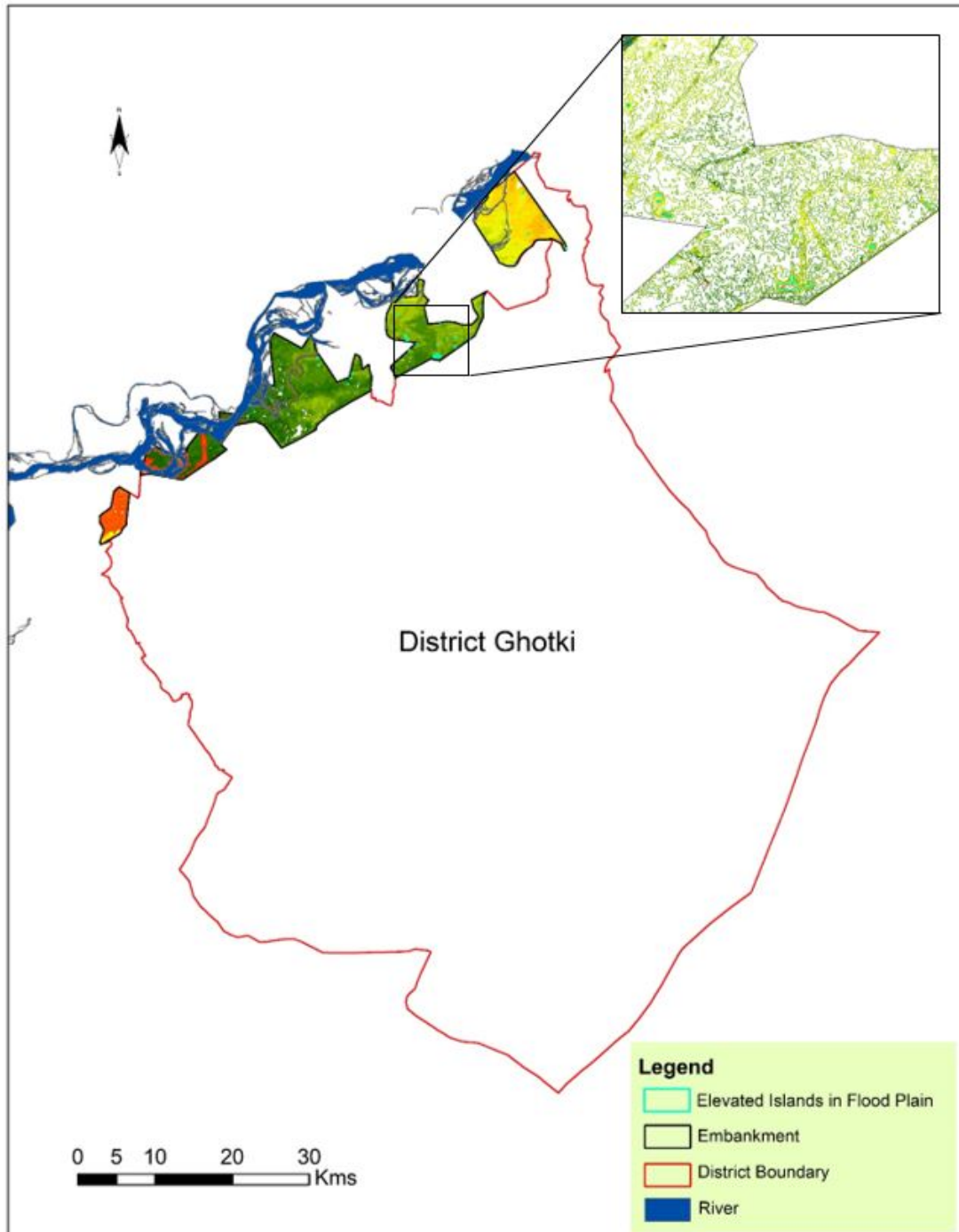
Shelter location	Co-ordinates	Area (acres)	Estimated Tents (numbers)	Avg. elevation (ft)
1	Upper right corner: 28° 8'57.90"N 69°43'23.09"E Upper left corner: 28° 9'8.51"N 69°43'3.59"E Lower right corner: 28° 8'39.85"N 69°43'12.18"E Lower left corner: 28° 8'53.31"N 69°42'47.34"E	97.6	~4500	238
2	Upper right corner: 28° 3'37.27"N 69°41'17.25"E Upper left corner: 28° 3'29.31"N 69°41'5.45"E Lower right corner: 28° 3'12.95"N 69°41'24.78"E Lower left corner: 28° 3'14.11"N 69°41'15.21"E	103	~4600	230
3	Upper right corner: 28° 3'7.91"N 69°31'11.85"E Upper left corner: 28° 3'2.79"N 69°30'55.78"E Lower right corner: 28° 2'26.62"N 69°31'26.78"E Lower left corner: 28° 2'24.88"N 69°30'49.41"E	232	~10000	232
4	Upper right corner: 28° 0'1.14"N 69°24'34.13"E Upper left corner: 28° 0'9.31"N 69°24'13.73"E Lower right corner: 27°59'25.83"N 69°24'34.65"E Lower left corner: 27°59'34.98"N 69°24'4.55"E	197	~8800	230
5	Upper right corner: 28° 0'4.16"N 69°21'9.36"E Upper left corner: 28° 0'14.93"N 69°20'53.76"E Lower right corner: 27°59'41.27"N 69°20'58.02"E Lower left corner: 27°59'47.65"N 69°20'42.19"E	103	~5000	220
6	Upper right corner: 28° 1'21.03"N 69°18'12.69"E Upper left corner: 28° 1'24.74"N 69°18'5.60"E Lower right corner: 28° 0'58.40"N 69°18'5.68"E Lower left corner: 28° 1'4.75"N 69°17'52.42"E	61	~2800	220
7	Upper right corner: 28° 2'15.32"N 69°44'3.35"E Upper left corner: 28° 2'17.21"N 69°43'26.97"E Lower right corner: 28° 2'7.41"N 69°44'3.81"E	50.3	~2250	230

	Lower left corner: 28° 1'57.77"N 69°43'32.05"E			
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A total of 7 shelter locations have been selected as Earthquake shelter places across district Ghotki. 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 37,950 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 GHOTKI

Total 31 elevated islands have been identified within the embankments in district Ghotki, with a cumulative area of approximately 79.71 acres. These elevated islands obstruct the river flow and thereby may be demolished/removed to reinstate the normal river flow within the flood plain.



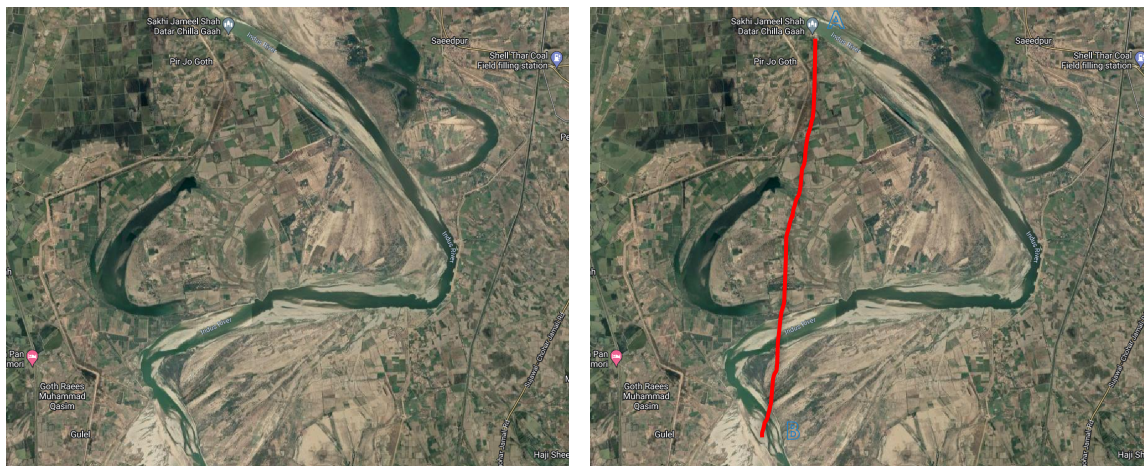
ANNEX – E – RIVER TRAINING AND STRAIGHTENING

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 Ghotki districts are safe from riverine flood. However, settled areas of the district may be endangered to severe flooding condition if any breaching occurs in river embankment.

Embankment breach due to Normal River flow meandering:

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

Below figure illustrate the concept:



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

ANNEX – F – LIST OF EQUIPMENT AVAILABLE IN DISTRICT GHOTKI

Equipment	Quantity
De-watering Machine	26
Buildozers / Dozers	11
Fire Brigade / Engine / Tender	6
Tractor / Trolley / Blade	9
Vehicle / Bus/ Van/Truck/	32
Diesel / Petrol Engine	22
Boats	13
Power Generators	2
Electric Motors	14

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