

MHVRA

INFORMED DISASTER MANAGEMENT PLAN

2023-2032

DISTRICT DADU



DEVELOPED BY
PDMA SINDH



THROUGH
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WITH THE SUPPORT OF



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PREFACE

Multi-Hazard Vulnerability Risk Assessment (MHVRA) and resultant database are the foundation for evidence-based disaster management plan. Such databases are also an integral part of the implementation of disaster risk reduction and disaster risk management strategies. The MHVRA study of the Dadu 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 Dadu 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 Dadu 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 DADU

INTRODUCTION

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

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

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

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

VISION

Vision of MHVRA Informed Disaster Management Plan is;

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

OBJECTIVES

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

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

REVIEW OF MHVRA INFORMED DISASTER MANAGEMENT PLAN

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

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

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

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

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

Table 1: Recommended Committee for Reviewing Disaster Management Plan

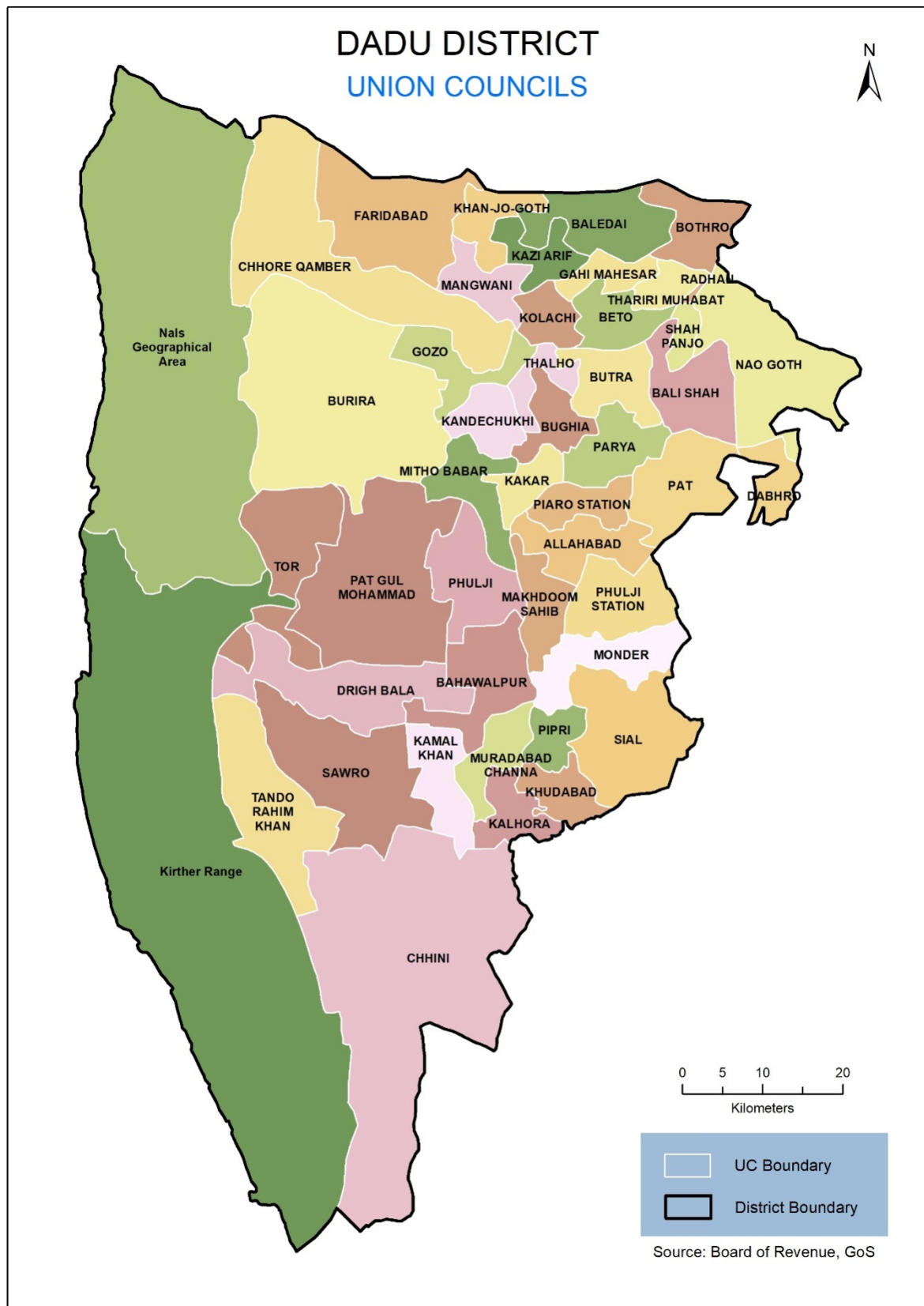
Committee Representative	Role
DG, PDMA Sindh / Dir Ops PDMA	Chairman
Concerned DC or representative officer	Member
Concerned officer from local government	Member
Elected representative of the concerned district	Member
Representatives from disaster affected communities	Member (s)
Representative from SUPARCO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

MODES OF REVIEW

Preferred modes of review of plan are;

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

DISASTER RISK PROFILE OF DISTRICT DADU



GEOGRAPHY

District area in Sq. Km	8,403	
Coordinates	Longitude 67° 7' to 68° 2' 17" East Latitude 26° 6' 35" to 27° 26' 20"North	
Surrounding Districts	Larkana and Kambar Shahdadkot in North Jamshoro in South Naushahro Feroze in East Balochistan Province in West	
Climate Conditions	Hot and Semi-Arid	
Coldest Month	January	
Hottest Month	May	
Seasonal Temperatures	Max Mean (°C)	Min Mean (°C)
Spring (March and April)	36.37	19.69
Dry Summer (May and June)	43.97	27.92
Wet Summer (July to September)	40.84	27.50
Autumn (October to November)	34.07	18.65
Winter (December to February)	25.61	10.55
Average Rainfall	113.76 mm/year	
Physiographic Features	Manchar Lake, Sanjri Dhand, Unheri Dhand, Bado Hill Station, Gaj River	

DEMOGRAPHY

	Year-1998	Year-2017
Population	1,106,717	1,550,390
Urban	229,134	383,406
Rural	877,583	1,166,984
No. of Household	-	286,810
Average Annual Growth Rate 1998-2017	1.79 %	

ECONOMY

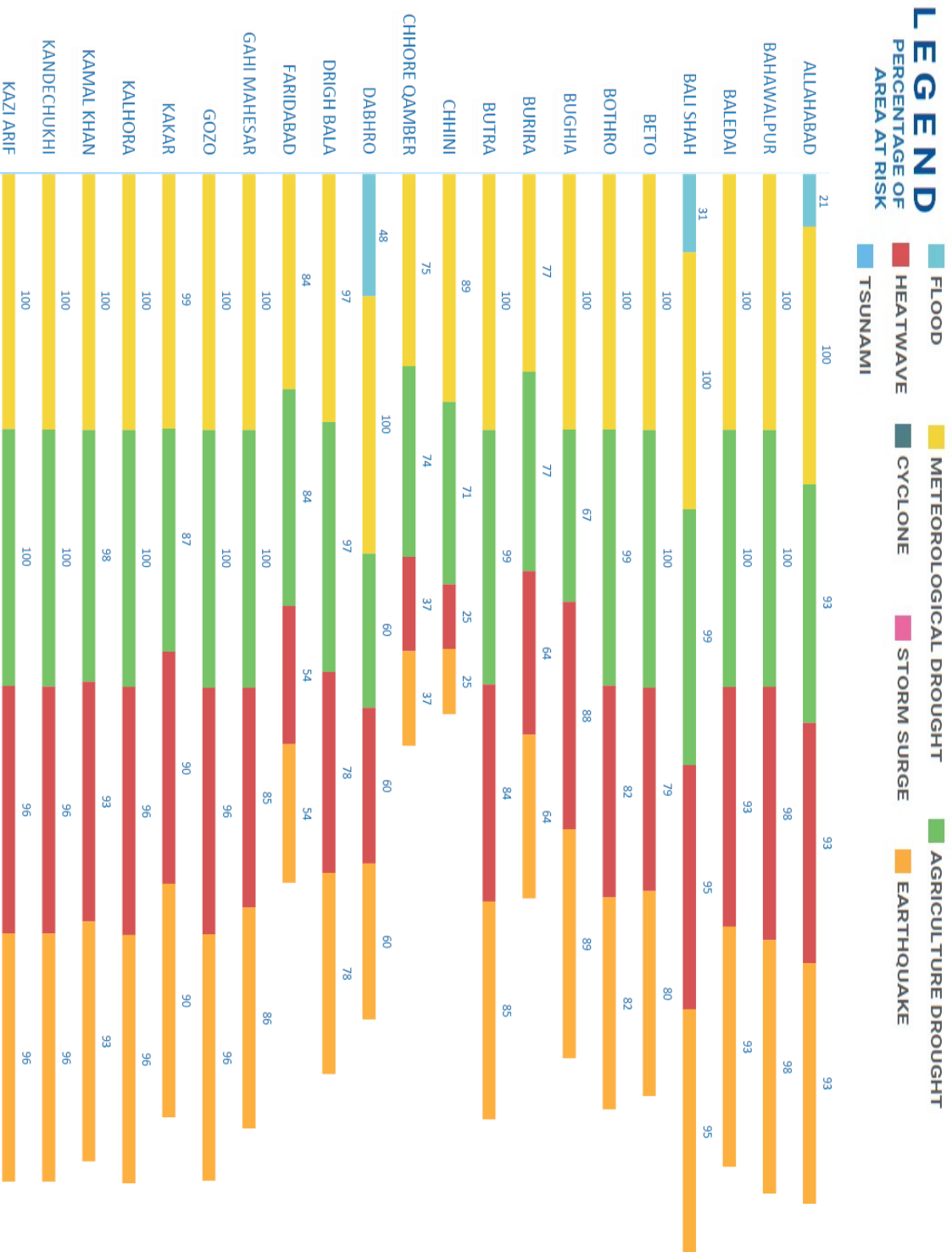
Industries	Agriculture, Textile, Oil & Gas
Agriculture	Production in M.tons as per (2016-17)
Major Crops	
Rice	189,268
Wheat	257,719
Sugarcane	282,304
Cotton	10,912
Minor Crops	
Rapeseed and Mustard	1,064
Gram	486
Jowar	400
Barley	172
Maize	152
Bajra	125
Sesame	90

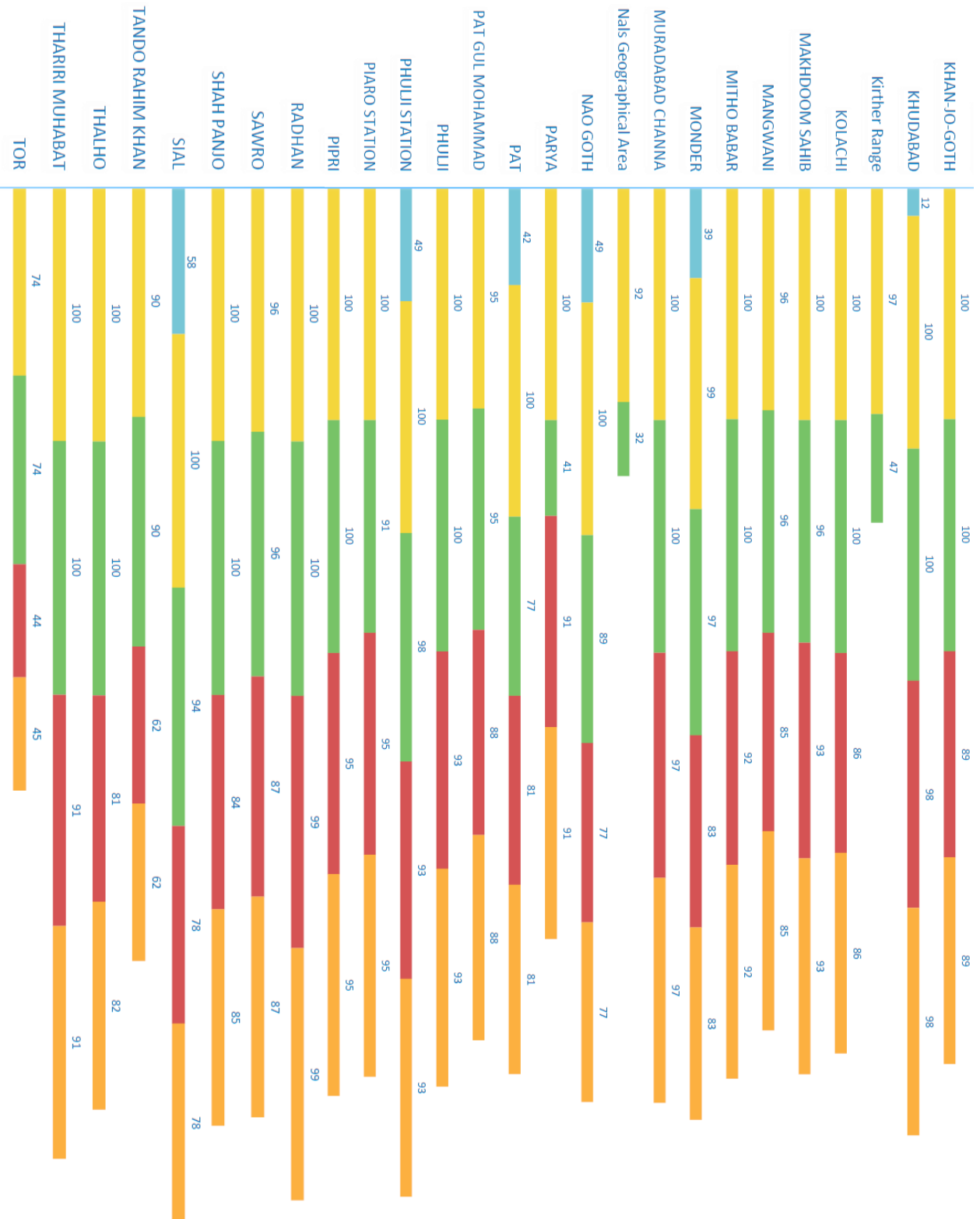
ADMINISTRATIVE SYSTEM

TALUKA NAMES	UC NAMES
<ol style="list-style-type: none">1. Dadu Taluka2. Johi Taluka3. Khairpur Nathan Shah Taluka4. Mehar Taluka	<ol style="list-style-type: none">1. Allahabad2. Bahawalpur3. Baledai4. Bali Shah5. Beto6. Bothro7. Bughia8. Burira9. Butra10. Chhini11. Chhore Qamber12. Dabhro13. Drigh Bala14. Faridabad15. Gahi Mahesar16. Gozo17. Kakar18. Kalhora19. Kamal Khan20. Kandechukhi21. Kazi Arif22. Khan-Jo-Goth23. Khudabad24. Kirther Range

	<ol style="list-style-type: none">25. Kolachi26. Makhdoom Sahib27. Mangwani28. Mitho Babar29. Monder30. Muradabad Channa31. Nals Geographical Area32. Nao Goth33. Parya34. Pat35. Pat Gul Mohammad36. Phulji37. Phulji Station38. Piaro Station39. Pipri40. Radhan41. Sawro42. Shah Panjo43. Sial44. Tando Rahim Khan45. Thalho46. Thariri Muhabat47. Tor
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DADU DISTRICT MULTI-HAZARD RISK PROFILES





Allahabad			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	81.473 sq km
		Forest Area	0.004 sq km
		Kachcha Area	0.174 sq km
		Natural Vegetation in Wet Areas	0.02 sq km
		Pakka Unplanned Area	1.359 sq km
		Range Land	0.102 sq km
		Bridges	2
		Education Facilities	55
		Health Facilities	1
		Petrol Pumps	1
		Settlements	39
		Irrigation and Drainage Network	33.791 km
		Railway Line	3.537 km
		Road Network	158.805 km
		Population	34320
Household	6431		
Meteorological Drought	Medium - Extreme	Agriculture Area	81.641 sq km
		Bare Area with sparse Natural Vegetation	0.029 sq km
		Forest Area	0.095 sq km
		Natural Vegetation in Wet Areas	0.18 sq km
		Range Land	1.911 sq km
		Water Body	0.599 sq km
		Wet Area	2.665 sq km
		Settlements	39
		Population	34668
		Household	6493
Agriculture Drought	Low - High	Agriculture Area	95.232 sq km
		Bare Area with sparse Natural Vegetation	0.037 sq km
		Forest Area	0.12 sq km
		Natural Vegetation in Wet Areas	0.064 sq km
		Range Land	2.4 sq km
		Water Body	0.753 sq km
		Wet Area	3.348 sq km
		Settlements	37

		Population	38935
		Household	7295
Heatwave	Low - High	Agriculture Area	81.408 sq km
		Kachcha Area	0.174 sq km
		Pakka Unplanned Area	1.363 sq km
		Population	34431
		Settlements	38
		Household	6448
Riverine Flood	Low - High	Education Facilities	1
		Settlements	1
		Road Network	24.712 km
		Agriculture Area	18.652 sq km
		Kachcha Area	0.076 sq km
		Natural Vegetation in Wet Areas	0.01 sq km
		Pakka Unplanned Area	0.005 sq km
		Population	1983
		House Hold	371
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BAHAWALPUR			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	123.343 sq km
		Forest Area	0.005 sq km
		Kachcha Area	0.155 sq km
		Pakka Planned Area	0.479 sq km
		Pakka Unplanned Area	1.002 sq km
		Range Land	0.016 sq km
		Bridges	4
		Education Facilities	71
		Health Facilities	2
		Mobile Towers	2
		Petrol Pumps	2
		Police Stations	1
		Settlements	41
		Irrigation and Drainage Network	49.188 km
Road Network	180.916 km		

		Population	16079
		Household	3143
Meteorological Drought	Medium – Extreme	Agriculture Area	123.42 sq km
		Forest Area	0.083 sq km
		Range Land	0.476 sq km
		Wet Area	1.124 sq km
		Settlements	41
		Population	16270
		Household	3176
Agriculture Drought	Low - Extreme	Agriculture Area	154.235 sq km
		Forest Area	0.104 sq km
		Range Land	0.596 sq km
		Wet Area	1.407 sq km
		Settlements	41
		Population	20384
		Household	3978
Heatwave	Low - High	Agriculture Area	123.312 sq km
		Kachcha Area	0.156 sq km
		Pakka Planned Area	0.481 sq km
		Pakka Unplanned Area	1.005 sq km
		Population	16119
		Settlements	41
		Household	3149
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BALEDAI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	108.958 sq km
		Pakka Unplanned Area	2.845 sq km
		Range Land	0.001 sq km
		Education Facilities	53
		Petrol Pumps	1
		Settlements	61
		Irrigation and Drainage	79.6 km

		Network	
		Road Network	177.117 km
		Population	49523
		Household	8914
Meteorological Drought	Medium – Extreme	Agriculture Area	109.104 sq km
		Range Land	0.008 sq km
		Water Body	0.433 sq km
		Wet Area	7.405 sq km
		Settlements	61
		Population	49975
		Household	8995
Agriculture Drought	Low - High	Agriculture Area	137.953 sq km
		Range Land	0.01 sq km
		Water Body	0.548 sq km
		Wet Area	9.364 sq km
		Settlements	61
		Population	63189
		Household	11379
Heatwave	Low - High	Agriculture Area	108.904 sq km
		Pakka Unplanned Area	2.849 sq km
		Population	49580
		Settlements	60
		Household	8924
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BALI SHAH			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	100.648 sq km
		Kachcha Area	0.089 sq km
		Natural Vegetation in Wet Areas	0.047 sq km
		Pakka Unplanned Area	3.526 sq km
		Range Land	0.02 sq km
		Bridges	3
		Bus Stops	1

		Education Facilities	58
		Health Facilities	2
		Industries	1
		Mobile Towers	5
		Petrol Pumps	2
		Police Stations	1
		Settlements	52
		Irrigation and Drainage Network	55.569 km
		Railway Line	8.165 km
		Road Network	153.654 km
		Population	63049
		Household	11421
Meteorological Drought	Medium – Extreme	Agriculture Area	100.815 sq km
		Natural Vegetation in Wet Areas	2.219 sq km
		Range Land	0.255 sq km
		Water Body	1.422 sq km
		Wet Area	1.328 sq km
		Settlements	52
		Population	63554
		Household	11511
Agriculture Drought	Low - High	Agriculture Area	126.59 sq km
		Natural Vegetation in Wet Areas	2.791 sq km
		Range Land	0.322 sq km
		Water Body	1.794 sq km
		Wet Area	1.674 sq km
		Settlements	47
		Population	76786
		Household	13899
Heatwave	Low - High	Agriculture Area	108.904 sq km
		Pakka Unplanned Area	2.849 sq km
		Population	49580
		Settlements	60
		Household	8924
Riverine Flood	Low - High	Education Facilities	7
		Settlements	3
		Irrigation and Drainage Network	0.966 km
		Road Network	11.913 km
		Agriculture Area	33.687 sq km

		Natural Vegetation in Wet Areas	0.038 sq km
		Pakka Unplanned Area	0.33 sq km
		Population	5744
		House Hold	1033
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BETO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	48.279 sq km
		Natural Vegetation in Wet Areas	0.04 sq km
		Pakka Planned Area	0.552 sq km
		Pakka Unplanned Area	4.83 sq km
		Range Land	0.008 sq km
		Bridges	6
		Education Facilities	49
		Grid Stations	1
		Health Facilities	12
		Mobile Towers	10
		Petrol Pumps	14
		Police Stations	1
		Post Offices	2
		Settlements	40
		Irrigation and Drainage Network	43.94 km
		Road Network	117.213 km
Population	81258		
Household	13851		
Meteorological Drought	Medium - Extreme	Agriculture Area	48.475 sq km
		Natural Vegetation in Wet Areas	1.521 sq km
		Range Land	0.223 sq km
		Water Body	8.545 sq km
		Wet Area	1.515 sq km
		Settlements	40
		Population	81676
		Household	13923

Agriculture Drought	Low - High	Agriculture Area	61.176 sq km
		Natural Vegetation in Wet Areas	1.92 sq km
		Range Land	0.281 sq km
		Water Body	10.784 sq km
		Wet Area	1.912 sq km
		Settlements	40
		Population	103102
		Household	17574
Heatwave	Low - High	Agriculture Area	48.191 sq km
		Pakka Planned Area	0.553 sq km
		Pakka Unplanned Area	4.833 sq km
		Population	81302
		Settlements	40
		Household	13859
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BOTHRO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	64 sq km
		Natural Vegetation in Wet Areas	0.013 sq km
		Pakka Unplanned Area	2.07 sq km
		Bridges	1
		Education Facilities	41
		Mobile Towers	2
		Settlements	38
		Irrigation and Drainage Network	35.774 km
		Road Network	70.938 km
		Population	35317
		Household	6354
Meteorological Drought	Medium – Extreme	Agriculture Area	64.124 sq km
		Natural Vegetation in Wet Areas	1.872 sq km
		Water Body	0.234 sq km

		Wet Area	11.669 sq km
		Settlements	38
		Population	35642
		Household	6412
Agriculture Drought	Low - Extreme	Agriculture Area	81.072 sq km
		Natural Vegetation in Wet Areas	2.366 sq km
		Water Body	0.295 sq km
		Wet Area	14.392 sq km
		Settlements	38
		Population	45062
		Household	8110
Heatwave	Low - High	Agriculture Area	63.966 sq km
		Pakka Unplanned Area	2.075 sq km
		Population	35396
		Settlements	37
		Household	6366
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BUGHIA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	48.429 sq km
		Pakka Planned Area	0.295 sq km
		Pakka Unplanned Area	2.636 sq km
		Range Land	0.028 sq km
		Bridges	3
		Education Facilities	61
		Grid Stations	1
		Health Facilities	5
		Mobile Towers	3
		Petrol Pumps	7
		Post Offices	1
		Settlements	36
		Irrigation and Drainage Network	40.599 km
Road Network	128.062 km		

		Population	51243
		Household	9638
Meteorological Drought	Medium – Extreme	Agriculture Area	48.579 sq km
		Range Land	0.361 sq km
		Water Body	3.402 sq km
		Wet Area	1.931 sq km
		Settlements	35
		Population	51638
		Household	9710
Agriculture Drought	Low - High	Agriculture Area	40.392 sq km
		Range Land	0.169 sq km
		Water Body	2.423 sq km
		Wet Area	1.6 sq km
		Settlements	28
		Population	57565
		Household	10848
Heatwave	Low - High	Agriculture Area	48.354 sq km
		Pakka Planned Area	0.295 sq km
		Pakka Unplanned Area	2.64 sq km
		Population	51345
		Settlements	33
		Household	9654
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BURIRA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	325.121 sq km
		Kachcha Area	0.319 sq km
		Natural Vegetation in Wet Areas	0.001 sq km
		Pakka Unplanned Area	0.41 sq km
		Range Land	0.475 sq km
		Education Facilities	24
		Mobile Towers	1

		Police Stations	1
		Settlements	26
		Tourist Places	1
		Irrigation and Drainage Network	12.71 km
		Road Network	47.281 km
		Population	12787
		Household	2364
Meteorological Drought	Medium – Extreme	Agriculture Area	325.714 sq km
		Bare Area with sparse Natural Vegetation	17.758 sq km
		Natural Vegetation in Wet Areas	0.519 sq km
		Range Land	52.665 sq km
		Settlements	24
		Population	12877
		Household	2377
Agriculture Drought	Low - Extreme	Agriculture Area	410.294 sq km
		Bare Area with sparse Natural Vegetation	22.356 sq km
		Natural Vegetation in Wet Areas	0.654 sq km
		Range Land	66.35 sq km
		Settlements	24
		Population	16226
		Household	2996
Heatwave	Low - High	Agriculture Area	324.901 sq km
		Kachcha Area	0.32 sq km
		Pakka Unplanned Area	0.411 sq km
		Population	12823
		Settlements	22
		Household	2368
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

BUTRA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	68.633 sq km
		Kachcha Area	0.022 sq km
		Natural Vegetation in Wet Areas	0.007 sq km
		Pakka Planned Area	0.08 sq km
		Pakka Unplanned Area	1.479 sq km
		Range Land	0.006 sq km
		Bridges	2
		Education Facilities	59
		Health Facilities	1
		Mobile Towers	5
		Petrol Pumps	1
		Police Stations	1
		Settlements	37
		Irrigation and Drainage Network	55.241 km
		Railway Line	3.075 km
		Road Network	149.597 km
Population	53370		
Household	9770		
Meteorological Drought	Medium - Extreme	Agriculture Area	68.828 sq km
		Natural Vegetation in Wet Areas	0.491 sq km
		Range Land	0.498 sq km
		Water Body	5.253 sq km
		Wet Area	6.878 sq km
		Settlements	37
		Population	53600
		Household	9811
Agriculture Drought	Low - Medium	Agriculture Area	85.68 sq km
		Natural Vegetation in Wet Areas	0.619 sq km
		Range Land	0.628 sq km
		Water Body	6.619 sq km
		Wet Area	8.63 sq km
		Settlements	36
		Population	44038
		Household	8086
Heatwave	Low - High	Agriculture Area	68.561 sq km
		Kachcha Area	0.022 sq km
		Pakka Planned Area	0.08 sq km

		Pakka Unplanned Area	1.482 sq km
		Population	53402
		Settlements	36
		Household	9777
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

CHHINI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	191.516 sq km
		Forest Area	0.004 sq km
		Kachcha Area	1.871 sq km
		Natural Vegetation in Wet Areas	0.007 sq km
		Pakka Planned Area	1.023 sq km
		Pakka Unplanned Area	2.349 sq km
		Range Land	0.579 sq km
		Bridges	7
		Education Facilities	87
		Mobile Towers	2
		Petrol Pumps	2
		Power Plants	3
		Settlements	98
		Tourist Places	1
		Irrigation and Drainage Network	44.621 km
		Road Network	168.181 km
Population	44065		
Household	8614		
Meteorological Drought	Medium – Extreme	Agriculture Area	192.3 sq km
		Bare Area with sparse Natural Vegetation	228.911 sq km
		Forest Area	1.249 sq km
		Natural Vegetation in Wet Areas	7.393 sq km
		Range Land	93.994 sq km
		Water Body	152.31 sq km
		Wet Area	16.943 sq km

		Settlements	95
		Population	44552
		Household	8706
Agriculture Drought	Low - Extreme	Agriculture Area	234.95 sq km
		Bare Area with sparse Natural Vegetation	229.858 sq km
		Forest Area	1.559 sq km
		Natural Vegetation in Wet Areas	5.935 sq km
		Range Land	113.826 sq km
		Water Body	77.613 sq km
		Wet Area	20.976 sq km
		Settlements	88
		Population	55573
		Household	10857
Heatwave	Low - High	Agriculture Area	191.361 sq km
		Kachcha Area	1.871 sq km
		Pakka Planned Area	1.024 sq km
		Pakka Unplanned Area	2.352 sq km
		Population	44083
		Settlements	81
		Household	8619
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River; however, it can be affected by flash floods due to overflow / breaches from F.P bund during monsoon / heavy rains.	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

CHHORE QAMBER			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	128.443 sq km
		Kachcha Area	0.059 sq km
		Pakka Unplanned Area	0.658 sq km
		Range Land	0.16 sq km
		Bridges	1
		Education Facilities	24
		Settlements	16

		Irrigation and Drainage Network	50.917 km
		Road Network	69.6 km
		Population	12574
		Household	2323
Meteorological Drought	Medium – Extreme	Agriculture Area	128.632 sq km
		Bare Area with sparse Natural Vegetation	77.99 sq km
		Range Land	54.581 sq km
		Water Body	0.278 sq km
		Wet Area	2.618 sq km
		Settlements	16
		Population	12679
		Household	2343
Agriculture Drought	Low - Extreme	Agriculture Area	162.337 sq km
		Bare Area with sparse Natural Vegetation	93.468 sq km
		Range Land	68.993 sq km
		Water Body	0.352 sq km
		Wet Area	3.301 sq km
		Settlements	16
		Population	16000
		Household	2956
Heatwave	Low - High	Agriculture Area	128.369 sq km
		Kachcha Area	0.059 sq km
		Pakka Unplanned Area	0.659 sq km
		Population	12602
		Settlements	15
		Household	2329
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

DABHRO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	27.235 sq km
		Kachcha Area	0.101 sq km

		Natural Vegetation in Wet Areas	0.085 sq km
		Pakka Unplanned Area	1.511 sq km
		Settlements	26
		Irrigation and Drainage Network	4.092 km
		Road Network	47.526 km
		Population	14903
		Household	2684
Meteorological Drought	Medium - Extreme	Agriculture Area	27.368 sq km
		Natural Vegetation in Wet Areas	10.902 sq km
		Water Body	0.569 sq km
		Settlements	26
		Population	15043
		Household	2707
Agriculture Drought	Low - Medium	Agriculture Area	20.26 sq km
		Natural Vegetation in Wet Areas	12.716 sq km
		Water Body	0.163 sq km
		Population	55
		Household	10
Heatwave	Low - High	Agriculture Area	27.182 sq km
		Kachcha Area	0.101 sq km
		Pakka Unplanned Area	1.516 sq km
		Population	14954
		Settlements	26
		Household	2694
Riverine Flood	Low - Extreme	Settlements	2
		Road Network	13.161 km
		Agriculture Area	19.581 sq km
		Kachcha Area	0.101 sq km
		Natural Vegetation in Wet Areas	2.575 sq km
		Pakka Unplanned Area	0.073 sq km
		Population	2390
		House Hold	429
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

DRIGH BALA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	148.727 sq km
		Forest Area	0.005 sq km
		Kachcha Area	0.163 sq km
		Natural Vegetation in Wet Areas	0.042 sq km
		Pakka Unplanned Area	1.077 sq km
		Range Land	0.193 sq km
		Bus Stops	1
		Education Facilities	35
		Health Facilities	1
		Mobile Towers	3
		Settlements	32
		Irrigation and Drainage Network	9.413 km
		Road Network	46.953 km
		Population	16713
Household	3267		
Meteorological Drought	Medium – Extreme	Agriculture Area	149.016 sq km
		Bare Area with sparse Natural Vegetation	9.244 sq km
		Forest Area	0.9 sq km
		Natural Vegetation in Wet Areas	9.799 sq km
		Range Land	16.123 sq km
		Water Body	0.095 sq km
		Wet Area	0.191 sq km
		Settlements	32
		Population	16885
		Household	3299
Agriculture Drought	Low - Extreme	Agriculture Area	186.636 sq km
		Bare Area with sparse Natural Vegetation	11.58 sq km
		Forest Area	1.127 sq km
		Natural Vegetation in Wet Areas	12.28 sq km
		Range Land	20.198 sq km
		Water Body	0.119 sq km
		Wet Area	0.24 sq km
		Settlements	32
		Population	21152
		Household	4133

Heatwave	Low - High	Agriculture Area	148.674 sq km
		Kachcha Area	0.163 sq km
		Pakka Unplanned Area	1.078 sq km
		Population	16737
		Settlements	29
		Household	3268
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

FARIDABAD			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	111.574 sq km
		Kachcha Area	0.247 sq km
		Natural Vegetation in Wet Areas	0 sq km
		Pakka Unplanned Area	0.469 sq km
		Range Land	0.127 sq km
		Education Facilities	15
		Health Facilities	1
		Settlements	12
		Irrigation and Drainage Network	2.001 km
		Road Network	25.754 km
		Population	12458
		Household	2240
Meteorological Drought	Medium – Extreme	Agriculture Area	111.776 sq km
		Bare Area with sparse Natural Vegetation	29.505 sq km
		Natural Vegetation in Wet Areas	0.987 sq km
		Range Land	32.268 sq km
		Water Body	0.011 sq km
		Wet Area	0.871 sq km
		Settlements	12
		Population	12602

		Household	2266
Agriculture Drought	Low - Extreme	Agriculture Area	141.273 sq km
		Bare Area with sparse Natural Vegetation	37.312 sq km
		Natural Vegetation in Wet Areas	1.248 sq km
		Range Land	40.819 sq km
		Water Body	0.014 sq km
		Wet Area	1.103 sq km
		Settlements	12
		Population	15917
		Household	2862
Heatwave	Low - High	Agriculture Area	111.531 sq km
		Kachcha Area	0.248 sq km
		Pakka Unplanned Area	0.47 sq km
		Population	12505
		Settlements	11
		Household	2250
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

GAHI MAHESAR			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	33.785 sq km
		Pakka Unplanned Area	1.228 sq km
		Bridges	1
		Education Facilities	20
		Mobile Towers	2
		Petrol Pumps	1
		Police Stations	1
		Settlements	15
		Irrigation and Drainage Network	21.161 km
		Road Network	52.334 km
		Population	21372
		Household	3843

Meteorological Drought	Medium - Extreme	Agriculture Area	33.869 sq km
		Water Body	3.296 sq km
		Wet Area	2.64 sq km
		Settlements	15
		Population	21550
		Household	3876
Agriculture Drought	Low - High	Agriculture Area	42.784 sq km
		Water Body	4.163 sq km
		Wet Area	3.335 sq km
		Settlements	15
		Population	27222
		Household	4898
Heatwave	Low - High	Agriculture Area	33.752 sq km
		Pakka Unplanned Area	1.228 sq km
		Population	21374
		Settlements	13
		Household	3845
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

GOZO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	74.848 sq km
		Natural Vegetation in Wet Areas	0.027 sq km
		Pakka Unplanned Area	0.615 sq km
		Range Land	0.004 sq km
		Education Facilities	43
		Health Facilities	1
		Police Stations	1
		Settlements	24
		Irrigation and Drainage Network	15.243 km
		Road Network	38.227 km
		Population	10795
		Household	1995

Meteorological Drought	Medium - Extreme	Agriculture Area	74.897 sq km
		Natural Vegetation in Wet Areas	2.44 sq km
		Range Land	0.279 sq km
		Water Body	0.562 sq km
		Settlements	24
		Population	10873
		Household	2009
Agriculture Drought	Low - Extreme	Agriculture Area	94.425 sq km
		Natural Vegetation in Wet Areas	3.077 sq km
		Range Land	0.352 sq km
		Water Body	0.708 sq km
		Settlements	24
		Population	13712
		Household	2534
Heatwave	Low - High	Agriculture Area	74.832 sq km
		Pakka Unplanned Area	0.616 sq km
		Population	10808
		Settlements	24
		Household	1997
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KAKAR			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	40.255 sq km
		Forest Area	0.001 sq km
		Pakka Unplanned Area	1.511 sq km
		Range Land	0.017 sq km
		Bridges	1
		Education Facilities	35
		Health Facilities	1
		Mobile Towers	4
		Petrol Pumps	3
		Settlements	25
		Irrigation and Drainage	22.54 km

		Network	
		Road Network	84.522 km
		Population	25994
		Household	4820
Meteorological Drought	Medium – Extreme	Agriculture Area	40.344 sq km
		Forest Area	0.016 sq km
		Range Land	0.237 sq km
		Water Body	1.049 sq km
		Wet Area	1.643 sq km
		Settlements	25
		Population	26204
		Household	4859
Agriculture Drought	Low - High	Agriculture Area	43.835 sq km
		Forest Area	0.02 sq km
		Range Land	0.295 sq km
		Water Body	1.301 sq km
		Wet Area	1.727 sq km
		Settlements	20
		Population	29793
		Household	5528
Heatwave	Low - High	Agriculture Area	40.211 sq km
		Pakka Unplanned Area	1.511 sq km
		Population	25995
		Settlements	25
		Household	4820
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KALHORA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	59.133 sq km
		Forest Area	0.001 sq km
		Kachcha Area	0.002 sq km
		Pakka Unplanned Area	1.036 sq km
		Range Land	0.016 sq km

		Bridges	3
		Education Facilities	48
		Health Facilities	1
		Mobile Towers	1
		Police Stations	1
		Settlements	28
		Irrigation and Drainage Network	20.977 km
		Railway Line	4.071 km
		Road Network	84.651 km
		Population	15840
		Household	3037
Meteorological Drought	Medium - Extreme	Agriculture Area	59.196 sq km
		Forest Area	0.053 sq km
		Range Land	0.352 sq km
		Wet Area	1.674 sq km
		Settlements	28
		Population	16006
		Household	3067
Agriculture Drought	Low - High	Agriculture Area	73.683 sq km
		Forest Area	0.067 sq km
		Range Land	0.44 sq km
		Wet Area	2.093 sq km
		Settlements	28
		Population	20003
		Household	3831
Heatwave	Low - High	Agriculture Area	59.114 sq km
		Kachcha Area	0.002 sq km
		Pakka Unplanned Area	1.039 sq km
		Population	15889
		Settlements	27
		Household	3045
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KAMAL KHAN			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	75.204 sq km
		Kachcha Area	0.157 sq km
		Pakka Planned Area	0.08 sq km
		Pakka Unplanned Area	1.609 sq km
		Range Land	0.009 sq km
		Bridges	3
		Bus Stops	3
		Education Facilities	49
		Grid Stations	1
		Health Facilities	5
		Mobile Towers	5
		Petrol Pumps	7
		Police Stations	2
		Settlements	18
		Tourist Places	1
		Irrigation and Drainage Network	36.968 km
		Road Network	85.301 km
Population	32309		
Household	6237		
Meteorological Drought	Medium - Extreme	Agriculture Area	75.286 sq km
		Range Land	1.147 sq km
		Wet Area	4.085 sq km
		Settlements	18
		Population	32480
		Household	6268
Agriculture Drought	Low - Extreme	Agriculture Area	91.699 sq km
		Range Land	1.435 sq km
		Wet Area	5.111 sq km
		Settlements	17
		Population	40643
		Household	7844
Heatwave	Low - High	Agriculture Area	75.187 sq km
		Kachcha Area	0.158 sq km
		Pakka Planned Area	0.08 sq km
		Pakka Unplanned Area	1.609 sq km
		Population	32320
		Settlements	16
		Household	6237

Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River; however, it can be affected by flash floods due to overflow / breaches from F.P bund during monsoon / heavy rains.
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge

KANDECHUKHI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	58.106 sq km
		Pakka Unplanned Area	0.43 sq km
		Range Land	0.146 sq km
		Bridges	1
		Education Facilities	43
		Health Facilities	1
		Settlements	22
		Irrigation and Drainage Network	41.522 km
		Road Network	62.905 km
		Population	7555
		Household	1398
Meteorological Drought	Medium – Extreme	Agriculture Area	58.194 sq km
		Range Land	1.171 sq km
		Water Body	0.068 sq km
		Wet Area	1.014 sq km
		Settlements	22
		Population	7614
		Household	1408
Agriculture Drought	Low – High	Agriculture Area	73.286 sq km
		Range Land	1.475 sq km
		Water Body	0.086 sq km
		Wet Area	1.277 sq km
		Settlements	22
		Population	9591
		Household	1772
Heatwave	Low - High	Agriculture Area	58.066 sq km
		Pakka Unplanned Area	0.431 sq km
		Population	7560

		Settlements	19
		Household	1397
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KAZI ARIF			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	51.633 sq km
		Forest Area	0 sq km
		Pakka Unplanned Area	1.268 sq km
		Range Land	0.003 sq km
		Bridges	1
		Education Facilities	31
		Mobile Towers	1
		Settlements	30
		Irrigation and Drainage Network	43.567 km
		Road Network	90.554 km
		Population	22064
		Household	3967
Meteorological Drought	Medium – Extreme	Agriculture Area	51.694 sq km
		Forest Area	0.03 sq km
		Range Land	0.095 sq km
		Water Body	0.037 sq km
		Wet Area	1.618 sq km
		Settlements	30
		Population	22258
		Household	4003
Agriculture Drought	Low - High	Agriculture Area	65.325 sq km
		Forest Area	0.038 sq km
		Range Land	0.12 sq km
		Water Body	0.047 sq km
		Wet Area	2.045 sq km
		Settlements	30
		Population	28127
		Household	5059

Heatwave	Low - High	Agriculture Area	51.601 sq km
		Pakka Unplanned Area	1.27 sq km
		Population	22099
		Settlements	30
		Household	3977
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KHAN-JO-GOTH			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	50.392 sq km
		Kachcha Area	0.146 sq km
		Natural Vegetation in Wet Areas	0.018 sq km
		Pakka Unplanned Area	1.132 sq km
		Range Land	0.02 sq km
		Bridges	2
		Education Facilities	35
		Grid Stations	1
		Health Facilities	3
		Mobile Towers	2
		Petrol Pumps	1
		Settlements	30
		Irrigation and Drainage Network	42.673 km
		Road Network	76.467 km
		Population	22240
Household	4004		
Meteorological Drought	Medium – Extreme	Agriculture Area	50.478 sq km
		Natural Vegetation in Wet Areas	1.079 sq km
		Range Land	0.235 sq km
		Water Body	0.01 sq km
		Wet Area	4.817 sq km
		Settlements	30
		Population	22426
		Household	4037

Agriculture Drought	Low - Extreme	Agriculture Area	63.828 sq km
		Natural Vegetation in Wet Areas	1.364 sq km
		Range Land	0.298 sq km
		Water Body	0.012 sq km
		Wet Area	6.087 sq km
		Settlements	30
		Population	28357
		Household	5106
Heatwave	Low - High	Agriculture Area	50.358 sq km
		Kachcha Area	0.145 sq km
		Pakka Unplanned Area	1.133 sq km
		Population	22246
		Settlements	29
		Household	4005
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KHUDABAD			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	54.468 sq km
		Pakka Unplanned Area	1.07 sq km
		Range Land	0.001 sq km
		Bridges	2
		Education Facilities	51
		Health Facilities	2
		Mobile Towers	2
		Petrol Pumps	2
		Settlements	26
		Irrigation and Drainage Network	18.043 km
		Railway Line	4.942 km
		Road Network	91.041 km
		Population	25872
Household	4841		
Meteorological	Medium - Extreme	Agriculture Area	54.518 sq km

Drought		Range Land	0.003 sq km
		Water Body	0 sq km
		Wet Area	0.186 sq km
		Settlements	26
		Population	26146
		Household	4892
Agriculture Drought	Low - High	Agriculture Area	68.149 sq km
		Range Land	0.004 sq km
		Water Body	0 sq km
		Wet Area	0.233 sq km
		Settlements	26
		Population	32697
		Household	6114
Heatwave	Low - High	Agriculture Area	54.451 sq km
		Pakka Unplanned Area	1.073 sq km
		Population	25955
		Settlements	26
		Household	4857
Riverine Flood	Low - High	Education Facilities	2
		Settlements	4
		Irrigation and Drainage Network	2.825 km
		Road Network	8.118 km
		Agriculture Area	6.99 sq km
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KIRTHER RANGE			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	1.216 sq km
		Natural Vegetation in Wet Areas	0.196 sq km
		Pakka Planned Area	0.429 sq km
		Range Land	0.165 sq km
		Mobile Towers	1
		Police Stations	2
		Settlements	1
		Tourist Places	1

		Road Network	59.865 km
Meteorological Drought	Medium – Extreme	Agriculture Area	1.238 sq km
		Bare Area with sparse Natural Vegetation	1103.876 sq km
		Natural Vegetation in Wet Areas	33.126 sq km
		Range Land	291.405 sq km
		Water Body	0.323 sq km
		Settlements	1
Agriculture Drought	Low - Extreme	Agriculture Area	1.328 sq km
		Bare Area with sparse Natural Vegetation	645.062 sq km
		Natural Vegetation in Wet Areas	40.928 sq km
		Range Land	166.506 sq km
		Water Body	0.403 sq km
		Settlements	1
Heatwave	Low - High	Agriculture Area	1.211 sq km
		Pakka Planned Area	0.431 sq km
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

KOLACHI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	40.436 sq km
		Natural Vegetation in Wet Areas	0.096 sq km
		Pakka Unplanned Area	1.345 sq km
		Bridges	2
		Education Facilities	43
		Health Facilities	3
		Mobile Towers	2
Petrol Pumps	1		

		Settlements	34
		Irrigation and Drainage Network	38.593 km
		Road Network	66.77 km
		Population	23536
		Household	4318
Meteorological Drought	Medium - Extreme	Agriculture Area	40.592 sq km
		Natural Vegetation in Wet Areas	2.816 sq km
		Water Body	2.266 sq km
		Wet Area	1.704 sq km
		Settlements	34
		Population	23771
		Household	4358
Agriculture Drought	Low - High	Agriculture Area	51.228 sq km
		Natural Vegetation in Wet Areas	3.554 sq km
		Water Body	2.86 sq km
		Wet Area	2.152 sq km
		Settlements	34
		Population	29995
		Household	5500
Heatwave	Low - High	Agriculture Area	40.372 sq km
		Pakka Unplanned Area	1.348 sq km
		Population	23598
		Settlements	34
		Household	4324
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

MAKHDOOM SAHIB			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	62.823 sq km
		Forest Area	0.003 sq km
		Kachcha Area	0.195 sq km
		Pakka Unplanned Area	1.53 sq km

		Range Land	0.083 sq km
		Education Facilities	71
		Health Facilities	2
		Mobile Towers	6
		Petrol Pumps	2
		Settlements	51
		Irrigation and Drainage Network	22.882 km
		Road Network	112.542 km
		Population	23244
		Household	4546
Meteorological Drought	Medium - Extreme	Agriculture Area	62.958 sq km
		Forest Area	0.073 sq km
		Range Land	1.508 sq km
		Water Body	0.564 sq km
		Wet Area	2.555 sq km
		Settlements	51
		Population	23505
		Household	4593
Agriculture Drought	Low - High	Agriculture Area	75.518 sq km
		Forest Area	0.092 sq km
		Range Land	1.894 sq km
		Water Body	0.705 sq km
		Wet Area	2.759 sq km
		Settlements	51
		Population	29493
		Household	5760
Heatwave	Low - High	Agriculture Area	62.762 sq km
		Kachcha Area	0.195 sq km
		Pakka Unplanned Area	1.535 sq km
		Population	23329
		Settlements	51
		Household	4560
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

MANGWANI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	52.813 sq km
		Kachcha Area	0.058 sq km
		Natural Vegetation in Wet Areas	0.018 sq km
		Pakka Unplanned Area	0.346 sq km
		Range Land	0.058 sq km
		Education Facilities	19
		Settlements	14
		Irrigation and Drainage Network	50.395 km
		Road Network	79.488 km
		Population	7079
Household	1294		
Meteorological Drought	Medium – Extreme	Agriculture Area	52.908 sq km
		Natural Vegetation in Wet Areas	0.317 sq km
		Range Land	3.921 sq km
		Water Body	0.257 sq km
		Wet Area	2.008 sq km
		Settlements	14
		Population	7137
		Household	1305
Agriculture Drought	Low - High	Agriculture Area	66.812 sq km
		Natural Vegetation in Wet Areas	0.4 sq km
		Range Land	4.952 sq km
		Water Body	0.324 sq km
		Wet Area	2.536 sq km
		Settlements	14
		Population	9012
		Household	1649
Heatwave	Low - High	Agriculture Area	52.768 sq km
		Kachcha Area	0.059 sq km
		Pakka Unplanned Area	0.347 sq km
		Population	7094
		Settlements	14
		Household	1298
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	

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

MITHO BABAR			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	75.327 sq km
		Pakka Unplanned Area	1.063 sq km
		Range Land	0.121 sq km
		Bridges	3
		Education Facilities	48
		Health Facilities	2
		Mobile Towers	1
		Petrol Pumps	3
		Settlements	24
		Irrigation and Drainage Network	36.783 km
		Road Network	112.588 km
		Population	16337
		Household	3101
Meteorological Drought	Medium – Extreme	Agriculture Area	75.404 sq km
		Range Land	6.329 sq km
		Water Body	0.121 sq km
		Settlements	24
		Population	16510
		Household	3133
Agriculture Drought	Low - Extreme	Agriculture Area	94.825 sq km
		Range Land	7.959 sq km
		Water Body	0.152 sq km
		Settlements	24
		Population	20761
		Household	3941
Heatwave	Low - High	Agriculture Area	75.283 sq km
		Pakka Unplanned Area	1.065 sq km
		Population	16364
		Settlements	24
		Household	3105

Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge

MONDER			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	80.239 sq km
		Kachcha Area	0.104 sq km
		Natural Vegetation in Wet Areas	0.03 sq km
		Pakka Planned Area	0.383 sq km
		Pakka Unplanned Area	2.84 sq km
		Range Land	0.009 sq km
		Education Facilities	67
		Grid Stations	1
		Health Facilities	2
		Mobile Towers	5
		Petrol Pumps	8
		Police Stations	5
		Power Plants	1
		Settlements	32
		Tourist Places	2
		Irrigation and Drainage Network	20.472 km
		Railway Line	3.521 km
		Road Network	116.472 km
Population	69930		
Household	12936		
Meteorological Drought	Medium – Extreme	Agriculture Area	80.417 sq km
		Natural Vegetation in Wet Areas	3.446 sq km
		Range Land	0.231 sq km
		Water Body	0.809 sq km
		Wet Area	6.823 sq km
		Settlements	32

		Population	70366
		Household	13019
Agriculture Drought	Low - High	Agriculture Area	100.779 sq km
		Natural Vegetation in Wet Areas	4.31 sq km
		Range Land	0.289 sq km
		Water Body	1.011 sq km
		Wet Area	7.087 sq km
		Settlements	32
		Population	88161
		Household	16311
Heatwave	Low - High	Agriculture Area	80.151 sq km
		Kachcha Area	0.105 sq km
		Pakka Planned Area	0.384 sq km
		Pakka Unplanned Area	2.848 sq km
		Population	70121
		Settlements	32
		Household	12973
Riverine Flood	Low - Extreme	Education Facilities	11
		Settlements	4
		Road Network	20.095 km
		Agriculture Area	38.922 sq km
		Kachcha Area	0.085 sq km
		Natural Vegetation in Wet Areas	0.066 sq km
		Pakka Unplanned Area	0.337 sq km
		Population	10375
		House Hold	1942
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

MURADABAD CHANNA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	61.097 sq km
		Forest Area	0.002 sq km
		Kachcha Area	0.18 sq km
		Pakka Planned Area	0.573 sq km
		Pakka Unplanned	0.453 sq km

		Area	
		Range Land	0.019 sq km
		Education Facilities	53
		Power Plants	1
		Settlements	27
		Tourist Places	1
		Irrigation and Drainage Network	25.681 km
		Road Network	94.17 km
		Population	8531
		Household	1669
Meteorological Drought	Medium - Extreme	Agriculture Area	61.167 sq km
		Forest Area	0.041 sq km
		Range Land	0.769 sq km
		Wet Area	0.73 sq km
		Settlements	27
		Population	8656
		Household	1693
Agriculture Drought	Low - High	Agriculture Area	76.437 sq km
		Forest Area	0.051 sq km
		Range Land	0.963 sq km
		Wet Area	0.914 sq km
		Settlements	27
		Population	10827
		Household	2118
Heatwave	Low - High	Agriculture Area	61.08 sq km
		Kachcha Area	0.18 sq km
		Pakka Planned Area	0.573 sq km
		Pakka Unplanned Area	0.454 sq km
		Population	8546
		Settlements	26
		Household	1671
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

NALS GEOGRAPHICAL AREA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	3.356 sq km
		Natural Vegetation in Wet Areas	0.015 sq km
		Range Land	0.072 sq km
		Police Stations	1
		Tourist Places	1
		Road Network	8.779 km
Meteorological Drought	Medium – Extreme	Agriculture Area	3.463 sq km
		Bare Area with sparse Natural Vegetation	820.394 sq km
		Forest Area	0.04 sq km
		Natural Vegetation in Wet Areas	19.438 sq km
		Range Land	183.219 sq km
		Water Body	0.095 sq km
Agriculture Drought	Low - High	Agriculture Area	0.913 sq km
		Bare Area with sparse Natural Vegetation	350.776 sq km
		Forest Area	0.041 sq km
		Natural Vegetation in Wet Areas	22.568 sq km
		Range Land	71.389 sq km
		Water Body	0.117 sq km
Heatwave	Low	Agriculture Area	3.349 sq km
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

NAO GOTH			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	168.964 sq km

		Kachcha Area	0.603 sq km
		Natural Vegetation in Wet Areas	0.234 sq km
		Pakka Unplanned Area	6.938 sq km
		Range Land	0.003 sq km
		Bus Stops	2
		Education Facilities	81
		Grid Stations	1
		Health Facilities	4
		Industries	2
		Mobile Towers	5
		Petrol Pumps	4
		Police Stations	2
		Settlements	98
		Irrigation and Drainage Network	55.207 km
		Railway Line	10.471 km
		Road Network	248.35 km
		Population	119882
		Household	21799
Meteorological Drought	Medium - Extreme	Agriculture Area	169.498 sq km
		Natural Vegetation in Wet Areas	30.927 sq km
		Range Land	0.119 sq km
		Water Body	4.866 sq km
		Wet Area	3.368 sq km
		Settlements	98
		Population	120786
		Household	21962
Agriculture Drought	Low - High	Agriculture Area	196.028 sq km
		Natural Vegetation in Wet Areas	38.733 sq km
		Range Land	0.15 sq km
		Water Body	6.087 sq km
		Wet Area	2.134 sq km
		Settlements	80
		Population	126864
		Household	23075
Heatwave	Low - High	Agriculture Area	168.756 sq km
		Kachcha Area	0.607 sq km
		Pakka Unplanned Area	6.951 sq km
		Population	120161

		Settlements	95
		Household	21850
Riverine Flood	Low - Extreme	Education Facilities	8
		Settlements	28
		Irrigation and Drainage Network	15.466 km
		Road Network	98.061 km
		Agriculture Area	107.305 sq km
		Kachcha Area	0.603 sq km
		Natural Vegetation in Wet Areas	3.325 sq km
		Pakka Unplanned Area	2.193 sq km
		Population	34154
		House Hold	6198
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

PARYA			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	72.364 sq km
		Forest Area	0.002 sq km
		Pakka Planned Area	0 sq km
		Pakka Unplanned Area	2.896 sq km
		Range Land	0.048 sq km
		Bridges	4
		Bus Stops	1
		Education Facilities	60
		Health Facilities	5
		Mobile Towers	5
		Petrol Pumps	3
		Power Plants	1
		Settlements	33
		Irrigation and Drainage Network	48.231 km
		Railway Line	6.702 km
		Road Network	149.621 km
Population	51534		
Household	6822		

Meteorological Drought	Medium - Extreme	Agriculture Area	72.55 sq km
		Forest Area	0.046 sq km
		Range Land	1.247 sq km
		Water Body	3.6 sq km
		Wet Area	2.269 sq km
		Settlements	33
		Population	51978
		Household	6894
Agriculture Drought	Low - Medium	Agriculture Area	36.263 sq km
		Forest Area	0.057 sq km
		Range Land	1.385 sq km
		Water Body	3.473 sq km
		Wet Area	0.31 sq km
		Settlements	8
		Population	24912
		Household	2106
Heatwave	Low - High	Agriculture Area	72.277 sq km
		Pakka Planned Area	0 sq km
		Pakka Unplanned Area	2.903 sq km
		Population	51668
		Settlements	32
		Household	6845
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

PAT			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	98.057 sq km
		Natural Vegetation in Wet Areas	0.071 sq km
		Pakka Unplanned Area	2.262 sq km
		Range Land	0.018 sq km
		Education Facilities	44
		Health Facilities	1
		Settlements	32

		Irrigation and Drainage Network	41.083 km
		Road Network	132.864 km
		Population	54124
		Household	10113
Meteorological Drought	Medium – Extreme	Agriculture Area	98.41 sq km
		Natural Vegetation in Wet Areas	10.338 sq km
		Range Land	1.064 sq km
		Water Body	3.774 sq km
		Wet Area	1.784 sq km
		Settlements	32
		Population	54511
		Household	10184
Agriculture Drought	Low – High	Agriculture Area	98.526 sq km
		Natural Vegetation in Wet Areas	11.46 sq km
		Range Land	0.664 sq km
		Water Body	3.818 sq km
		Wet Area	1.788 sq km
		Settlements	20
		Population	40800
		Household	7625
Heatwave	Low - High	Agriculture Area	97.923 sq km
		Pakka Unplanned Area	2.266 sq km
		Population	54210
		Settlements	32
		Household	10126
Riverine Flood	Low - High	Education Facilities	6
		Settlements	3
		Irrigation and Drainage Network	4.678 km
		Road Network	14.794 km
		Agriculture Area	50.191 sq km
		Natural Vegetation in Wet Areas	1.32 sq km
		Pakka Unplanned Area	0.252 sq km
		Population	6192
		House Hold	1157
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	

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

PAT GUL MOHAMMAD			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	299.236 sq km
		Forest Area	0.003 sq km
		Kachcha Area	0 sq km
		Natural Vegetation in Wet Areas	0.001 sq km
		Pakka Unplanned Area	2.389 sq km
		Range Land	0.351 sq km
		Education Facilities	41
		Health Facilities	1
		Mobile Towers	1
		Post Offices	1
		Settlements	36
		Irrigation and Drainage Network	5.629 km
		Road Network	39.105 km
		Population	32210
Household	6299		
Meteorological Drought	Medium – Extreme	Agriculture Area	299.628 sq km
		Bare Area with sparse Natural Vegetation	0.451 sq km
		Forest Area	0.145 sq km
		Natural Vegetation in Wet Areas	0.03 sq km
		Range Land	22.422 sq km
		Water Body	0.001 sq km
		Settlements	36
		Population	32535
Household	6360		
Heatwave	Low - High	Agriculture Area	299.093 sq km
		Kachcha Area	0 sq km
		Pakka Unplanned Area	2.396 sq km
		Population	32302
		Settlements	35
		Household	6314

Agriculture Drought	Low - Extreme	Agriculture	376.113 sq km
		Bare Area with sparse Natural Vegetation	0.566 sq km
		Forest	0.182 sq km
		Natural Vegetation in Wet Areas	0.038 sq km
		Range Lands	28.134 sq km
		Water Body	0.001 sq km
		Settlements	36
		Population	40829
		Household	7983
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

PHULJI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	110.171 sq km
		Pakka Unplanned Area	0.173 sq km
		Range Land	0.158 sq km
		Bridges	1
		Education Facilities	22
		Settlements	10
		Irrigation and Drainage Network	33.588 km
		Road Network	98.521 km
		Population	2330
		Household	456
Meteorological Drought	Medium – Extreme	Agriculture Area	110.245 sq km
		Range Land	7.097 sq km
		Water Body	0.003 sq km
		Wet Area	0.43 sq km
		Settlements	10

		Population	2346
		Household	459
Agriculture Drought	Low - Extreme	Agriculture Area	138.321 sq km
		Range Land	8.914 sq km
		Water Body	0.004 sq km
		Wet Area	0.258 sq km
		Settlements	10
		Population	2943
		Household	576
Heatwave	Low - High	Agriculture Area	110.135 sq km
		Pakka Unplanned Area	0.173 sq km
		Population	2338
		Settlements	10
		Household	457
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

PHULJI STATION			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	98.21 sq km
		Natural Vegetation in Wet Areas	0.06 sq km
		Pakka Unplanned Area	2.225 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	74
		Health Facilities	1
		Mobile Towers	4
		Petrol Pumps	3
		Police Stations	1
		Settlements	32

		Irrigation and Drainage Network	29.85 km
		Railway Line	10.287 km
		Road Network	169.283 km
		Population	51823
		Household	9737
Meteorological Drought	Medium – Extreme	Agriculture Area	98.358 sq km
		Natural Vegetation in Wet Areas	3.93 sq km
		Water Body	1.456 sq km
		Wet Area	0.533 sq km
		Settlements	32
		Population	52332
		Household	9834
Agriculture Drought	Low - High	Agriculture Area	121.6 sq km
		Natural Vegetation in Wet Areas	4.833 sq km
		Water Body	1.823 sq km
		Wet Area	0.669 sq km
		Settlements	32
		Population	65683
		Household	12342
Heatwave	Low - High	Agriculture Area	98.142 sq km
		Pakka Unplanned Area	2.232 sq km
		Population	51992
		Settlements	32
		Household	9771
Riverine Flood	Low - High	Education facilities	17
		Settlements	4
		Road	35.935 km
		Agriculture	52.215 sq km
		Natural vegetation in wet areas	0.069 sq km
		Pakka unplanned	0.313 sq km
		Population	7701
		House hold	1440
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

PIARO STATION			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	54.178 sq km
		Pakka Planned Area	0.353 sq km
		Pakka Unplanned Area	1.323 sq km
		Range Land	0.015 sq km
		Bridges	1
		Bus Stops	1
		Education Facilities	58
		Grid Stations	1
		Health Facilities	5
		Industries	1
		Mobile Towers	2
		Petrol Pumps	2
		Settlements	27
		Irrigation and Drainage Network	26.218 km
		Railway Line	6.8 km
		Road Network	95.84 km
		Population	30526
Household	5695		
Meteorological Drought	Medium - Extreme	Agriculture Area	54.229 sq km
		Range Land	0.119 sq km
		Water Body	1.16 sq km
		Wet Area	1.314 sq km
		Settlements	27
		Population	30717
		Household	5730
Agriculture Drought	Low - High	Agriculture Area	62.217 sq km
		Range Land	0.149 sq km
		Water Body	1.458 sq km
		Wet Area	1.497 sq km
		Settlements	21
		Population	32030
		Household	5977
Heatwave	Low - High	Agriculture Area	54.154 sq km
		Pakka Planned Area	0.354 sq km
		Pakka Unplanned Area	1.325 sq km
		Population	30573

		Settlements	27
		Household	5702
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

PIPRI			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	40.686 sq km
		Pakka Planned Area	0.598 sq km
		Pakka Unplanned Area	1.902 sq km
		Range Land	0 sq km
		Bridges	4
		Education Facilities	48
		Health Facilities	1
		Industries	1
		Mobile Towers	3
		Petrol Pumps	6
		Police Stations	1
		Settlements	28
		Irrigation and Drainage Network	24.703 km
		Railway Line	8.692 km
		Road Network	77.369 km
Population	50888		
Household	9337		
Meteorological Drought	Medium - Extreme	Agriculture Area	40.754 sq km
		Range Land	0.01 sq km
		Wet Area	0.2 sq km
		Settlements	28
		Population	51234
		Household	9401
Agriculture Drought	Low - High	Agriculture Area	51.005 sq km
		Range Land	0.013 sq km
		Wet Area	0.25 sq km
		Settlements	28
		Population	64146

		Household	11773
Heatwave	Low - High	Agriculture Area	40.659 sq km
		Pakka Planned Area	0.597 sq km
		Pakka Unplanned Area	1.905 sq km
		Population	50941
		Settlements	27
		Household	9346
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

RADHAN			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	2.496 sq km
		Pakka Unplanned Area	0.654 sq km
		Bridges	1
		Education Facilities	6
		Mobile Towers	2
		Post Offices	1
		Settlements	7
		Irrigation and Drainage Network	3.431 km
		Road Network	15.136 km
		Population	9852
		Household	1769
Meteorological Drought	Medium - Extreme	Agriculture Area	2.501 sq km
		Water Body	0.02 sq km
		Settlements	7
		Population	9909
		Household	1780
Agriculture Drought	Low - Medium	Agriculture Area	3.159 sq km
		Water Body	0.025 sq km
		Settlements	7
		Population	12515
		Household	2248

Heatwave	Low - High	Agriculture Area	2.493 sq km
		Pakka Unplanned Area	0.654 sq km
		Population	9867
		Settlements	7
		Household	1772
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

SAWRO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	206.196 sq km
		Forest Area	0.011 sq km
		Kachcha Area	0.17 sq km
		Natural Vegetation in Wet Areas	0.029 sq km
		Pakka Unplanned Area	1.021 sq km
		Range Land	0.394 sq km
		Bridges	1
		Education Facilities	37
		Health Facilities	1
		Settlements	42
		Tourist Places	1
		Irrigation and Drainage Network	13.149 km
		Road Network	38.438 km
		Population	16053
Household	3139		
Meteorological Drought	Medium – Extreme	Agriculture Area	206.56 sq km
		Bare Area with sparse Natural Vegetation	2.3 sq km
		Forest Area	0.756 sq km
		Natural Vegetation in Wet Areas	1.185 sq km
		Range Land	14.454 sq km
		Wet Area	4.092 sq km

		Settlements	42
		Population	16226
		Household	3173
Agriculture Drought	Medium - Extreme	Agriculture Area	258.293 sq km
		Bare Area with sparse Natural Vegetation	2.872 sq km
		Forest Area	0.946 sq km
		Natural Vegetation in Wet Areas	1.482 sq km
		Range Land	18.08 sq km
		Wet Area	5.116 sq km
		Settlements	42
		Population	20288
		Household	3966
Heatwave	Low - High	Agriculture Area	206.121 sq km
		Kachcha Area	0.17 sq km
		Pakka Unplanned Area	1.024 sq km
		Population	16100
		Settlements	38
		Household	3145
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

SHAH PANJO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	19.512 sq km
		Pakka Unplanned Area	0.578 sq km
		Education Facilities	10
		Settlements	9
		Irrigation and Drainage Network	11.32 km

		Road Network	44.008 km
		Population	10100
		Household	1836
Meteorological Drought	Medium – Extreme	Agriculture Area	19.604 sq km
		Water Body	2.882 sq km
		Wet Area	0.659 sq km
		Settlements	9
		Population	10206
		Household	1856
Agriculture Drought	Low - High	Agriculture Area	24.735 sq km
		Water Body	3.636 sq km
		Wet Area	0.831 sq km
		Settlements	9
		Population	12877
		Household	2342
Heatwave	Low - High	Agriculture Area	19.476 sq km
		Pakka Unplanned Area	0.58 sq km
		Population	10133
		Settlements	9
		Household	1843
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

SIAL			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	143.581 sq km
		Kachcha Area	0.031 sq km
		Natural Vegetation in Wet Areas	0.079 sq km
		Pakka Planned Area	0.566 sq km
		Pakka Unplanned Area	5.973 sq km
		Range Land	0.008 sq km
		Ambulance Services	1
		Bridges	3

		Bus Stops	1
		Education Facilities	117
		Fire Stations	1
		Health Facilities	10
		Mobile Towers	14
		Petrol Pumps	7
		Police Stations	5
		Post Offices	3
		Settlements	63
		Irrigation and Drainage Network	21.653 km
		Railway Line	5.216 km
		Road Network	207.413 km
		Population	148112
		Household	27035
Meteorological Drought	Medium – Extreme	Agriculture Area	143.865 sq km
		Natural Vegetation in Wet Areas	16.219 sq km
		Range Land	0.163 sq km
		Water Body	2.054 sq km
		Wet Area	3.489 sq km
		Settlements	63
		Population	148539
		Household	27115
Agriculture Drought	Low - High	Agriculture Area	179.968 sq km
		Natural Vegetation in Wet Areas	20.215 sq km
		Range Land	0.205 sq km
		Water Body	2.488 sq km
		Wet Area	2.007 sq km
		Settlements	57
		Population	180240
		Household	32873
Heatwave	Low - High	Agriculture Area	143.461 sq km
		Kachcha Area	0.032 sq km
		Pakka Planned Area	0.567 sq km
		Pakka Unplanned Area	5.973 sq km
		Population	148082
		Settlements	63
		Household	27031
Riverine Flood	Low - Extreme	Education Facilities	27

		Health Facilities	1
		Police Stations	1
		Settlements	23
		Road Network	75.589 km
		Agriculture Area	109.356 sq km
		Kachcha Area	0.031 sq km
		Natural Vegetation in Wet Areas	1.414 sq km
		Pakka Unplanned Area	0.865 sq km
		Range Land	0.005 sq km
		Population	17990
		House Hold	3363
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

TANDO RAHIM KHAN			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	118.943 sq km
		Kachcha Area	0.508 sq km
		Natural Vegetation in Wet Areas	0.062 sq km
		Pakka Unplanned Area	3.021 sq km
		Range Land	0.111 sq km
		Education Facilities	39
		Grid Stations	1
		Health Facilities	6
		Mobile Towers	2
		Petrol Pumps	1
		Settlements	41
		Road Network	14.359 km
		Population	47577
		Household	9294
Meteorological Drought	Medium – Extreme	Agriculture Area	119.228 sq km
		Bare Area with sparse Natural Vegetation	38.715 sq km
		Natural Vegetation in Wet Areas	8.132 sq km
		Range Land	9.213 sq km

		Settlements	40
		Population	47921
		Household	9365
Agriculture Drought	Medium - Extreme	Agriculture Area	148.992 sq km
		Bare Area with sparse Natural Vegetation	48.385 sq km
		Natural Vegetation in Wet Areas	10.166 sq km
		Range Land	11.513 sq km
		Settlements	40
		Population	59893
		Household	11702
Heatwave	Low – High	Agriculture Area	118.928 sq km
		Kachcha Area	0.509 sq km
		Pakka Unplanned Area	3.027 sq km
		Population	47676
		Settlements	39
		Household	9318
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	
THALHO			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	28.977 sq km
		Pakka Planned Area	0.142 sq km
		Pakka Unplanned Area	1.499 sq km
		Range Land	0.029 sq km
		Education Facilities	48
		Mobile Towers	5
		Petrol Pumps	6
		Settlements	29
		Irrigation and Drainage Network	26.042 km
		Road Network	58.667 km
		Population	28467
Household	5329		

Meteorological Drought	Medium – Extreme	Agriculture Area	29.09 sq km
		Range Land	1.228 sq km
		Water Body	1.774 sq km
		Wet Area	3.388 sq km
		Settlements	29
		Population	28702
		Household	5370
Agriculture Drought	Low - Extreme	Agriculture Area	36.665 sq km
		Range Land	1.548 sq km
		Water Body	2.236 sq km
		Wet Area	4.184 sq km
		Settlements	29
		Population	36178
		Household	6767
Heatwave	Low - High	Agriculture Area	28.932 sq km
		Pakka Planned Area	0.142 sq km
		Pakka Unplanned Area	1.5 sq km
		Population	28473
		Settlements	29
		Household	5332
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

THARIRI MUHABAT			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	31.757 sq km
		Pakka Unplanned Area	0.881 sq km
		Bridges	3
		Education Facilities	18
		Health Facilities	1
		Petrol Pumps	1
		Settlements	19
		Irrigation and Drainage Network	15.197 km

		Road Network	48.998 km
		Population	14261
		Household	2567
Meteorological Drought	Medium – Extreme	Agriculture Area	31.826 sq km
		Water Body	2.898 sq km
		Wet Area	0.033 sq km
		Settlements	19
		Population	14421
		Household	2595
Agriculture Drought	Low - High	Agriculture Area	40.196 sq km
		Water Body	3.66 sq km
		Wet Area	0.042 sq km
		Settlements	19
		Population	18213
		Household	3277
Heatwave	Low - High	Agriculture Area	31.729 sq km
		Pakka Unplanned Area	0.882 sq km
		Population	14283
		Settlements	17
		Household	2570
Riverine Flood	Nil	The UC falls out of vulnerable zone for Riverine Flood	
Cyclone	Nil	The UC falls out of vulnerable zone for Cyclone	
Tsunami	Nil	The UC falls out of vulnerable zone for Tsunami	
Storm Surge	Nil	The UC falls out of vulnerable zone for Storm Surge	

TOR			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	69.727 sq km
		Forest Area	0 sq km
		Kachcha Area	1.38 sq km
		Natural Vegetation in Wet Areas	0.024 sq km
		Pakka Unplanned Area	1.252 sq km
		Range Land	0.419 sq km
		Bridges	2
		Education Facilities	48

		Health Facilities	3
		Mobile Towers	5
		Police Stations	1
		Post Offices	2
		Settlements	41
		Road Network	7.67 km
		Population	39602
		Household	7555
Meteorological Drought	Medium – Extreme	Agriculture Area	70.191 sq km
		Bare Area with sparse Natural Vegetation	4.97 sq km
		Forest Area	0.018 sq km
		Natural Vegetation in Wet Areas	6.451 sq km
		Range Land	36.527 sq km
		Settlements	40
		Population	39941
		Household	7616
Agriculture Drought	Low - Extreme	Agriculture Area	88.132 sq km
		Bare Area with sparse Natural Vegetation	6.229 sq km
		Forest Area	0.023 sq km
		Natural Vegetation in Wet Areas	8.09 sq km
		Range Land	45.874 sq km
		Settlements	40
		Population	50155
		Household	9563
Heatwave	Low - High	Agriculture Area	69.554 sq km
		Kachcha Area	1.382 sq km
		Pakka Unplanned Area	1.254 sq km
		Population	39679
		Settlements	39
		Household	7568
Riverine Flood	Nil	The UC is not prone to flood hazard due to Indus River. However, Nai Gaj Nadi passes near the UC and has potential to produce flooding during monsoon / heavy rains. In case of excessive water in Nai Gaj Nadi, overtopping / breaching and consequent residual risk of flooding cannot be ruled out for UC.	

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

ORGANIZATION STRUCTURE FOR DISASTER MANAGEMENT AT DISTRICT LEVEL

INTRODUCTION

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

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

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

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

Table 2: District Disaster Management Authority

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

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

Table 3: TDMC Taluka Disaster Management Committee

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

Table 4: UCDMC Union Council Disaster Management Committee

Sr.#	Committee Representative	Role
1.	UC Administrator	Chairperson
2.	Secretary UC	Secretary
3.	Station House Officer (Police) – Concerned	Member

4.	Two Representatives of NGOs/Civil Society	Members
5.	Representation of Volunteers from Communities at Risk	Members
6.	Representation of Renowned Persons	Members

RESPONSIBILITY OF DISTRICT DISASTER MANAGEMENT AUTHORITY

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

FUNCTION OF DDMA

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

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

RESPONSIBILITY OF TALUKA DISASTER MANAGEMENT COMMITTEE

- The TDMC shall work as front-line body for disaster management in the district and shall ensure implementation of disaster management measures set by DDMA and PDMA

- The TDMC shall interface directly with communities at risk in disaster preparedness, disaster risk reduction and response
- The TDMC shall bridge between government and communities in disaster response
- The TDMC shall coordinate between DDMA, PDMA and all stakeholders working at grass-root level in pre, during and post disaster events

FUNCTION OF TALUKA DISASTER MANAGEMENT COMMITTEE

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

RESPONSIBILITY OF UNION COUNCIL DISASTER MANAGEMENT COMMITTEE

1. UCDMC shall work as front-line, first responder body at village, mohalla and ward level.
2. Shall assist TDMC, DDMA and PDMA especially in disaster response.
3. Shall encourage and keep record of volunteers in Union Council.

4. Shall formulate different groups to respond disaster and emergency events such as evacuation group, camp management group etc. and share this record with TDMC, DDMA and PDMA.
5. Shall prepare awareness and capacity development proposals and training programs and follow-up with TDMC, DDMA and PDMA for arranging such events at grass root level.

FUNCTION OF UCDMC

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

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 scars in disaster response activities
- Publish, broadcast /telecast programs highlighting government initiatives and collective response of NGOs, INGOs and other departments for relief and rehabilitation

PAKISTAN METEOROLOGICAL DEPARTMENT (PMD)

Pre-Disaster

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

During-Disaster

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

Post-Disaster

- Technical assistance in rescue and rehabilitation process

POLICE DEPARTMENT

Pre-Disaster

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

During-Disaster

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

Post-Disaster

- Assist in relief and rehabilitation process

REVENUE DEPARTMENT

Pre-Disaster

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

During-Disaster

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

Post-Disaster

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

ARMED FORCES

Pre-Disaster

- Coordinate with the DDMA in the pre-disaster planning

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

During-Disaster

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

Post-Disaster

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

SOCIAL WELFARE AND COMMUNITY DEVELOPMENT

Pre-Disaster

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

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

During-Disaster

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

Post-Disaster

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

NGOs / INGOs

Pre-Disaster

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

- Resource mobilization at local and international level

During-Disaster

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

Post-Disaster

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

DISASTER MANAGEMENT GUIDELINES

INTRODUCTION

Multi-Hazard Vulnerability Risk Assessment of Dadu district reveals that the district is relatively safe in terms of natural disasters. The pertinent hazards to district are hydro-meteorological hazards including drought and riverine flood (09 UCs) with the potential to cause urban flooding. The risk of geophysical hazards is low in the district. In modern technological era, hydro-meteorological hazards can be precisely forecasted and action can be taken well in time to minimize damages and losses. In other words, the vulnerabilities and risks are manageable and losses and damages can be minimized through adoption of best management practices and mobilization of resources.

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

Riverine 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 Dadu adjoining river Indus are likely to be affected due to breaches in embankments of river Indus.3. It is highly recommended to identify and reinforce sections of vulnerable embankments before flooding season to avoid breaches in embankments and consequential damages.4. As far as riverine floods are concerned, the Sindh province has sufficient time for preparation and reaction. Close monitoring of river discharge level in coordination with irrigation department, the government of
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	<p>Punjab, Federal Flood Commission and Pakistan Meteorological Department (PMD) be conducted.</p> <ol style="list-style-type: none"> 5. Timely alerts be issued to people living in low lying areas within flood plain. 6. In case of high anticipated flows evacuation of people and livestock be carried out. 7. Soaking and compacting of embankments before arrival of flood water. 8. Reinforcement and stone pitching of high-risk embankments. 9. Use alternative eco-friendly options like use of bamboo wood etc. to minimize erosion impact on high-risk embankments. 10. Where necessary and possible, erection of guide embankments and spur before arrival of high flood water. 11. 24/7 vigilance of high-risk embankments by Sindh Irrigation Department. 12. Readily availability of breach filling stock and machinery at high risk embankments. 13. Restoration of natural eco-system within flood plain such as revival of braided/Yazoo channels and natural lakes within flood plain to disperse and distribute flood water across the plain. 14. Removal of possible congestion factors within the flood plain. 15. Public participation comprising local people be encouraged in pre and during flood periods.
<p>Earthquake</p>	<ol style="list-style-type: none"> 1. The geology of Sindh is divisible in three main regions, the mountain ranges of Kirthar, Pab containing a chain of minor hills in the west and in east it is covered by the Thar Desert and part of Indian Platform where the main exposure is of Karoonjhar Mountains, which is famous for Nagar Parkar Granite. District Dadu lies on the western side of the province along the mountain ranges of Kirthar. District Dadu falls away from any major fault line and is unlikely to be affected by a massive earthquake. 2. Though risk of geophysical hazards in Dadu district is low but still some

	<p>actions must be taken to avoid losses in case of minor jolts. Urban settings are most likely to be affected by jolts. It is highly recommended to identify old and weak buildings in the city and other urban settings of the district. Local concerned authorities may decide evacuation or retrofitting of such buildings / structures.</p> <p>3. 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 Dadu district is situated.</p> <p>4. Local government departments must be strengthened to manage situation arisen from earthquake jolts. Strengthening must include capacity building to act as first responder in any likely situation.</p>
Heatwave	<p>1. Historically, district Dadu is not prone to severe heatwave spells. However, the district has witnessed rapidly increased severity of heatwave in the past five years. Most of the district is sparsely populated, which significantly lowers the chances of severe heatwave impacts. However, urban centers along with some unplanned settlements are vulnerable to heatwave.</p> <p>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.</p> <p>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 efferent and cost-effective solution is tree plantation. Tree plantation must be encouraged at levels including government functionaries, NGOs, community and individual levels.</p> <p>4. Additionally, introduction of reduced Urban Heat Islands (UHI) through policies and implementation in infrastructure development will significantly reduce impacts of heatwaves.</p>
Cyclone	<p>1. According to MHVRA Study 2022, there is no Cyclone Hazard in Dadu district.</p>

<p>Drought</p>	<ol style="list-style-type: none"> 1. Climatic condition of the district Dadu can be categorized as Hot and Semi-Arid (Climate Classification of Pakistan (Khan et al., 2010). 41.2% of the total district area consists of bare areas with sparse natural vegetation only on western hilly/mountainous areas of the district. Small water bodies are found at the eastern side of the district in proximity to the built-up areas. The rainfall in the district is insufficient with average annual rainfall 113.76 mm. 2. Drought is also forecastable hazard and can be predicted well in advance. Though drought does not bring any prominent or famine like conditions in the districts, however, it causes reduction in agricultural production and some extent disturb food supply for the animals and livestock. The best practice to manage drought related impacts is storage of food supplies for both humans and animals. 3. The situation of drought may vary in future due to climate change effects, therefore, introduction of drought resilient crops is need of the time. Additionally, efficient use of available water resources and introduction of efficient irrigation systems in agriculture sector is also required. 4. Further, farmers may be encouraged for alternative crops during expected drought seasons. Also policies for compensation of framers must also be introduced to assist and encourage drought hit farmers.
<p>Tsunami</p>	<p>According to MHVRA Study 2022, there is no Tsunami Hazard in Dadu district.</p>

STANDARD OPERATING PROCEDURES

INTRODUCTION

Overall, disaster risk reduction is collective responsibility of concerned departments, associated line departments, private sector and communities. Synergized and 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

In addition to heavy rains and 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 concerned DDMA and local	Based on forecast	PDMA

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 an 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	Post disaster	PDMA and DDMA

armed services for rescue and recovery		
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 Dadu shall ensure availability of all necessary equipment and supplies at DEOC for 24/7 operations. The deputy commissioner or chairperson DDMA will also ensure availability and presence of representatives of DDMA in DEOC during emergency operations for liaison and close coordination and smooth emergency response.
- A contact information of relevant government officials, influential personnel, political figures, volunteer groups, social welfare organizations and communities of high disaster risk prone areas shall be collected and maintained by PEOC and DEOC. For establishing quick liaison and coordination this contact information shall be used by both PEOC and DEOC. In addition to these contacts, PEOC will arrange random SMS alerts, robo calls etc. through commercial cellular services.

- The PEOC will establish the direct contact/coordination with district disaster management officer for disaster alerts and warnings and onward dissemination and other immediate actions.
- All warnings and alerts shall be carefully scrutinized by the central body i.e. PDMA and disaster warning alerts shall only be issued through single nodal agency to avoid any circulation of misinformation etc.
- During the disaster, all instructions, guidelines, action plans and advisories on disaster events, evacuation, relief operations etc. shall be issued by PEOC or DEOC in consultation with PEOC.

DISASTER MANAGEMENT PLAN

INTRODUCTION

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

Riverine Flood	
UCs at Risk (9)	Allahabad, Bali Shah, Dabhro, Khudabad, Monder, Nao Goth, Pat, Phulji Station, Sial
UCs not at Risk (38)	Bahawalpur, Baledai, Beto, Bothro, Bughia, Burira, Butra, Chhini, Chhore Qamber, Drigh Bala, Faridabad, Gahi Mahesar, Gozo, Kakar, Kalhora, Kamal Khan, Kandechukhi, Kazi Arif, Khan-Jo-Goth, Kirther Range, Kolachi, Makhdoom Sahib, Mangwani, Mitho Babar, Muradabad Channa, Nals Geographical Area, Parya, Pat Gul Mohammad, Phulji, Piaro Station, Pipri, Radhan, Sawro, Shah Panjo, Tando Rahim Khan, Thalho, Thariri Muhabat, Tor
General Description	<ol style="list-style-type: none"> Dadu district is located in the west of Sindh province and is bounded on the north by district Qamber Shahdadkot, on the east by district Larkana and Shaheed Benazirabad, on the west by Kirthar mountain range and Balochistan, and on the south by district Jamshoro. The district is mostly irrigated by Sukkur barrage. There are two main canals in the district Rice canal and Dadu canal. Besides, land is also irrigated by tube wells and spillover of river Indus. The total population of district according to 2017 census was recorded to be 1,550,266. Majority of the people live in the rural area. River Indus flows along the eastern boundary of the district. Manchar is a huge lake of the district and is used for fish breeding and as a natural reservoir. The district Dadu is prone to riverine flood. It was consecutively hit by heavy floods in 2010, 2011 and 2012. The relative severity of floods was ranked as high in district Dadu. In 2010 floods, 1,166 villages/settlements of 40 UCs and 920,105 persons were affected. There were 27 casualties and 327 injuries. The floods of 2011 had devastating effect on this district as well, with 1,454 villages/settlements of 52 union councils in 4 talukas being affected. A total population of 325,000 persons was affected and there were 19 casualties and 161 injuries. Comparatively, floods of 2012 had a very mild effect on the district, only 1 casualty was reported, no villages and population was affected. Only 214 hectares of crop area was inundated. According to MHVRA Study 2022, flood hazard intensity for district Dadu is Low to Very High. According to MHVRA Study 2022, flood risk for district Dadu is Low to Extreme."
Disaster Management Measures	
Preparedness	
<ol 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.

5. Classify and map bunds based on their origin (Mud, Brick, Stone, Concrete, Boulder, etc.)
6. Readiness of flood camps in high riverine flood and breaching risk areas.
7. Maintenance and strengthening of identified weak embankments.
8. Awareness and motivation campaigns on construction of flood resilient buildings and infrastructures.
9. Regular awareness campaigns on flood precautions and safe evacuations using various media platform.
10. Inclusion and implementation of Disaster Risk Reduction (DRR) measures in development projects at planning stage for building flood resilient infrastructure.
11. Conduct of satellite imagery based study for identification of vulnerable embankments before each monsoon and flooding period.
12. Collection and management of contact information of area/village influential for alert and warning dissemination.
13. Readiness of community-based volunteers and other related organizations / NGOs.
14. Regular community-based flood fighting trainings through government departments or any other appropriate platforms.
15. Installation of digital flood level gauges along embankments and dissemination of real-time flow level measurements to concerned authorities.
16. Installation of surveillance cameras at safe places for consistent monitoring of structural integrity of vulnerable embankments.

Response

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

Recovery and Rehabilitation

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

Earthquake	
UCs at Risk	All UCs
General Description	<ol style="list-style-type: none"> 1. 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 Dadu is "Low". 5. The earthquake risk intensity for district Dadu is "Low".
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Identifying and inventorying weak buildings and structures especially in urban settings of the district and situation demanding action by concerned departments. 2. Preparation of landuse plans, town plans and implementation of building codes in new residential schemes, schools, public and private offices. 3. Implementation of DRR measures in public infrastructure development schemes. 4. Establishment of search and rescue infrastructure and services which can be mobilized as first responder in post-earthquake situation. 5. Mobilize NGOs, INGOs, community development organizations and volunteers, and conduct earthquake safety awareness campaigns and drills especially in main urban settings. 6. Availability of necessary material and equipment required for establishing temporary shelters with life support facilities i.e. mobile medical camps, schools, power supply, water and sanitation etc. 7. Availability of alternative communication system in case if usual communication means are disturbed by earthquake. 8. Preparation of medical emergency plan to manage mass casualties in case of any major earthquake event. 	
Response	
<ol style="list-style-type: none"> 1. Obtain firsthand information on intensity of earthquake and damages; prioritize areas for search and rescue operation. 2. Mobilize community-based volunteers, scouts and other trained personnel to hard hit areas to assess situation and help victims. 3. Establish emergency camps / shelters with necessary life support facilities. 4. Establish medical camps for provision of first aid and possible medical assistance to injured. 5. Evacuate people from damaged houses to safe places and shelters. 6. Provide security in affected areas and maintain law and order situation to prevent incidents of thefts and stampede. 7. Arrangement and conduct of aerial / drone survey of the affected areas. 8. Establish information and help desks for facilitation of affectees. 9. Restore essential services like power, water supply, and telecommunication of critical infrastructure like hospitals, control Rooms, etc. on priority basis. 	

Recovery and Rehabilitation
<ol 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"> Heatwave is a condition of atmospheric temperature that leads to physiological stress, which sometimes can claim human life. 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. Dadu has a moderate climate. The highest average temperature in Dadu is 44°C in June and the lowest is 09°C in January. The winters are short and cool, and it is dry and mostly clear year round. December, January and February are the coldest months. A severe heatwave, in 2015, gripped Dadu and its surrounding areas, temperatures soared to 50 degrees Celsius. According to MHVRA Study 2022, heatwave hazard intensity for district Dadu is “Severe”. According to MHVRA Study 2022, heatwave risk for district Dadu is “Low to High”.
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> Consistent future development strategy: Tree plantation, restoration of natural ecosystem, construction of environment friendly and well planned residential societies, offices, infrastructure and human dwellings. Monitoring for hot weather alerts through local and international sources and issuance of timely Hot Day Advisories, and Hot Day Warnings. Upgradation of major public health care facilities with necessary equipment and medicines to treat heatstroke patients. Heatstroke awareness campaigns and wide public coverage through media, social media, SMS, NGOs and social welfare organizations. Arrangements for uninterrupted supply of electricity and water in vulnerable areas. 	
Response	
<ol style="list-style-type: none"> Mobilization of NGOs, social welfare organization and volunteers for arranging heatstroke facilitation camps and distribution of fresh drinking water in affected areas. Local radio FM broadcasts to disseminate heatstroke safety and precautions. Mobilize mobile medical teams for first-aid and other medical emergency support in affected area. Record keeping of heatwave patients and fatalities. 	
Recovery and Rehabilitation	
<ol style="list-style-type: none"> Post event review of heatwave plan and modifications if required. 	

Cyclone / Tsunami	
UCs at Risk	Nil
General Description	According to MHVRA Study 2022, there is no risk of Cyclone / Tsunami in Dadu district.

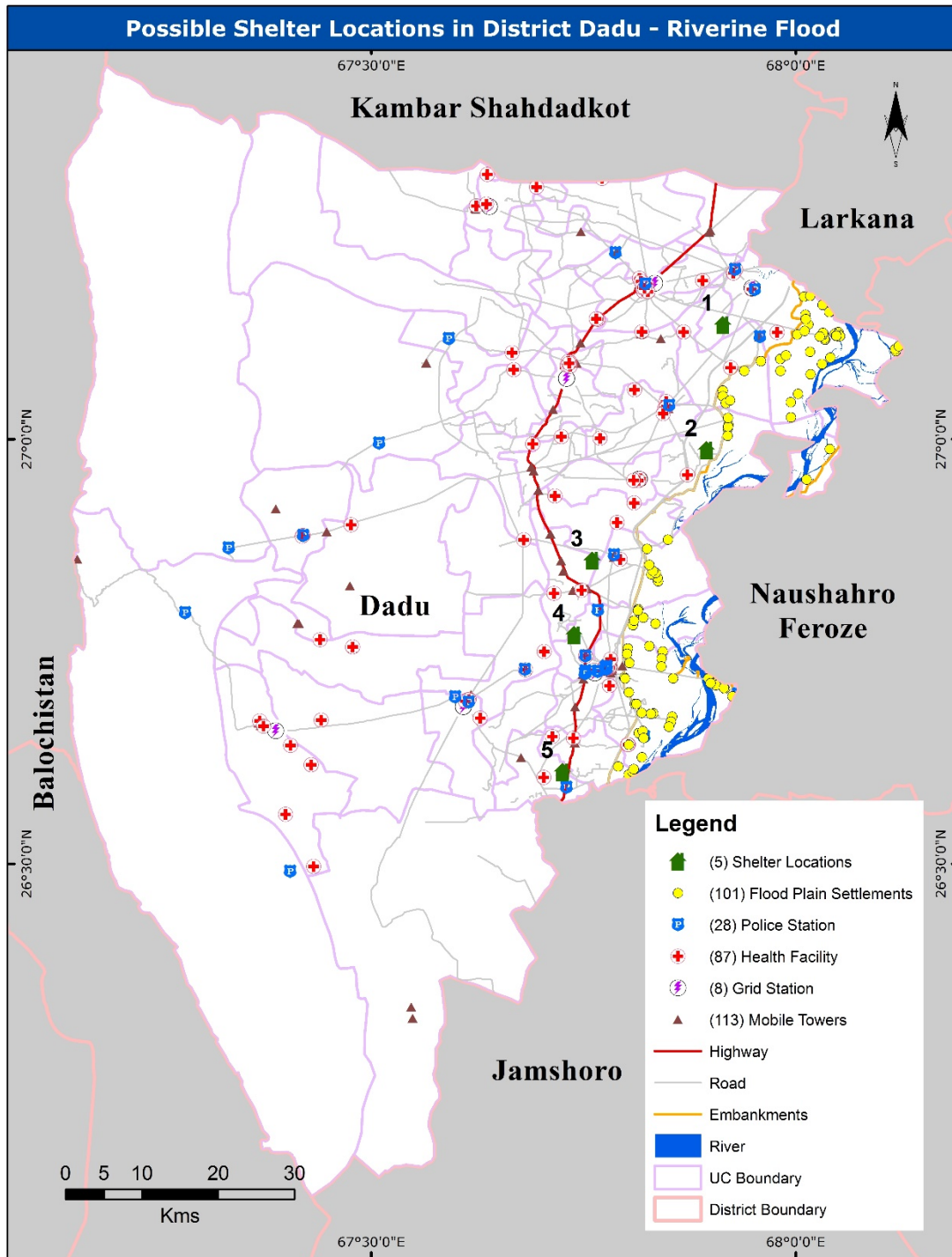
Drought	
UCs at Risk	All UCs
General Description	<ol style="list-style-type: none"> 1. Climatic condition of the district can be categorized as Hot and Semi-Arid (Climate Classification of Pakistan (Khan <i>et al.</i>, 2010) 2. Rainfall is insufficient, average annual rainfall received during a year across the district is only 113.76 mm. 3. River Indus is flowing along eastern boundary of district Dadu. 4. 41.2% of the total district area of Dadu consists of bare areas with sparse natural vegetation only on western hilly/mountainous areas. 5. Crops that are dependent on rainfall covers 17.8% of the total district area, situated in the middle of the district. Whereas, irrigated crop fields are 19% of the total district area. 6. Range lands with natural herbs and shrubs are mostly found on western hilly/mountainous area. 7. Small water bodies are mostly found at eastern side, whereas, a huge water body, Manchar lake, is situated in south of the district. 8. Irrigated crop/crop in flood plain fields are irrigated through canals tube-wells and spill-over of River Indus. 9. According to MHVRA Study 2022, <ol style="list-style-type: none"> a. Meteorological drought hazard for district Dadu is "Extreme" b. Meteorological drought risk for district Dadu is "Medium to Extreme" c. Agricultural drought hazard for district Dadu is "Mild to Extreme" d. Agricultural drought risk for district Dadu is "Low to Extreme"
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> 1. Implement Drought Early Warning System (EWS) at provincial/district level to get clear indications of the impending drought and its consequences, e.g. forecast of impending drought conditions related to changing weather conditions linked to El Nino or La Nina events. 2. Implementation of water supply and demand management and encouragement of efficient irrigation systems in agriculture. 3. Research and promote drought resistant agriculture crops. 4. Resilience and improvement of adaptive capacity of farmers. 5. Monitoring of temperature, precipitation, potential evapotranspiration, soil moisture, stream flow, groundwater levels, lakes, and reservoirs for drought forecasting. 6. Control ground water extraction from upper and lower aquifers to be within the sustainable yield limits. 	
Response	
<ol style="list-style-type: none"> 1. Assess data about the nature of drought conditions and their impact. 2. Provision and installation of solar water pumps for availability of clean drinking water. 3. Public information campaign for water management and saving. 	

Recovery and Rehabilitation

1. Cash and in-kind support to farmers for next cropping.
2. Awareness and encouragement of farmers on best irrigation practices and water saving.

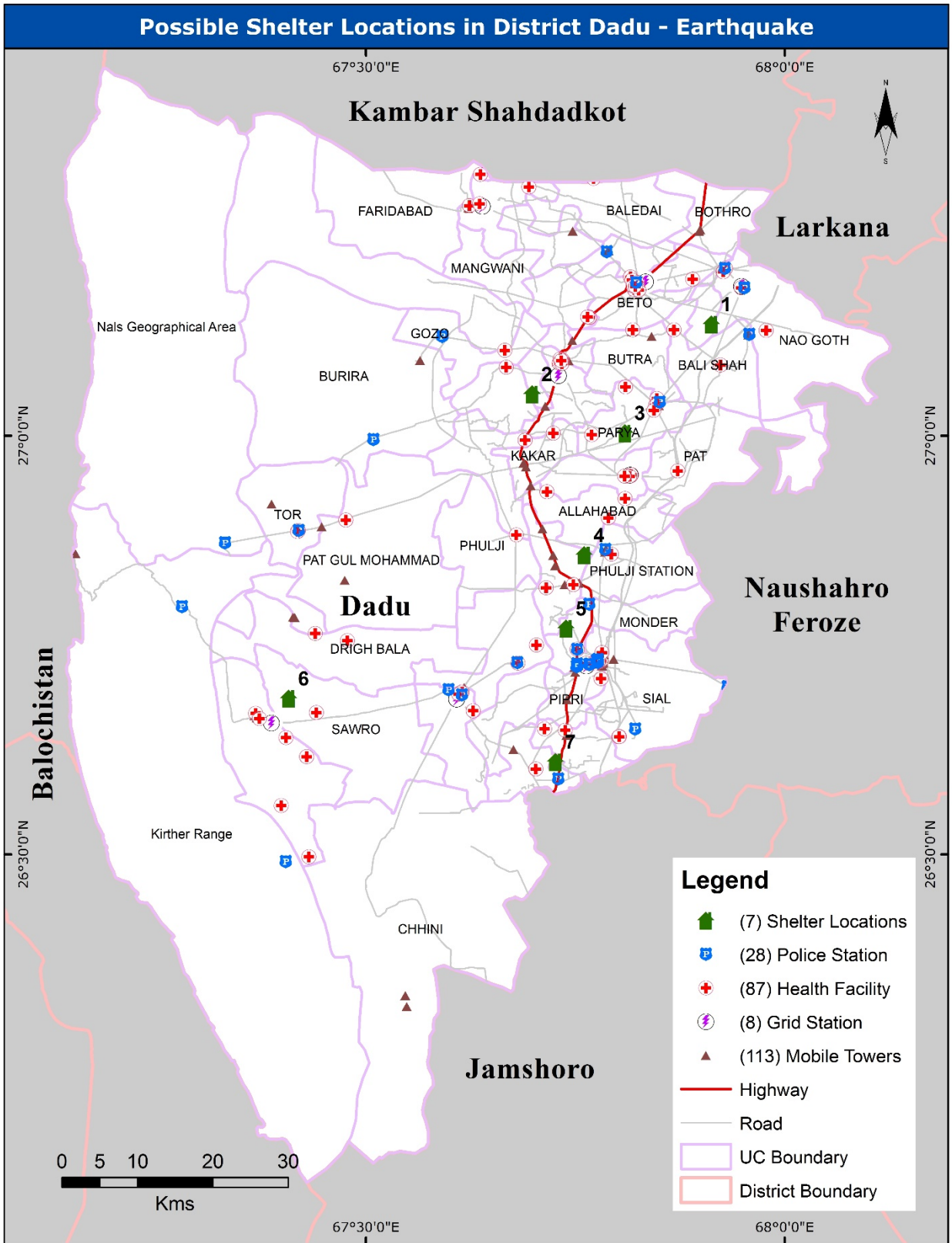
SHELTER LOCATION MAP

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



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

*Annex-B details the list of flood shelter locations



*Annex-C details the list of earthquake shelter locations

Proposed Priority Disaster Risk Management Projects

INTRODUCTION

Following are the recommended disaster risk management projects, which may be initiated to ensure effective disaster management in district Dadu. 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 – DADU DISTRICT

The existing nature of disaster in Dadu district can be categorized in low to extreme range. The prominent hazards in the district are riverine flood, drought, and heatwave. As far as riverine flood is concerned the settled areas of few UCs in the district are likely to be effected only 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. There is no risk of storm surge, cyclone and tsunami in the district. For other hazards like earthquake the risk is low, heat wave low to high, agricultural drought low to extreme and that of meteorological drought medium to extreme. 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:

Table9: Cost Benefit Analysis of Disaster Risk Measures in District Dadu

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 Dadu, as these can accommodate large number of people during disasters. Gradually, permanent multi-purpose shelters specially in near river 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 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 issued 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 (101) within flood Plains Prone to Riverine Flood

S.No	Name	long	lat	Area (acres)
1	Adam Phanwar	67.851	26.662	20.24
2	Admani	67.819	26.678	4.52
3	Ahmad	67.812	26.688	5.14
4	Amb Magsi	67.982	27.080	18.36
5	Ameenani Shareef	67.804	26.640	37.57
6	Bambia	67.854	26.673	10.53
7	Barai	67.830	26.677	3.01
8	Budhar	67.809	26.611	6.42
9	Chanrat Nau	67.820	26.656	4.69
10	Chhoti Sita	67.920	27.015	0.63
11	Dawach	67.832	26.845	7.30
12	Dost Mohammad	67.804	26.702	8.75
13	Goth Abdul Latif Chandio	68.040	26.988	5.44
14	Goth Bachna	67.918	27.043	8.43
15	Goth Behram Machhi	67.923	27.046	11.00
16	Goth Chandio	68.018	27.077	10.31
17	Goth Charo	68.010	27.168	5.04
18	Goth Dodo Kalhoro	68.041	27.096	-
19	Goth Ishaq Machhi	68.028	27.121	10.60
20	Goth Khair Muhammad	67.914	27.050	5.87
21	Goth Khokhar	67.920	27.004	17.80
22	Goth Khuda Bux Machhi	68.012	27.141	30.10
23	Goth Machhi	68.032	27.158	2.23
24	Goth Magsi	68.003	27.053	2.00
25	Goth Nari Lashari	68.017	27.169	14.39
26	Goth Shaikhan	67.802	26.754	7.87
27	Goth Sumar Machhi	68.011	27.147	3.15
28	Gul Mohammad Magsi	67.798	26.719	22.93
29	Haji Hashim	67.803	26.605	8.27
30	Ibrahim Chandio	67.828	26.756	5.77
31	Jhale Ja Shahr	67.853	26.668	13.39
32	Khairo Dero	67.819	26.625	8.43
33	Khharal	67.843	26.750	5.84
34	Khata Khharal	67.842	26.742	1.50
35	Lalia	67.897	26.718	11.00
36	Latif Arain	67.827	26.852	12.17
37	Magsi Machhi	67.799	26.718	22.93
38	Majid Ja Bhan	67.808	26.608	14.70
39	Malkani	67.832	26.677	1.48

S.No	Name	long	lat	Area (acres)
40	Mastal	67.842	26.732	4.20
41	Mohammad Hassan Kalhoro	68.031	27.089	33.90
42	Mondar	67.814	26.798	44.14
43	Nari Sharif	67.939	27.081	43.76
44	Nurja	67.821	26.648	8.24
45	Purana Dera	67.825	26.871	24.50
46	Qadir Bux Chohan	67.791	26.615	1.90
47	Qandra	67.925	26.697	2.54
48	Saeedi Moosarri	68.011	27.127	113.52
49	Sita	67.920	27.025	39.75
50	Siyal	67.804	26.737	23.42
51	Sonehri	67.906	26.711	18.91
52	Sonehri	67.801	26.747	7.84
53	Untitled Settlement	67.906	26.712	8.27
54	Untitled Settlement	67.901	26.714	6.59
55	Untitled Settlement	68.050	27.126	0.05
56	Untitled Settlement	68.040	27.150	16.12
57	Untitled Settlement	68.017	27.169	14.39
58	Untitled Settlement	67.916	26.706	3.61
59	Untitled Settlement	67.901	26.713	0.06
60	Untitled Settlement	68.013	26.953	25.06
61	Untitled Settlement	68.035	27.117	1.29
62	Untitled Settlement	67.815	26.654	9.47
63	Untitled Settlement	67.808	26.781	13.43
64	Untitled Settlement	67.835	26.783	21.40
65	Untitled Settlement	67.810	26.786	7.27
66	Untitled Settlement	67.820	26.790	30.76
67	Untitled Settlement	67.815	26.800	27.43
68	Untitled Settlement	67.838	26.833	8.68
69	Untitled Settlement	67.837	26.837	9.61
70	Untitled Settlement	67.830	26.841	4.57
71	Untitled Settlement	67.835	26.843	7.50
72	Untitled Settlement	67.849	26.882	18.89
73	Untitled Settlement	67.920	27.013	26.12
74	Untitled Settlement	67.921	27.017	36.91
75	Untitled Settlement	67.914	27.057	25.34
76	Untitled Settlement	67.959	27.092	14.53
77	Untitled Settlement	67.982	27.095	13.30
78	Untitled Settlement	67.989	27.099	17.72
79	Untitled Settlement	68.017	27.103	13.12
80	Untitled Settlement	68.034	27.117	1.08
81	Untitled Settlement	68.034	27.119	3.20
82	Untitled Settlement	68.033	27.124	5.4

S.No	Name	long	lat	Area (acres)
83	Untitled Settlement	68.002	27.123	11.97
84	Untitled Settlement	68.032	27.125	4.32
85	Untitled Settlement	68.015	27.135	3.39
86	Untitled Settlement	67.810	26.688	1.98
87	Untitled Settlement	67.915	26.707	5.78
88	Untitled Settlement	67.900	26.713	10.46
89	Untitled Settlement	67.856	26.718	16.10
90	Untitled Settlement	67.994	27.026	57.59
91	Untitled Settlement	67.994	27.044	15.10
92	Untitled Settlement	68.118	27.104	4.62
93	Untitled Settlement	68.117	27.106	4.50
94	Untitled Settlement	68.121	27.110	51.58
95	Untitled Settlement	68.050	27.121	40.62
96	Untitled Settlement	68.046	27.124	25.15
97	Untitled Settlement	68.040	27.150	16.12
98	Untitled Settlement	68.050	27.124	40.62
99	Untitled Settlement	68.052	27.121	40.62
100	Untitled Settlement	68.048	27.122	25.15
101	Untitled Settlement	68.048	27.122	25.15

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° 9'13.05"N 67°56'4.48"E Upper left corner: 27° 9'32.00"N 67°55'4.06"E Lower right corner: 27° 6'22.15"N 67°53'50.21"E Lower left corner: 27° 6'34.90"N 67°53'30.66"E	2,340	~105,000	139
2	Upper right corner: 26°59'46.91"N 67°54'5.08"E Upper left corner: 26°59'37.28"N 67°53'37.83"E Lower right corner: 26°58'44.16"N 67°53'38.27"E Lower left corner: 26°58'40.60"N 67°53'12.92"E	356	~16,000	145
3	Upper right corner: 26°51'45.50"N 67°46'20.84"E Upper left corner: 26°51'55.75"N 67°45'5.56"E Lower right corner: 26°50'49.80"N 67°45'39.15"E Lower left corner: 26°50'41.51"N 67°45'13.84"E	678	~30,500	133
4	Upper right corner: 26°47'23.09"N 67°44'36.84"E Upper left corner: 26°46'39.61"N 67°43'50.53"E Lower right corner: 26°44'49.96"N 67°44'48.18"E Lower left corner: 26°44'49.27"N 67°44'24.14"E	1,205	~54,000	125
5	Upper right corner: 26°36'58.28"N 67°43'58.63"E Upper left corner: 26°37'1.56"N 67°43'6.15"E Lower right corner: 26°36'11.71"N 67°43'28.78"E Lower left corner: 26°36'9.11"N 67°42'47.31"E	515	~23,000	131

A total of 5 shelter locations have been selected as Flood shelter places across district Dadu. 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 228,500 tents (tent with size of 45 sq. m each) can be set up within the demarcated shelter places.

Annex – C – Shelter Locations Description – Earthquake

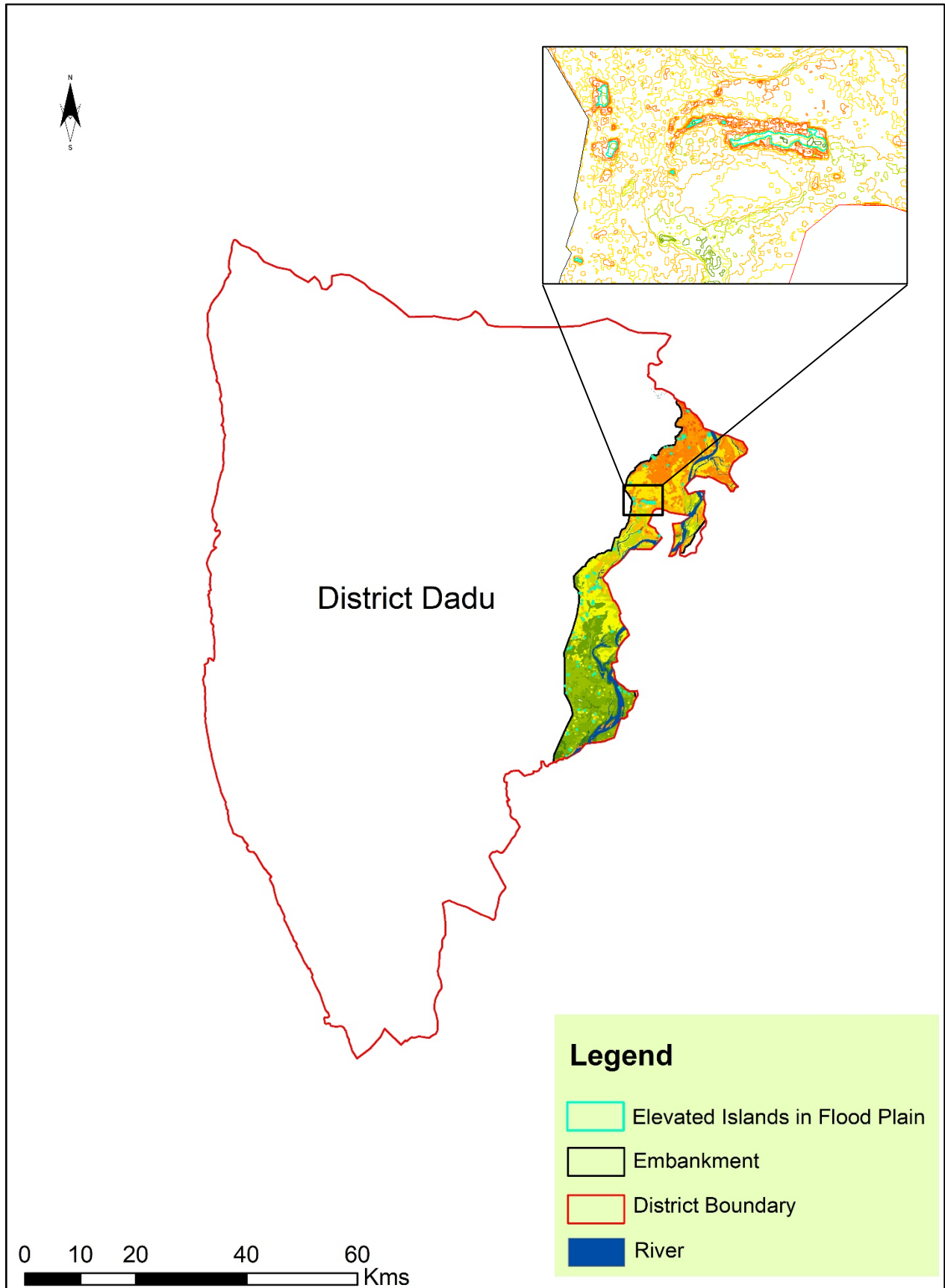
The given shelter locations for earthquake are proposed on the findings of the MHVRA 2022 study and information obtained through satellite technology and online verifiable sources. It is recommended to conduct on ground physical surveys to evaluate their suitability.

Shelter location	Co-ordinates		Area (acres)	Estimated Tents (numbers)	Avg. elevation (ft)
1	Upper right corner:	27° 9'13.05"N 67° 56'4.48"E	2,340	~105,000	139
	Upper left corner:	27° 9'32.00"N 67° 55'4.06"E			
	Lower right corner:	27° 6'22.15"N 67° 53'50.21"E			
	Lower left corner:	27° 6'34.90"N 67° 53'30.66"E			
2	Upper right corner:	27° 3'3.55"N 67° 42'23.43"E	301	~13,500	134
	Upper left corner:	27° 3'27.92"N 67° 41'39.59"E			
	Lower right corner:	27° 2'41.27"N 67° 42'12.43"E			
	Lower left corner:	27° 2'41.38"N 67° 41'30.65"E			
3	Upper right corner:	27° 0'33.99"N 67° 48'57.60"E	266	~11,900	140
	Upper left corner:	27° 0'35.39"N 67° 48'32.29"E			
	Lower right corner:	26° 59'36.90"N 67° 48'32.17"E			
	Lower left corner:	26° 59'39.36"N 67° 48'23.03"E			
4	Upper right corner:	26° 51'45.50"N 67° 46'20.84"E	678	~30,500	133
	Upper left corner:	26° 51'55.75"N 67° 45'5.56"E			
	Lower right corner:	26° 50'49.80"N 67° 45'39.15"E			
	Lower left corner:	26° 50'41.51"N 67° 45'13.84"E			
5	Upper right corner:	26° 47'23.09"N 67° 44'36.84"E	1,205	~54,000	125
	Upper left corner:	26° 46'39.61"N 67° 43'50.53"E			
	Lower right corner:	26° 44'49.96"N 67° 44'48.18"E			
	Lower left corner:	26° 44'49.27"N 67° 44'24.14"E			
6	Upper right corner:	26° 42'41.71"N 67° 24'11.30"E	1,792	~80,000	169
	Upper left corner:	26° 42'16.86"N 67° 23'34.08"E			
	Lower right corner:	26° 40'6.12"N 67° 24'57.95"E			
	Lower left corner:	26° 39'58.47"N 67° 23'59.34"E			
7	Upper right corner:	26° 36'58.28"N 67° 43'58.63"E	515	~23,000	131
	Upper left corner:	26° 37'1.56"N 67° 43'6.15"E			
	Lower right corner:	26° 36'11.71"N 67° 43'28.78"E			
	Lower left corner:	26° 36'9.11"N 67° 42'47.31"E			

A total of 7 shelter locations have been selected as Earthquake shelter places across district Dadu. 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 317,900 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 Dadu

Total 61 elevated islands have been identified within the embankments in district Dadu, with a cumulative area of approximately 186.30 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 Dadu 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 Dadu

Equipment	Quantity
De-watering Machine	10
Fire Brigade / Engine / Tender	6
Tractor / Trolley / Blade	9
Vehicle / Bus / Van / Truck	1
Diesel / Petrol Engine	12
Refuge Van	7
Power Generators	3
Sucker Machine	1
Winch Machine	1
Garbage Bin	7

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