

# MHVRA

## INFORMED DISASTER MANAGEMENT PLAN

2023-2032

### DISTRICT SUKKUR



DEVELOPED BY  
PDMA SINDH



THROUGH  
SUPARCO



WITH THE SUPPORT OF



## CONTENTS

<b>Preface</b> .....	3
<b>Acknowledgements</b> .....	4
<b>Introduction to Disaster Management Plan of District Sukkur</b> .....	5
<b>Introduction</b> .....	6
<b>Vision</b> .....	7
<b>Objectives</b> .....	7
<b>Review of MHVRA Informed Disaster Management Plan</b> .....	7
<b>Modes of Review</b> .....	9
<b>Disaster Risk Profile of District Sukkur</b> .....	10
<b>District Sukkur at a Glance</b> .....	11
Geography .....	12
Demography .....	12
Economy .....	13
Administrative System .....	13
<b>Sukkur District Multi-Hazard Risk Profiles</b> .....	14
<b>UC Wise Risk Profile</b> .....	16
<b>Organization Structure for Disaster Management at District Level</b> .....	46
<b>Introduction</b> .....	47
<b>Responsibility of District Disaster Management Authority</b> .....	49
<b>Function of DDMA</b> .....	49
<b>Responsibility of Taluka Disaster Management Committee</b> .....	51
<b>Function of Taluka Disaster Management Committee</b> .....	51
<b>Responsibility of Union Council Disaster Management Committee</b> .....	52
<b>Function of UCDMC</b> .....	52
<b>Establishment of Emergency Operation Centers</b> .....	53
<b>Provincial Emergency Operation Center (PEOC)</b> .....	53
<b>District Emergency Operation Center (DEOC)</b> .....	54
<b>Function of DEOC</b> .....	54
<b>Sector Wise Roles and Responsibilities of Government Functionaries</b> .....	55
<b>Agriculture and Livestock Department</b> .....	56
<b>Provincial Disaster Management Authority (PDMA)</b> .....	57
<b>District Disaster Management Authority (DDMA)</b> .....	58
<b>Civil Defense</b> .....	59
<b>Education Department</b> .....	60
<b>Finance Department</b> .....	61
<b>Health Department</b> .....	62
<b>Irrigation Department</b> .....	63
<b>Information Department</b> .....	64

<b>Pakistan Meteorological Department (PMD)</b> .....	<b>65</b>
<b>Police Department</b> .....	<b>66</b>
<b>Revenue Department</b> .....	<b>67</b>
<b>Armed Forces</b> .....	<b>67</b>
<b>Social Welfare and Community Development</b> .....	<b>68</b>
<b>NGOs / INGOs</b> .....	<b>69</b>
<b>Disaster Management Guidelines</b> .....	<b>71</b>
<b>Introduction</b> .....	<b>72</b>
<b>Standard Operating Procedures</b> .....	<b>76</b>
<b>Introduction</b> .....	<b>77</b>
<b>Action Plan for Flood</b> .....	<b>77</b>
<b>Action plan for forecastable disasters</b> .....	<b>78</b>
<b>Action plan for unforecastable hazards</b> .....	<b>79</b>
<b>SOP for PEOC and DEOCs</b> .....	<b>80</b>
<b>Disaster Management Plan</b> .....	<b>83</b>
<b>Introduction</b> .....	<b>84</b>
<b>Shelter Location Map</b> .....	<b>91</b>
<b>Proposed Priority Disaster Risk Management Projects</b> .....	<b>93</b>
<b>Introduction</b> .....	<b>94</b>
<b>Cost Benefit Analysis</b> .....	<b>96</b>
<b>Introduction</b> .....	<b>97</b>
<b>Cost Benefit Analysis – Sukkur District</b> .....	<b>97</b>
<b>Annex – A – Vulnerable Settlements Prone to Riverine Flood</b> .....	<b>100</b>
<b>Annex – B – Shelter Locations Description – Riverine Flood</b> .....	<b>107</b>
<b>Annex – C – Shelter Locations Description – Earthquake</b> .....	<b>108</b>
<b>Annex – D – Elevated Islands within Embankments in Sukkur</b> .....	<b>109</b>
<b>Annex – E – River Training and Straightening</b> .....	<b>110</b>
<b>Annex – F – List of Equipment Available in District Sukkur</b> .....	<b>111</b>

## 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 Sukkur 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 Sukkur 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 Sukkur 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.*

*All rights for this IDMP are reserved with PDMA Sindh*

DEVELOPED BY  
PDMA SINDH



THROUGH  
SUPARCO



WITH THE SUPPORT OF



# **INTRODUCTION TO DISASTER MANAGEMENT PLAN OF DISTRICT SUKKUR**

## 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**

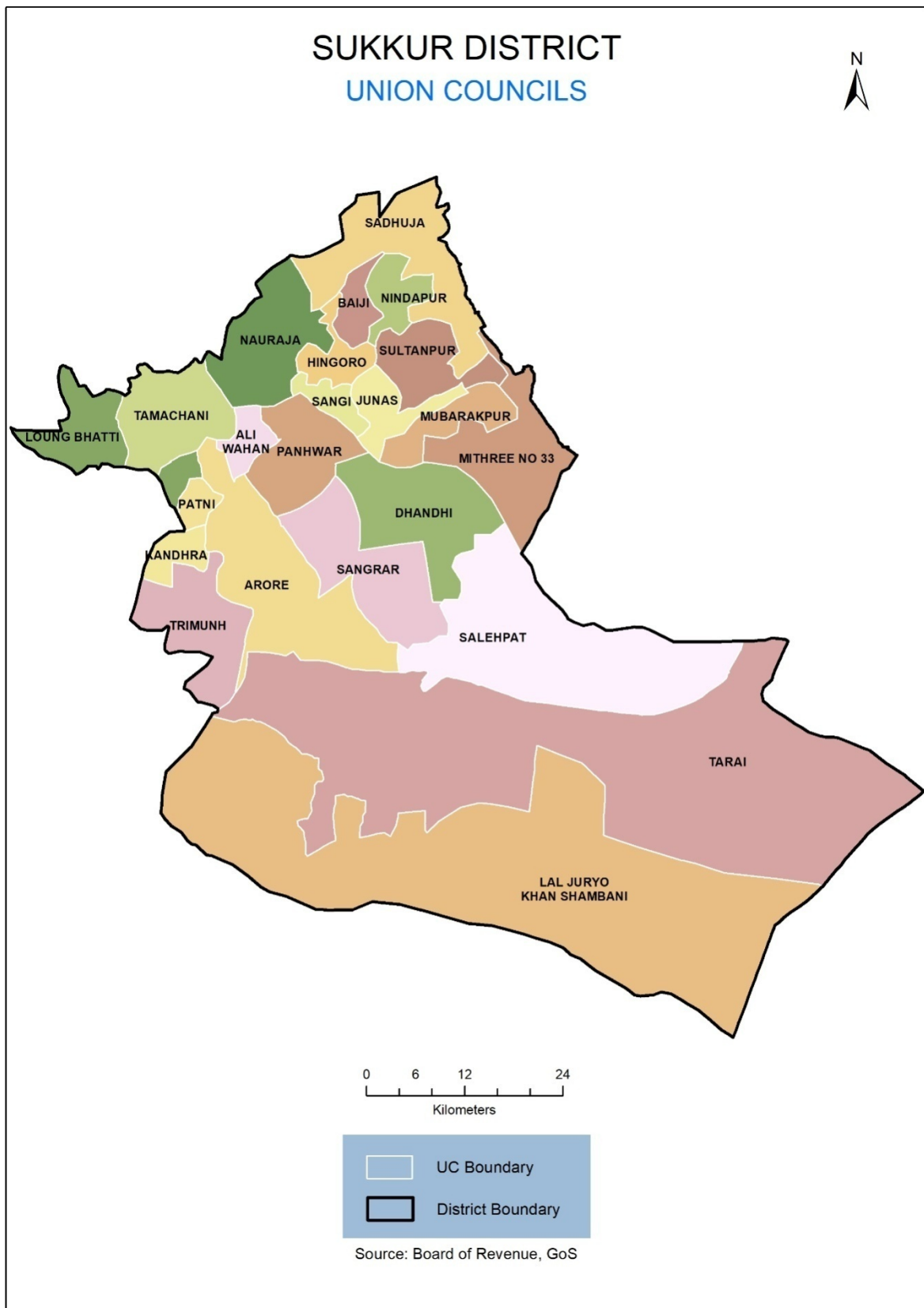
<b>Committee Representative</b>	<b>Role</b>
DG, PDMA Sindh / Dir Ops PDMA	Chairman
Concerned DC or representative officer	Member
Concerned officer from local government	Member
Elected representative of the concerned district	Member
Representatives from disaster affected communities	Member (s)
Representative 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 SUKKUR**



## GEOGRAPHY

<b>District area in Sq. Km</b>	5,062	
<b>Coordinates</b>	Longitude 68° 30' 35" to 69° 00' 48" East Latitude 27° 00' 04" to 28° 15' 02"North	
<b>Surrounding Districts</b>	Kashmore in North Shikarpur in North West Khairpur in South West Ghotki and India in East	
<b>Climate Conditions</b>	Hot and Arid	
<b>Coldest Month</b>	January	
<b>Hottest Month</b>	June	
<b>Seasonal Temperatures</b>	<b>Max Mean (°C)</b>	<b>Min Mean (°C)</b>
Spring (March and April)	37.62	20.75
Dry Summer (May and June)	44.92	29.37
Wet Summer (July to September)	41.81	29.14
Autumn (October to November)	35.08	19.25
Winter (December to February)	26.17	10.61
<b>Average Rainfall</b>	96.5 mm/year	
<b>Physiographic Features</b>	River Indus	

## DEMOGRAPHY

	<b>Year-1998</b>	<b>Year-2017</b>
<b>Population</b>	664,797	1,073,469
Urban	111,464	243,537
Rural	553,333	829,932
<b>No. of Household</b>	-	212,356
<b>Average Annual Growth Rate 1998-2017</b>	2.55 %	

---

**ECONOMY**

<b>Industries</b>	Food Products and Beverages, Manufacture of Textiles
<b>Agriculture</b>	<b>Production in M.tons as per (2016-17)</b>
<b>Major Crops</b>	
Sugarcane	472,585
Cotton	34,556
Wheat	171,561
<b>Minor Crops</b>	
Bajra	10
Rapeseed And Mustard	344
Barley	10
Sesame	30
Maize	177
Gram	461
Jowar	1,815
Tobacco	21

---

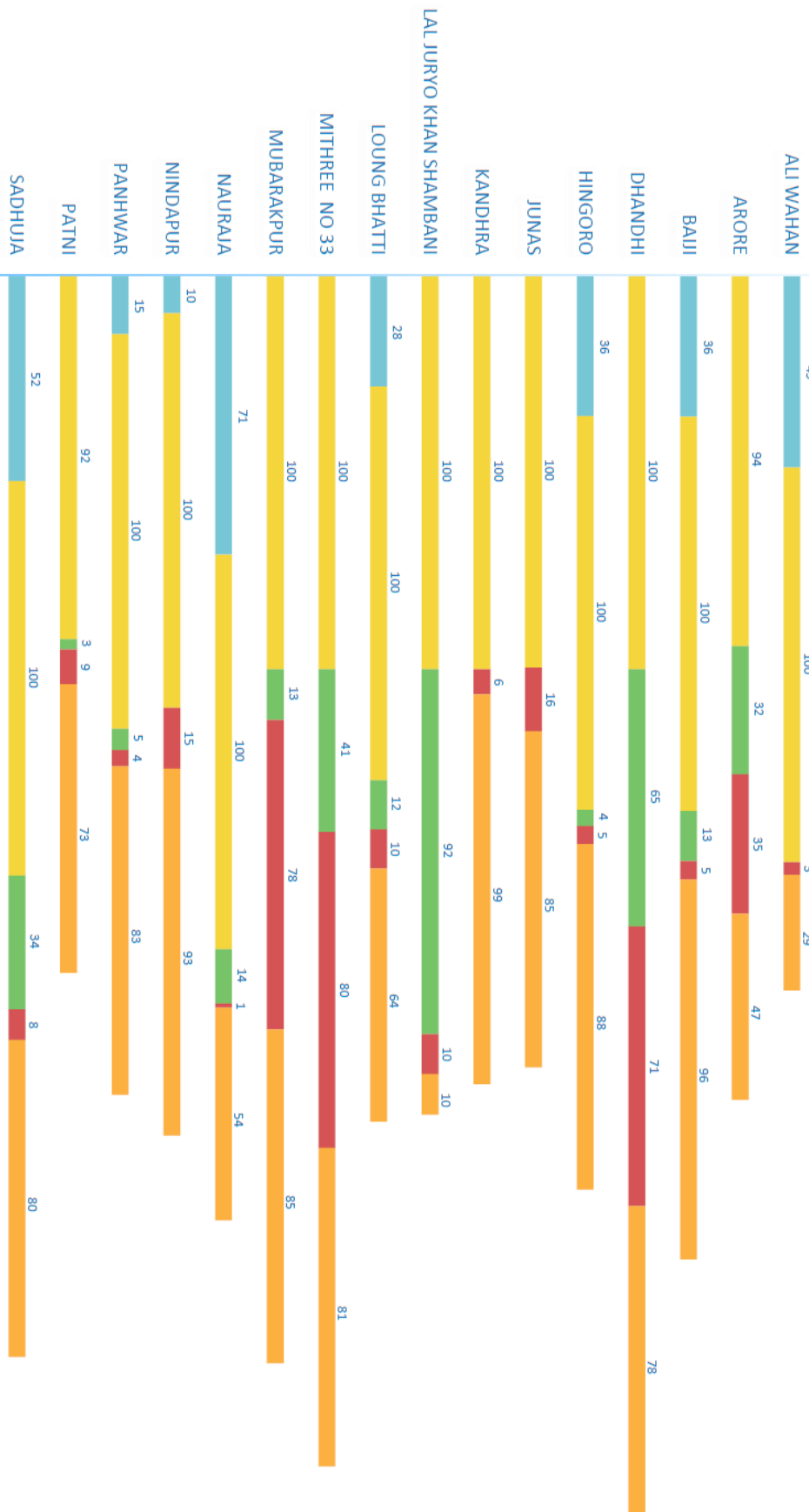
**ADMINISTRATIVE SYSTEM**

<b>TALUKA NAMES</b>	<b>UC NAMES</b>
<ol style="list-style-type: none"><li>1. New Sukkur Taluka</li><li>2. Pano Aqil Taluka</li><li>3. Rohri Taluka</li><li>4. Salehpat Taluka</li><li>5. Sukkur City Taluka</li></ol>	<ol style="list-style-type: none"><li>1. Ali Wahan</li><li>2. Arore</li><li>3. Baiji</li><li>4. Dhandhi</li><li>5. Hingoro</li><li>6. Junas</li><li>7. Kandhra</li><li>8. Lal Juryo Khan Shambani</li><li>9. Loung Bhatti</li><li>10. Mithree No. 33</li><li>11. Mubarakpur</li><li>12. Nauraja</li><li>13. Nindapur</li><li>14. Panhwar</li><li>15. Patni</li><li>16. Sadhuja</li><li>17. Salehpat</li><li>18. Sangi</li><li>19. Sangrar</li><li>20. Sultanpur</li><li>21. Tamachani</li><li>22. Tarai</li><li>23. Trimunh</li></ol>

SUKKUR DISTRICT MULTI-HAZARD RISK PROFILES

**LEGEND**  
PERCENTAGE OF  
AREA AT RISK

- FLOOD
- METEOROLOGICAL DROUGHT
- HEATWAVE
- CYCLONE
- STORM SURGE
- AGRICULTURE DROUGHT
- TSUNAMI
- EARTHQUAKE







UC WISE RISK PROFILE

Ali Wahan			
Hazard Type	Risk	Elements at Risk	
Earthquake	Low	Agriculture Area	8.75 sq km
		Kachcha Area	0.037 sq km
		Natural Vegetation in Wet Areas	0.06 sq km
		Pakka Planned Area	0.386 sq km
		Pakka Unplanned Area	0.154 sq km
		Education Facilities	5
		Industries	8
		Mobile Towers	1
		Petrol Pumps	1
		Settlements	5
		Railway Line	1.143 km
		Road Network	5.424 km
		Population	5776
		Household	1021
Meteorological Drought	Medium - Extreme	Settlements	5
		Agriculture Area	8.876 sq km
		Bare Area with sparse Natural Vegetation	0.027 sq km
		Natural Vegetation in Wet Areas	9.205 sq km
		Water Body	0.035 sq km
		Population	5802
		Household	1025
Agricultural Drought	Low	Agriculture Area	0.167 sq km
		Natural Vegetation in Wet Areas	0.073 sq km
Heatwave	Low - Medium	Agriculture Area	0.058 sq km
		Kachcha Area	0.036 sq km
		Pakka Planned Area	0.386 sq km
		Pakka Unplanned Area	0.153 sq km
		Population	5758
		Household	1017
		Settlements	5
Riverine Flood	Low - Extreme	Agriculture Area	7.947 sq km
		Kachcha Area	0.037 sq km
		Natural Vegetation in Wet Areas	8.489 sq km

		Pakka Unplanned Area	0.009 sq km
		Settlements	2
		Road Network	0.011 km
		Population	566
		Household	98
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Arore</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	115.391 sq km
		Forest Area	0.006 sq km
		Kachcha Area	4.108 sq km
		Natural Vegetation in Wet Areas	0.24 sq km
		Pakka Planned Area	3.534 sq km
		Pakka Unplanned Area	5.748 sq km
		Range Land	0.398 sq km
		Bridges	12
		Education Facilities	122
		Grid Stations	1
		Health Facilities	5
		Industries	6
		Mobile Towers	31
		Petrol Pumps	13
		Police Stations	2
		Post Offices	1
		Power Plants	1
		Settlements	110
		Tourist Places	6
		Irrigation and Drainage Network	55.678 km
Railway Line	16.824 km		
Road Network	211.194 km		
Population	248070		
Household	44831		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	109
		Agriculture Area	115.938 sq km
		Bare Area with sparse Natural Vegetation	120.474 sq km

		Forest Area	0.144 sq km
		Natural Vegetation in Wet Areas	0.82 sq km
		Range Land	3.697 sq km
		Water Body	0.568 sq km
		Wet Area	0.12 sq km
		Population	247897
		Household	44802
<b>Agricultural Drought</b>	Low - Medium	Settlements	6
		Agriculture Area	15.359 sq km
		Bare Area with sparse Natural Vegetation	98.207 sq km
		Forest Area	0.033 sq km
		Range Land	3.093 sq km
		Water Body	0.123 sq km
		Wet Area	0.011 sq km
		Population	3678
		Household	659
<b>Heatwave</b>	Low - High	Agriculture Area	83.238 sq km
		Kachcha Area	4.104 sq km
		Pakka Planned Area	3.53 sq km
		Pakka Unplanned Area	5.738 sq km
		Population	247820
		Household	44790
		Settlements	105
<b>Riverine Flood</b>	Low - Extreme	Agriculture Area	0.191 sq km
		Natural Vegetation in Wet Areas	0.552 sq km
		Pakka Planned Area	0.005 sq km
		Pakka Unplanned Area	0.004 sq km
		Bridges	2
		Tourist Places	1
		Railway Line	0.429 km
		Road Network	0.293 km
		Population	233
		Household	43
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Baiji</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	34.361 sq km
		Kachcha Area	1.147 sq km
		Natural Vegetation in Wet Areas	0.011 sq km
		Pakka Planned Area	0.503 sq km
		Range Land	0.001 sq km
		Bridges	4
		Bus Stops	2
		Education Facilities	29
		Health Facilities	1
		Mobile Towers	3
		Petrol Pumps	1
		Post Offices	1
		Settlements	44
		Irrigation and Drainage Network	11.01 km
		Road Network	50.276 km
Population	20467		
Household	3550		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	44
		Agriculture Area	34.44 sq km
		Natural Vegetation in Wet Areas	0.403 sq km
		Range Land	0.017 sq km
		Water Body	0.048 sq km
		Population	20616
		Household	3577
<b>Agricultural Drought</b>	Low	Agriculture Area	6.014 sq km
		Natural Vegetation in Wet Areas	0.049 sq km
<b>Heatwave</b>	Low - Medium	Agriculture Area	0.337 sq km
		Kachcha Area	1.132 sq km
		Pakka Planned Area	0.503 sq km
		Population	20272
		Household	3520
		Settlements	41
<b>Riverine Flood</b>	Low - Extreme	Agriculture Area	12.948 sq km
		Kachcha Area	0.003 sq km
		Natural Vegetation in Wet Areas	0.4 sq km
		Settlements	1

		Road Network	4.871 km
		Population	34
		Household	6
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Dhandhi</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	145.568 sq km
		Kachcha Area	2.798 sq km
		Pakka Planned Area	0.256 sq km
		Pakka Unplanned Area	0.289 sq km
		Bridges	2
		Education Facilities	44
		Mobile Towers	2
		Petrol Pumps	2
		Settlements	101
		Irrigation and Drainage Network	43.268 km
		Road Network	218.618 km
		Population	40406
Household	7095		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	101
		Agriculture Area	146.002 sq km
		Bare Area with sparse Natural Vegetation	38.865 sq km
		Water Body	0.488 sq km
		Wet Area	2.319 sq km
		Population	40867
		Household	7172
<b>Agricultural Drought</b>	Low - Medium	Settlements	54
		Agriculture Area	110.973 sq km
		Bare Area with sparse Natural Vegetation	43.048 sq km
		Water Body	0.616 sq km
		Wet Area	1.306 sq km
		Population	31562
		Household	5547

<b>Heatwave</b>	Low - High	Agriculture Area	131.589 sq km
		Kachcha Area	2.8 sq km
		Pakka Planned Area	0.255 sq km
		Pakka Unplanned Area	0.29 sq km
		Population	40437
		Household	7097
		Settlements	79
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Hingoro</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	38.143 sq km
		Forest Area	0.022 sq km
		Kachcha Area	1.236 sq km
		Natural Vegetation in Wet Areas	0.008 sq km
		Pakka Planned Area	0.732 sq km
		Range Land	0.294 sq km
		Bridges	5
		Education Facilities	35
		Health Facilities	1
		Industries	1
		Petrol Pumps	4
		Police Stations	1
		Settlements	44
		Irrigation and Drainage Network	12.432 km
		Railway Line	4.746 km
		Road Network	62.157 km
		Population	18000
Household	3078		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	44
		Agriculture Area	38.283 sq km
		Forest Area	0.031 sq km
		Natural Vegetation in Wet Areas	0.663 sq km
		Range Land	0.802 sq km

		Water Body	0.143 sq km
		Wet Area	1.902 sq km
		Population	18176
		Household	3106
<b>Agricultural Drought</b>	Low	Agriculture Area	2.397 sq km
		Natural Vegetation in Wet Areas	0.016 sq km
		Population	17
		Household	3
<b>Heatwave</b>	Low - Medium	Agriculture Area	0.347 sq km
		Kachcha Area	1.221 sq km
		Pakka Planned Area	0.732 sq km
		Population	17788
		Household	3037
		Settlements	43
<b>Riverine Flood</b>	Low - Extreme	Agriculture Area	15.607 sq km
		Kachcha Area	0.292 sq km
		Natural Vegetation in Wet Areas	0.528 sq km
		Education Facilities	3
		Settlements	8
		Road Network	4.077 km
		Population	3626
		Household	628
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Junas</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	44.878 sq km
		Forest Area	0.023 sq km
		Kachcha Area	1.3 sq km
		Pakka Planned Area	3.794 sq km
		Pakka Unplanned Area	0.181 sq km
		Range Land	0.248 sq km
		Bridges	2
		Education Facilities	32
		Health Facilities	2

		Mobile Towers	1
		Petrol Pumps	1
		Police Stations	1
		Settlements	55
		Irrigation and Drainage Network	23.318 km
		Railway Line	1.182 km
		Road Network	105.569 km
		Population	24635
		Household	3963
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	55
		Agriculture Area	45 sq km
		Forest Area	1.789 sq km
		Range Land	1.151 sq km
		Water Body	0.986 sq km
		Wet Area	4.491 sq km
		Population	24774
		Household	3986
<b>Heatwave</b>	Low - Medium	Agriculture Area	4.536 sq km
		Kachcha Area	1.285 sq km
		Pakka Planned Area	3.793 sq km
		Pakka Unplanned Area	0.179 sq km
		Population	24415
		Household	3926
		Settlements	47
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	
<b>Agricultural Drought</b>	Nil	The UC falls out of vulnerable zone for Agricultural Drought	

<b>Kandhra</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	33.585 sq km
		Kachcha Area	0.107 sq km
		Pakka Planned Area	0.651 sq km
		Pakka Unplanned Area	1.376 sq km



		Education Facilities	38
		Mobile Towers	4
		Petrol Pumps	2
		Settlements	41
		Irrigation and Drainage Network	22.073 km
		Railway Line	7.014 km
		Road Network	66.759 km
		Population	26092
		Household	4722
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	41
		Agriculture Area	33.617 sq km
		Water Body	0.016 sq km
		Wet Area	0.007 sq km
		Population	26249
		Household	4749
<b>Heatwave</b>	Low - Medium	Agriculture Area	0.434 sq km
		Kachcha Area	0.106 sq km
		Pakka Planned Area	0.645 sq km
		Pakka Unplanned Area	1.366 sq km
		Population	25905
		Household	4687
		Settlements	36
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	
<b>Agricultural Drought</b>	Nil	The UC falls out of vulnerable zone for Agricultural Drought	

<b>Lal Juryo Khan Shambani</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	114.766 sq km
		Kachcha Area	3.517 sq km
		Pakka Planned Area	0.836 sq km
		Pakka Unplanned Area	0.187 sq km
		Range Land	0.069 sq km
		Bridges	3

		Education Facilities	55
		Mobile Towers	2
		Petrol Pumps	4
		Police Stations	1
		Settlements	78
		Irrigation and Drainage Network	71.73 km
		Road Network	275.325 km
		Population	42811
		Household	8196
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	78
		Agriculture Area	115.589 sq km
		Bare Area with sparse Natural Vegetation	1047.821 sq km
		Range Land	14.01 sq km
		Water Body	3.176 sq km
		Wet Area	0.76 sq km
		Population	43230
		Household	8276
<b>Agricultural Drought</b>	Low - Extreme	Settlements	28
		Agriculture Area	67.845 sq km
		Bare Area with sparse Natural Vegetation	1295.302 sq km
		Range Land	17.364 sq km
		Water Body	2.674 sq km
		Wet Area	0.451 sq km
		Population	29319
		Household	5613
<b>Heatwave</b>	Low - Medium	Agriculture Area	114.621 sq km
		Kachcha Area	3.525 sq km
		Pakka Planned Area	0.834 sq km
		Pakka Unplanned Area	0.187 sq km
		Population	42862
		Household	8205
		Settlements	71
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Loung Bhatti</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	59.209 sq km
		Kachcha Area	0.19 sq km
		Natural Vegetation in Wet Areas	0.325 sq km
		Pakka Planned Area	4.138 sq km
		Pakka Unplanned Area	3.548 sq km
		Range Land	0.03 sq km
		Ambulance Services	2
		Bridges	15
		Bus Stops	5
		Education Facilities	77
		Fire Stations	1
		Grain Mandi	5
		Grid Stations	1
		Health Facilities	31
		Industries	13
		Mobile Towers	15
		Petrol Pumps	12
		Police Stations	3
		Post Offices	9
		Settlements	41
		Tourist Places	8
Irrigation and Drainage Network	40.309 km		
Railway Line	4.384 km		
Road Network	87.326 km		
Population	191917		
Household	34110		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	41
		Agriculture Area	59.531 sq km
		Natural Vegetation in Wet Areas	23.423 sq km
		Range Land	1.254 sq km
		Water Body	0.035 sq km
		Wet Area	0.123 sq km
		Population	192956
		Household	34293
<b>Agricultural Drought</b>	Low	Agriculture Area	10.241 sq km
		Natural Vegetation in Wet Areas	5.802 sq km
		Range Land	1.257 sq km

<b>Heatwave</b>	Low - Medium	Agriculture Area	0.803 sq km
		Kachcha Area	0.188 sq km
		Pakka Planned Area	4.128 sq km
		Pakka Unplanned Area	3.535 sq km
		Population	191547
		Household	34044
		Settlements	32
<b>Riverine Flood</b>	Low - High	Agriculture Area	26.383 sq km
		Kachcha Area	0.058 sq km
		Natural Vegetation in Wet Areas	4.164 sq km
		Pakka Planned Area	0.007 sq km
		Pakka Unplanned Area	0.003 sq km
		Range Land	0.012 sq km
		Bridges	3
		Bus Stops	1
		Education Facilities	1
		Settlements	3
		Irrigation and Drainage Network	0.047 km
		Road Network	7.782 km
		Population	796
		Household	136
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Mithree No 33</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	134.017 sq km
		Forest Area	0.014 sq km
		Kachcha Area	3.562 sq km
		Pakka Planned Area	0.533 sq km
		Pakka Unplanned Area	0.399 sq km
		Range Land	0.073 sq km
		Bridges	2
		Education Facilities	61
		Health Facilities	4
		Mobile Towers	5
		Petrol Pumps	3
		Police Stations	1

		Settlements	61
		Irrigation and Drainage Network	49.088 km
		Road Network	229.57 km
		Population	55794
		Household	9672
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	61
		Agriculture Area	134.459 sq km
		Bare Area with sparse Natural Vegetation	25.482 sq km
		Forest Area	0.387 sq km
		Range Land	1.002 sq km
		Water Body	0.431 sq km
		Wet Area	6.876 sq km
		Population	56176
		Household	9740
<b>Agricultural Drought</b>	Low - Extreme	Settlements	9
		Agriculture Area	62.241 sq km
		Bare Area with sparse Natural Vegetation	25.187 sq km
		Forest Area	0.062 sq km
		Range Land	0.474 sq km
		Water Body	0.299 sq km
		Wet Area	1.038 sq km
		Population	14857
		Household	2577
<b>Heatwave</b>	Low - High	Agriculture Area	133.491 sq km
		Kachcha Area	3.567 sq km
		Pakka Planned Area	0.533 sq km
		Pakka Unplanned Area	0.398 sq km
		Population	55854
		Household	9683
		Settlements	53
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>MUBARAKPUR</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	54.23 sq km
		Forest Area	0.049 sq km
		Kachcha Area	1.305 sq km
		Pakka Unplanned Area	0.113 sq km
		Range Land	0.046 sq km
		Education Facilities	37
		Health Facilities	2
		Mobile Towers	1
		Settlements	59
		Irrigation and Drainage Network	25.365 km
		Road Network	86.133 km
		Population	17603
Household	3055		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	59
		Agriculture Area	54.45 sq km
		Bare Area with sparse Natural Vegetation	1.641 sq km
		Forest Area	1.142 sq km
		Range Land	1.187 sq km
		Water Body	0.688 sq km
		Wet Area	5.213 sq km
		Population	17781
Household	3082		
<b>Agricultural Drought</b>	Low	Settlements	3
		Agriculture Area	9.589 sq km
		Bare Area with sparse Natural Vegetation	0.001 sq km
		Forest Area	0.029 sq km
		Range Land	0.7 sq km
		Water Body	0.419 sq km
		Wet Area	0.026 sq km
		Population	96
Household	17		
<b>Heatwave</b>	Low - High	Agriculture Area	50.298 sq km
		Kachcha Area	1.305 sq km
		Pakka Unplanned Area	0.114 sq km
		Population	17613
		Household	3054
Settlements	57		

<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge

<b>Nauraja</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	81.954 sq km
		Forest Area	0.001 sq km
		Kachcha Area	1.461 sq km
		Natural Vegetation in Wet Areas	0.277 sq km
		Education Facilities	7
		Settlements	48
		Irrigation and Drainage Network	2.8 km
		Road Network	10.468 km
		Population	18143
		Household	3150
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	48
		Agriculture Area	82.414 sq km
		Forest Area	0.021 sq km
		Natural Vegetation in Wet Areas	43.148 sq km
		Water Body	0.572 sq km
		Population	18359
		Household	3184
<b>Agricultural Drought</b>	Low	Settlements	2
		Agriculture Area	27.075 sq km
		Natural Vegetation in Wet Areas	0.233 sq km
		Population	1759
		Household	305
<b>Heatwave</b>	Medium	Agriculture Area	0.307 sq km
		Kachcha Area	1.451 sq km
		Population	18014
		Household	3127
		Settlements	42

<b>Riverine Flood</b>	Low - Extreme	Agriculture Area	79.598 sq km
		Kachcha Area	1.396 sq km
		Natural Vegetation in Wet Areas	28.88 sq km
		Education Facilities	5
		Settlements	43
		Road Network	6.023 km
		Population	17326
		Household	3007
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Ninda Pur</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	41.884 sq km
		Kachcha Area	0.831 sq km
		Natural Vegetation in Wet Areas	0.008 sq km
		Pakka Planned Area	5.528 sq km
		Pakka Unplanned Area	1.359 sq km
		Range Land	0.011 sq km
		Bridges	13
		Bus Stops	3
		Education Facilities	91
		Grid Stations	1
		Health Facilities	8
		Mobile Towers	15
		Petrol Pumps	15
		Police Stations	1
		Settlements	78
		Tourist Places	1
		Irrigation and Drainage Network	26.122 km
		Railway Line	9.715 km
		Road Network	102.009 km
Population	95605		
Household	16599		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	78
		Agriculture Area	41.971 sq km
		Natural Vegetation in Wet Areas	0.102 sq km



		Range Land	0.064 sq km
		Water Body	1.038 sq km
		Wet Area	2.097 sq km
		Population	95881
		Household	16646
<b>Heatwave</b>	Low - Medium	Agriculture Area	2.314 sq km
		Kachcha Area	0.819 sq km
		Pakka Planned Area	5.511 sq km
		Pakka Unplanned Area	1.346 sq km
		Population	95074
		Household	16508
		Settlements	74
<b>Riverine Flood</b>	Medium - Extreme	Agriculture Area	4.982 sq km
		Natural Vegetation in Wet Areas	0.02 sq km
		Road Network	3.352 km
<b>Agricultural Drought</b>	Low	Agriculture Area	0.114 sq km
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Panhwar</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	96.881 sq km
		Kachcha Area	1.392 sq km
		Natural Vegetation in Wet Areas	0.25 sq km
		Pakka Planned Area	1.638 sq km
		Pakka Unplanned Area	1.309 sq km
		Range Land	0.003 sq km
		Bridges	10
		Education Facilities	42
		Grid Stations	1
		Industries	1
		Mobile Towers	7
		Petrol Pumps	13
		Settlements	114
		Irrigation and Drainage Network	41.836 km

		Railway Line	14.737 km
		Road Network	156.298 km
		Population	52186
		Household	9185
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	114
		Agriculture Area	97.236 sq km
		Natural Vegetation in Wet Areas	4.024 sq km
		Range Land	0.199 sq km
		Water Body	3.304 sq km
		Wet Area	4.283 sq km
		Population	52606
		Household	9257
<b>Agricultural Drought</b>	Low	Settlements	1
		Agriculture Area	8.087 sq km
		Range Land	0.252 sq km
		Wet Area	0.007 sq km
		Population	469
		Household	82
<b>Heatwave</b>	Low - Medium	Agriculture Area	1.158 sq km
		Kachcha Area	1.377 sq km
		Pakka Planned Area	1.628 sq km
		Pakka Unplanned Area	1.295 sq km
		Population	51723
		Household	9097
		Settlements	91
<b>Riverine Flood</b>	Low - Extreme	Agriculture Area	15.433 sq km
		Kachcha Area	0.184 sq km
		Natural Vegetation in Wet Areas	2.599 sq km
		Education Facilities	1
		Settlements	7
		Road Network	2.036 km
		Population	2281
		Household	395
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Patni</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	14.415 sq km
		Kachcha Area	0.043 sq km
		Pakka Planned Area	0.487 sq km
		Pakka Unplanned Area	0.867 sq km
		Range Land	0.011 sq km
		Bridges	3
		Education Facilities	16
		Health Facilities	1
		Mobile Towers	1
		Petrol Pumps	7
		Post Offices	1
		Settlements	14
		Irrigation and Drainage Network	9.549 km
		Railway Line	7.053 km
		Road Network	34.209 km
Population	16673		
Household	2944		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	14
		Agriculture Area	14.499 sq km
		Bare Area with sparse Natural Vegetation	0.97 sq km
		Range Land	0.119 sq km
		Water Body	2.313 sq km
		Wet Area	0.597 sq km
		Population	16775
		Household	2960
<b>Agricultural Drought</b>	Low - Medium	Agriculture Area	0.08 sq km
		Bare Area with sparse Natural Vegetation	0.57 sq km
		Range Land	0.063 sq km
<b>Heatwave</b>	Low - Medium	Agriculture Area	0.376 sq km
		Kachcha Area	0.043 sq km
		Pakka Planned Area	0.485 sq km
		Pakka Unplanned Area	0.86 sq km
		Population	16579
		Household	2925
		Settlements	13
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	

<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge

<b>Sadhuja</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	155.027 sq km
		Forest Area	0.009 sq km
		Kachcha Area	4.052 sq km
		Natural Vegetation in Wet Areas	0.348 sq km
		Pakka Planned Area	0.418 sq km
		Pakka Unplanned Area	1.02 sq km
		Range Land	0.034 sq km
		Bridges	5
		Education Facilities	84
		Petrol Pumps	1
		Settlements	148
		Tourist Places	1
		Irrigation and Drainage Network	29.977 km
		Railway Line	3.307 km
		Road Network	161.311 km
Population	68167		
Household	11829		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	148
		Agriculture Area	155.494 sq km
		Forest Area	0.146 sq km
		Natural Vegetation in Wet Areas	25.401 sq km
		Range Land	1.093 sq km
		Water Body	1.734 sq km
		Wet Area	2.84 sq km
		Population	68674
Household	11909		
<b>Agricultural Drought</b>	Low - Medium	Settlements	10
		Agriculture Area	78.582 sq km
		Natural Vegetation in Wet Areas	7.831 sq km
		Water Body	0.094 sq km
		Population	2334
		Household	401

<b>Heatwave</b>	Low - Medium	Agriculture Area	11.174 sq km
		Kachcha Area	4.002 sq km
		Pakka Planned Area	0.415 sq km
		Pakka Unplanned Area	1.012 sq km
		Population	67408
		Household	11681
		Settlements	137
<b>Riverine Flood</b>	Low - High	Agriculture Area	90.547 sq km
		Kachcha Area	1.513 sq km
		Natural Vegetation in Wet Areas	12.034 sq km
		Education Facilities	17
		Settlements	38
		Tourist Places	1
		Road Network	28.323 km
		Population	18778
		Household	3259
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Salehpat</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	42.142 sq km
		Education Facilities	4
		Settlements	4
		Irrigation and Drainage Network	11.671 km
		Road Network	54.331 km
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	4
		Agriculture Area	42.603 sq km
		Bare Area with sparse Natural Vegetation	391.308 sq km
		Water Body	1.21 sq km
		Wet Area	1.158 sq km
<b>Agricultural Drought</b>	Low - Extreme	Settlements	4
		Agriculture Area	54.159 sq km
		Bare Area with sparse	474.576 sq km

		Natural Vegetation	
		Water Body	1.538 sq km
		Wet Area	1.472 sq km
<b>Heatwave</b>	Low	Agriculture Area	42.027 sq km
		Settlements	1
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Sangi</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	21.694 sq km
		Forest Area	0.006 sq km
		Kachcha Area	0.387 sq km
		Natural Vegetation in Wet Areas	0.016 sq km
		Pakka Planned Area	1.179 sq km
		Pakka Unplanned Area	0.086 sq km
		Range Land	0.042 sq km
		Bridges	5
		Education Facilities	19
		Health Facilities	2
		Mobile Towers	1
		Petrol Pumps	1
		Post Offices	1
		Power Plants	1
		Settlements	35
		Irrigation and Drainage Network	6.835 km
		Railway Line	4.084 km
Road Network	46.471 km		
Population	20514		
Household	3555		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	35
		Agriculture Area	21.805 sq km
		Forest Area	0.124 sq km
		Natural Vegetation in Wet Areas	0.609 sq km

		Range Land	0.158 sq km
		Water Body	0.454 sq km
		Wet Area	1.629 sq km
		Population	20406
		Household	3536
<b>Heatwave</b>	Low - Medium	Agriculture Area	0.212 sq km
		Kachcha Area	0.382 sq km
		Pakka Planned Area	1.176 sq km
		Pakka Unplanned Area	0.086 sq km
		Population	20419
		Household	3538
		Settlements	27
<b>Agricultural Drought</b>	Low	Agriculture Area	0.364 sq km
<b>Riverine Flood</b>	Low - Extreme	Agriculture Area	6.116 sq km
		Kachcha Area	0.048 sq km
		Natural Vegetation in Wet Areas	0.58 sq km
		Settlements	6
		Road Network	2.993 km
		Population	597
		Household	104
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Sangrar</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	137.056 sq km
		Forest Area	0.001 sq km
		Kachcha Area	2.496 sq km
		Natural Vegetation in Wet Areas	0.004 sq km
		Pakka Planned Area	0.082 sq km
		Pakka Unplanned Area	0.673 sq km
		Range Land	0.036 sq km
		Bridges	2
		Education Facilities	44
		Petrol Pumps	3
		Settlements	99

		Irrigation and Drainage Network	42.61 km
		Road Network	181.502 km
		Population	38860
		Household	6861
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	99
		Agriculture Area	137.53 sq km
		Bare Area with sparse Natural Vegetation	44.071 sq km
		Forest Area	0.005 sq km
		Natural Vegetation in Wet Areas	0.053 sq km
		Range Land	0.853 sq km
		Water Body	0.438 sq km
		Wet Area	0.564 sq km
		Population	39337
		Household	6937
<b>Agricultural Drought</b>	Low - Extreme	Settlements	41
		Agriculture Area	106.882 sq km
		Bare Area with sparse Natural Vegetation	47.873 sq km
		Forest Area	0.006 sq km
		Natural Vegetation in Wet Areas	0.067 sq km
		Range Land	1.065 sq km
		Water Body	0.551 sq km
		Wet Area	0.002 sq km
		Population	16022
		Household	2824
<b>Heatwave</b>	Low - High	Agriculture Area	112.46 sq km
		Kachcha Area	2.493 sq km
		Pakka Planned Area	0.081 sq km
		Pakka Unplanned Area	0.671 sq km
		Population	38803
		Household	6845
		Settlements	82
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	



<b>Sultan Pur</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	73.717 sq km
		Forest Area	0.069 sq km
		Kachcha Area	1.618 sq km
		Pakka Planned Area	14.957 sq km
		Pakka Unplanned Area	0.657 sq km
		Range Land	0.653 sq km
		Bridges	2
		Education Facilities	64
		Health Facilities	1
		Mobile Towers	3
		Post Offices	2
		Settlements	86
		Tourist Places	1
		Irrigation and Drainage Network	41.135 km
		Railway Line	1.71 km
		Road Network	206.515 km
Population	73736		
Household	11732		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	86
		Agriculture Area	73.895 sq km
		Forest Area	1.038 sq km
		Range Land	1.492 sq km
		Water Body	0.881 sq km
		Wet Area	2.664 sq km
		Population	74005
		Household	11774
<b>Heatwave</b>	Low - Medium	Agriculture Area	18.581 sq km
		Kachcha Area	1.598 sq km
		Pakka Planned Area	14.924 sq km
		Pakka Unplanned Area	0.65 sq km
		Population	73147
		Household	11626
		Settlements	81
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	

<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge
<b>Agricultural Drought</b>	Nil	The UC falls out of vulnerable zone for Agricultural Drought

<b>Tamachani</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	68.555 sq km
		Kachcha Area	0.175 sq km
		Natural Vegetation in Wet Areas	0.169 sq km
		Pakka Planned Area	8.432 sq km
		Pakka Unplanned Area	5.77 sq km
		Range Land	0.061 sq km
		Ambulance Services	1
		Bridges	12
		Bus Stops	2
		Education Facilities	124
		Grain Mandi	5
		Grid Stations	2
		Health Facilities	10
		Industries	44
		Mobile Towers	34
		Petrol Pumps	18
		Police Stations	7
		Post Offices	4
		Power Plants	2
		Settlements	56
		Tourist Places	2
		Irrigation and Drainage Network	35.865 km
Railway Line	9.784 km		
Road Network	104.342 km		
Population	325695		
Household	57843		
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	56
		Agriculture Area	69.123 sq km
		Natural Vegetation in Wet Areas	17.323 sq km
		Range Land	0.542 sq km
		Water Body	4.223 sq km
		Wet Area	0.362 sq km

		Population	327603
		Household	58180
<b>Agricultural Drought</b>	Low	Agriculture Area	3.642 sq km
		Natural Vegetation in Wet Areas	0.351 sq km
<b>Heatwave</b>	Low - Medium	Agriculture Area	1.938 sq km
		Kachcha Area	0.173 sq km
		Pakka Planned Area	8.425 sq km
		Pakka Unplanned Area	5.74 sq km
		Population	324989
		Household	57720
		Settlements	48
<b>Riverine Flood</b>	Low - Extreme	Agriculture Area	40.563 sq km
		Kachcha Area	0.029 sq km
		Natural Vegetation in Wet Areas	15.494 sq km
		Pakka Planned Area	0 sq km
		Pakka Unplanned Area	0.008 sq km
		Education Facilities	2
		Settlements	3
		Irrigation and Drainage Network	1.641 km
		Road Network	3.572 km
		Population	410
		Household	72
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge	

<b>Tarai</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	134.422 sq km
		Forest Area	0.005 sq km
		Kachcha Area	4.127 sq km
		Natural Vegetation in Wet Areas	0.027 sq km
		Pakka Planned Area	0.078 sq km
		Pakka Unplanned Area	0.172 sq km
		Range Land	0.213 sq km

		Bridges	9
		Education Facilities	67
		Industries	1
		Mobile Towers	2
		Petrol Pumps	3
		Settlements	82
		Irrigation and Drainage Network	102.825 km
		Road Network	214.05 km
		Population	41274
		Household	7908
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	82
		Agriculture Area	135.697 sq km
		Bare Area with sparse Natural Vegetation	1111.592 sq km
		Forest Area	0.359 sq km
		Natural Vegetation in Wet Areas	0.397 sq km
		Range Land	9.748 sq km
		Water Body	2.521 sq km
		Population	41607
Household	7970		
<b>Agricultural Drought</b>	Low - Extreme	Settlements	22
		Agriculture Area	94.229 sq km
		Bare Area with sparse Natural Vegetation	1360.045 sq km
		Forest Area	0.443 sq km
		Natural Vegetation in Wet Areas	0.503 sq km
		Range Land	12.299 sq km
		Water Body	3.178 sq km
		Population	10878
Household	2087		
<b>Heatwave</b>	Low - High	Agriculture Area	134.149 sq km
		Kachcha Area	4.122 sq km
		Pakka Planned Area	0.078 sq km
		Pakka Unplanned Area	0.173 sq km
		Population	41230
		Household	7903
Settlements	72		
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	

<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami
<b>Storm Surge</b>	Nil	The UC falls out of vulnerable zone for Storm Surge

<b>Trimunh</b>			
<b>Hazard Type</b>	<b>Risk</b>	<b>Elements at Risk</b>	
<b>Earthquake</b>	Low	Agriculture Area	78.342 sq km
		Kachcha Area	0.811 sq km
		Pakka Planned Area	0.662 sq km
		Pakka Unplanned Area	1.572 sq km
		Range Land	0.07 sq km
		Education Facilities	62
		Settlements	85
		Irrigation and Drainage Network	15.776 km
		Road Network	159.297 km
		Population	36371
		Household	6578
<b>Meteorological Drought</b>	Medium - Extreme	Settlements	85
		Agriculture Area	78.499 sq km
		Bare Area with sparse Natural Vegetation	45.628 sq km
		Forest Area	0.003 sq km
		Range Land	1.59 sq km
		Water Body	0.468 sq km
		Wet Area	0.646 sq km
		Population	36505
		Household	6601
<b>Agricultural Drought</b>	Low - Medium	Settlements	2
		Agriculture Area	4.384 sq km
		Bare Area with sparse Natural Vegetation	57.921 sq km
		Forest Area	0.004 sq km
		Range Land	1.62 sq km
		Population	1018
		Household	178
<b>Heatwave</b>	Low - High	Agriculture Area	44.075 sq km
		Kachcha Area	0.804 sq km
		Pakka Planned Area	0.66 sq km
		Pakka Unplanned Area	1.568 sq km
		Population	36255

		Household	6559
		Settlements	80
<b>Riverine Flood</b>	Nil	The UC falls out of vulnerable zone for Riverine Flood	
<b>Cyclone</b>	Nil	The UC falls out of vulnerable zone for Cyclone	
<b>Tsunami</b>	Nil	The UC falls out of vulnerable zone for Tsunami	
<b>Storm Surge</b>	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**

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

**Table 4: UCDMC Union Council Disaster Management Committee**

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

## RESPONSIBILITY OF DISTRICT DISASTER MANAGEMENT AUTHORITY

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

## FUNCTION OF DDMA

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

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

## RESPONSIBILITY OF TALUKA DISASTER MANAGEMENT COMMITTEE

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

---

## FUNCTION OF TALUKA DISASTER MANAGEMENT COMMITTEE

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

## RESPONSIBILITY OF UNION COUNCIL DISASTER MANAGEMENT COMMITTEE

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

---

## FUNCTION OF UCDMC

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

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

## ESTABLISHMENT OF EMERGENCY OPERATION CENTERS

### PROVINCIAL EMERGENCY OPERATION CENTER (PEOC)

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

The functions of PEOC are summarized below;

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

---

## **DISTRICT EMERGENCY OPERATION CENTER (DEOC)**

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

---

## **FUNCTION OF DEOC**

The functions of DEOC are appended below;

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

## **SECTOR WISE ROLES AND RESPONSIBILITIES OF GOVERNMENT FUNCTIONARIES**



## AGRICULTURE AND LIVESTOCK DEPARTMENT

### ***Pre-Disaster***

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

### ***During-Disaster***

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

### ***Post-Disaster***

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

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

## **PROVINCIAL DISASTER MANAGEMENT AUTHORITY (PDMA)**

### ***Pre-Disaster***

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

### ***During-Disaster***

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

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

#### ***Post-Disaster***

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

### **DISTRICT DISASTER MANAGEMENT AUTHORITY (DDMA)**

#### ***Pre-Disaster***

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

### ***During-Disaster***

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

### ***Post-Disaster***

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

## **CIVIL DEFENSE**

### ***Pre-Disaster***

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

### ***During-Disaster***

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

### ***Post-Disaster***

- Assist in rehabilitation process if required

## **EDUCATION DEPARTMENT**

### ***Pre-Disaster***

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

### ***During-Disaster***

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

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

#### ***Post-Disaster***

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

## **FINANCE DEPARTMENT**

#### ***Pre-Disaster***

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

#### ***During-Disaster***

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

#### ***Post-Disaster***

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

## HEALTH DEPARTMENT

### *Pre-Disaster*

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

### *During-Disaster*

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

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

#### ***Post-Disaster***

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

## **IRRIGATION DEPARTMENT**

#### ***Pre-Disaster***

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



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

#### ***During-Disaster***

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

#### ***Post-Disaster***

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

## **INFORMATION DEPARTMENT**

#### ***Pre-Disaster***

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

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

#### ***During-Disaster***

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

#### ***Post-Disaster***

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

### **PAKISTAN METEOROLOGICAL DEPARTMENT (PMD)**

#### ***Pre-Disaster***

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

#### ***During-Disaster***

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

### ***Post-Disaster***

- Technical assistance in rescue and rehabilitation process

## **POLICE DEPARTMENT**

### ***Pre-Disaster***

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

### ***During-Disaster***

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

### ***Post-Disaster***

- Assist in relief and rehabilitation process

## REVENUE DEPARTMENT

### *Pre-Disaster*

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

### *During-Disaster*

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

### *Post-Disaster*

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

## ARMED FORCES

### *Pre-Disaster*

- Coordinate with the DDMA in the pre-disaster planning

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

#### ***During-Disaster***

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

#### ***Post-Disaster***

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

## **SOCIAL WELFARE AND COMMUNITY DEVELOPMENT**

#### ***Pre-Disaster***

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

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

#### ***During-Disaster***

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

#### ***Post-Disaster***

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

### **NGOs / INGOs**

#### ***Pre-Disaster***

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

- Resource mobilization at local and international level

#### ***During-Disaster***

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

#### ***Post-Disaster***

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

## DISASTER MANAGEMENT GUIDELINES



## INTRODUCTION

Multi-hazard vulnerability Risk Assessment of Sukkur 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 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.

<b>Riverine Flood</b>	<ol style="list-style-type: none"><li>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.</li><li>2. Though river Indus floodplain is bounded by flood protective embankment, but still some parts of district Sukkur adjoining river Indus are likely to be affected due to breaches in embankments of river Indus.</li><li>3. It is highly recommended to identify and reinforce sections of vulnerable embankments before flooding season to avoid breaches in embankments and consequential damages.</li><li>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</li></ol>
-----------------------	---

	<p>Punjab, Federal Flood Commission and Pakistan Meteorological Department (PMD) be conducted.</p> <ol style="list-style-type: none"> <li>5. Timely alerts be issued to people living in low lying areas within flood plain.</li> <li>6. In case of high anticipated flows evacuation of people and livestock be carried out.</li> <li>7. Soaking and compacting of embankments before arrival of flood water.</li> <li>8. Reinforcement and stone pitching of high-risk embankments.</li> <li>9. Use alternative eco-friendly options like use of bamboo wood etc. to minimize erosion impact on high-risk embankments.</li> <li>10. Where necessary and possible, erection of guide embankments and spur before arrival of high flood water.</li> <li>11. 24/7 vigilance of high-risk embankments by Sindh Irrigation Department.</li> <li>12. Readily availability of breach filling stock and machinery at high risk embankments.</li> <li>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.</li> <li>14. Removal of possible congestion factors within the flood plain.</li> <li>15. Public participation comprising local people be encouraged in pre and during flood periods.</li> </ol>
<p><b>Earthquake</b></p>	<ol style="list-style-type: none"> <li>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 Sukkur falls away from any major fault line and is unlikely to be affected by a massive earthquake.</li> <li>2. Some of prominent faults situated in Sindh are (a) Karachi-Jati, (b) Surjan-Jhampir, (c) Pab Fault (d) Hub Fault and (e) Allah Bund-Rann of</li> </ol>

	<p>Kutch faults.</p> <ol style="list-style-type: none"> <li>3. Though risk of geophysical hazards in Sukkur district is low but still some actions must be taken to avoid losses in case of minor jolts. Sukkur is old and historical city having abundance of closely spaced houses. It is highly recommended to identify old and weak buildings in the city and other urban settings of the district. Local concerned authorities may decide evacuation or retrofitting of such buildings / structures.</li> <li>4. It is also recommended that, new housing schemes, societies and infrastructure be built with proper town planning and following Building Codes recommended for the zone in which Sukkur district is situated.</li> <li>5. Local government departments must be strengthened to manage situation arisen from earthquake jolts. Strengthening must include capacity building to act as first responder in any likely situation.</li> </ol>
<b>Heatwave</b>	<ol style="list-style-type: none"> <li>1. The district has witnessed rapidly increased severity of heatwave in the past five years. The district is moderately populated, which significantly increases the chances of moderate heatwave impacts.</li> <li>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.</li> <li>3. Scientific studies suggest that, frequency and intensity of heatwaves is increased due to climate change. Though climate change is global phenomena, however, its impacts can be minimized through local interventions. The most efficient and cost-effective solution is tree plantation. Tree plantation must be encouraged at different levels including government functionaries, NGOs, community and individual levels.</li> <li>4. Additionally, introduction of reduced Urban Heat Islands (UHI) through policies and implementation in infrastructure development will significantly reduce impacts of heatwaves.</li> </ol>
<b>Drought</b>	<ol style="list-style-type: none"> <li>1. Sukkur is a moderately populated district with closely spaced homes in major cities. Climatic condition of the district can be categorized as</li> </ol>

	<p>Warm and Semi-Arid (Climate Classification of Pakistan (Khan et al., 2010). Average annual rainfall received during a year across the district is 96.5 mm. Agriculture is practiced in the district which is mainly dependent on rainfall.</p> <p>2. Drought is also forecastable hazard and can be predicted well in advance. Though drought does not bring any prominent or famine like conditions in the district, however, it causes reduction in agricultural production and some extent disturb food supply for the animals and livestock. The best practice to manage drought related impacts is storage of food supplies for both humans and animals.</p> <p>3. The situation of drought may vary in future due to climate change effects, therefore, introduction of drought resilient crops is need of the time. Additionally, efficient use of available water resources and introduction of efficient irrigation systems in agriculture sector is also required.</p>
<b>Cyclone</b>	According to MHVRA Study 2022, there is no Cyclone Hazard in Sukkur district.
<b>Tsunami</b>	According to MHVRA Study 2022, there is no Tsunami Hazard in Sukkur district.

# STANDARD OPERATING PROCEDURES

## INTRODUCTION

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

## ACTION PLAN FOR FLOOD

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

**Table 5: Action Plan for Flood Hazard Management**

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

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

## ACTION PLAN FOR FORECASTABLE DISASTERS

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

**Table 6: Action Plan for Heatwave Hazard Management**

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

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

**Table 7: Action Plan for Drought Hazard Management**

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

## ACTION PLAN FOR UNFORECASTABLE HAZARDS

### Earthquake

The earthquake is unforecastable hazard and does not provide reaction time to prevent damages.

The recommended post disaster action plan are as follows

**Table 8: Action Plan for Earthquake Hazard Management**

Action	Timelines	Responsibility
Mobilization of man and material resources for rescue and recovery	Post disaster	PDMA and DDMA



Mobilization of NGO, INGO, volunteer groups, scouts and armed services for rescue and recovery	Post disaster	PDMA and DDMA
Coordination and establishment of relief camps, mobile medical camps, life support facilities and provision of relief to affectees	Post disaster	PDMA and DDMA
Coordination and mobilization of rescue teams to search and rescue life in collapsed structures	Post disaster	PDMA and DDMA
Coordination with National Disaster Management Authority (NDMA) for seeking assistance from international agencies (depending on severity of events and damages/losses)	Post disaster	PDMA
Coordination and mobilization of resources on Build Back Better principles	Post disaster	PDMA

### SOP FOR PEOC AND DEOCs

- For the smooth operation of the emergency activities the PEOC and District Emergency Response Centre (DEOC) will work under defined Standard Operating Procedures (SOPs). These SOPs are broadly categorized in three sections
  - a. Action on receipt of early warning, safe evacuation, search and rescue, initial assessment, relief distribution, recovery and deactivation of response.
  - b. Coordination and information dissemination
  - c. Contingency planning and response actions

- For localized emergencies, the situation shall be dealt within the regular operating mode of the emergency management services in the district.
- DDMA shall activate the DEOC and take the operational lead for the district government response.
- The DEOC will serve as the center for receiving early warning and issuing information to public at village level, taking measures to evacuate people, updating relevant departments, response agencies, and media etc.
- The DEOC will lead the coordination and management of relief operations in affected areas in the district with the assistance of PEOC.
- DEOC will coordinate with all concerned departments and humanitarian agencies at district level.
- DEOC will coordinate for early recovery with the assistance of PDMA and other concerned departments.
- In standby position, PEOC and DEOC shall be alert and ready to start emergency operations. The PEOC shall coordinate with concerned departments like NDMA, PMD, etc. for regular updates on likely disaster events. Once the threat is established, the PDMA shall approve the alert and activate response mechanism of PEOC and DEOC.
- Once PEOC and DEOC activation is approved or issued, both centers will remain fully operational on 24/7 basis and coordination shall be established with all concerned departments.
- PEOC and DEOC will collect regular updates on disaster situation and after normalization of situation and with mutual consultation shall inform PDMA to issue stand down or disaster deactivation call and final report on emergency operations will be circulated to stakeholders.
- The operationalization of PEOC and DEOC means complete activation of centers during disaster situation. Management of PDMA shall ensure full functionalities of PEOC including stock for emergency food, office supplies, communication system with backup support, electricity generators, computers, screens, multimedia projectors and other necessary equipment. While Deputy Commissioner Sukkur 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 (11)	<b>Ali Wahan, Arore, Baiji, Hingoro, Loung Bhatti, Nauraja, Nindapur, Panhwar, Sadhuja, Sangi, Tamachani</b>
UCs not at Risk (12)	<b>Dhandhi, Junas, Kandhra, Lal Juryo Khan Shambani, Mithree No. 33, Mubarakpur, Patni, Salehpat, Sangrar, Sultanpur, Tarai , Trimunh</b>
General Description	<ol style="list-style-type: none"> <li>1. This district is bounded by district Ghotki and India on the east, district Kashmore on the north, district Shikarpur on the north-west, and district Khairpur on the west and south.</li> <li>2. Indus River flows on the north-western side of this district. Sukkur is the narrowest part of the Indus River course.</li> <li>3. Sukkur has a large Riverine forest along the course of the Indus. These tropical forests are found within the protective embankments on either side of the Indus.</li> <li>4. The areas of the district that are adjacent to the river and canal are irrigated and mainly consists of the croplands.</li> <li>5. The north western parts of the district are irrigated through Indus River. Nara canal emanates from the Sukkur Barrage and irrigates the southern parts of the district. However, the rest of the district, on the eastern border, due to non-availability of water are barren.</li> <li>6. The total population of district according to 2017 census was recorded to be 1,487,903. Since district Sukkur is a partly urban district, where 51% of the population resides in urban areas, sources of livelihood are diversified for the resident population. While agriculture is the main source of employment for the rural population.</li> <li>7. District Sukkur is vulnerable to riverine floods.</li> <li>8. District Sukkur was hit by floods in 2010, 2011, and 2012. However, the severity of these floods was moderate in Sukkur as compared to other districts.</li> <li>9. In 2010 floods, a total 130 villages were affected. A population of 247,913 persons was affected and there were 16 casualties.</li> <li>10. Large parts of Sukkur district were inundated in 2010 and 2011 floods and was badly hit by heavy rains in 2012, which resulted in damage to the public health infrastructure in the district.</li> <li>11. According to MHVRA study 2022, flood hazard intensity for district Sukkur is “<b>Low to Very High</b>”</li> <li>12. According to MHVRA study 2022, flood risk for district Sukkur is “<b>Low to Extreme</b>”</li> </ol>
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> <li>1. Recording of daily river discharge at barrages in Sindh, and regular dissemination among stakeholders.</li> <li>2. In case of high discharge, dissemination of warnings and alerts to masses living in flood plain.</li> <li>3. Identification and inspection of vulnerable embankments likely to be affected due to flooding during pre-monsoon season, as per “Bund Manual” of irrigation department.</li> </ol>	

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

#### **Response**

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

#### **Recovery and Rehabilitation**

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

Earthquake	
<b>UCs at Risk</b>	<b>All UCs</b>
<b>General Description</b>	<ol style="list-style-type: none"> <li>1. An earthquake is a sudden shaking of the ground caused by two chunks of earth's crust sliding past one another.</li> <li>2. Although earthquakes are short-lived, usually not lasting more than a minute, they can leave behind incredible damage.</li> <li>3. Identifying potential hazards ahead of time and advance planning can reduce the dangers of serious injury or loss of life from an earthquake.</li> <li>4. The earthquake hazard intensity for district Sukkur is "<b>Low</b>"</li> <li>5. The earthquake risk intensity for district Sukkur is "<b>Low</b>"</li> </ol>
Disaster Management Measures	
Preparedness	
<ol style="list-style-type: none"> <li>1. Identifying and inventorying weak buildings and structures especially in urban settings of the district and situation demanding action by concerned departments.</li> <li>2. Preparation of landuse plans, town plans and implementation of building codes in new residential schemes, schools, public and private offices.</li> <li>3. Implementation of DRR measures in public infrastructure development schemes.</li> <li>4. Establishment of search and rescue infrastructure and services which can be mobilized as first responder in post-earthquake situation.</li> <li>5. Mobilize NGOs, INGOs, community development organizations and volunteers, and conduct earthquake safety awareness campaigns and drills especially in main urban settings.</li> <li>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.</li> <li>7. Availability of alternative communication system in case if usual communication means are disturbed by earthquake.</li> <li>8. Preparation of medical emergency plan to manage mass casualties in case of any major earthquake event.</li> </ol>	
Response	
<ol style="list-style-type: none"> <li>1. Obtain firsthand information on intensity of earthquake and damages; prioritize areas for search and rescue operation.</li> <li>2. Mobilize community-based volunteers, scouts and other trained personnel to hard hit areas to assess situation and help victims.</li> <li>3. Establish emergency camps / shelters with necessary life support facilities.</li> <li>4. Establish medical camps for provision of first aid and possible medical assistance to injured.</li> <li>5. Evacuate people from damaged houses to safe places and shelters.</li> <li>6. Provide security in affected areas and maintain law and order situation to prevent incidents of thefts and stampede.</li> <li>7. Arrangement and conduct of aerial / drone survey of the affected areas.</li> <li>8. Establish information and help desks for facilitation of affectees.</li> <li>9. Restore essential services like power, water supply, and telecommunication of critical infrastructure like hospitals, control Rooms, etc. on priority basis.</li> </ol>	

### **Recovery and Rehabilitation**

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



<b>Heatwave</b>	
<b>UCs at Risk</b>	<b>All UCs</b>
<b>General Description</b>	<ol style="list-style-type: none"> <li>1. Heatwave is a condition of atmospheric temperature that leads to physiological stress, which sometimes can claim human life.</li> <li>2. Sukkur is known for its extremely hot summers. Sukkur has a hot desert climate, characterized by very hot and hazy summers as the temperature can reach 50°C which creates problem for the individuals like heat stroke, skin burn and sometimes death of a person.</li> <li>3. Dry heat is experienced starting April to early June until the Monsoon season starts to arrive. Monsoons in Sukkur are not very wet, but bring high dew points, resulting in high heat indices.</li> <li>4. A severe heatwave, in 2010, engulfed parts of Sindh, including Sukkur.</li> <li>5. A severe heat wave with temperatures as high as 49°C struck southern Pakistan in June 2015. It caused the deaths of about 2,000 people from dehydration and heat stroke, mostly in Sindh province.</li> <li>6. 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.</li> <li>7. Very high temperature not only affects vegetation but also creates problem for the individuals like heat stroke, skin burn etc.</li> <li>8. According to MHVRA study 2022, heatwave hazard intensity for district Sukkur is <b>“High to Severe”</b></li> <li>9. According to MHVRA study 2022, heatwave risk for district Sukkur is <b>“Low to High”</b></li> </ol>
<b>Disaster Management Measures</b>	
<b>Preparedness</b>	
<ol style="list-style-type: none"> <li>1. Consistent future development strategy: Tree plantation, restoration of natural ecosystem, construction of environment friendly and well planned residential societies, offices, infrastructure and human dwellings.</li> <li>2. Monitoring for hot weather alerts through local and international sources and issuance of timely Hot Day Advisories, and Hot Day Warnings.</li> <li>3. Upgradation of major public health care facilities with necessary equipment and medicines to treat heatstroke patients.</li> <li>4. Heatstroke awareness campaigns and wide public coverage through media, social media, SMS, NGOs and social welfare organizations.</li> <li>5. Arrangements for uninterrupted supply of electricity and water in vulnerable areas.</li> </ol>	
<b>Response</b>	
<ol style="list-style-type: none"> <li>1. Mobilization of NGOs, social welfare organization and volunteers for arranging heatstroke facilitation camps and distribution of fresh drinking water in affected areas.</li> <li>2. Local radio FM broadcasts to disseminate heatstroke safety and precautions.</li> <li>3. Mobilize mobile medical teams for first-aid and other medical emergency support in affected area.</li> <li>4. Record keeping of heatwave patients and fatalities.</li> </ol>	
<b>Recovery and Rehabilitation</b>	
<ol style="list-style-type: none"> <li>1. Post event review of heatwave plan and modifications if required.</li> </ol>	

<b>Cyclone/Tsunami</b>	
<b>UCs at Risk</b>	<b>Nil</b>
<b>General Description</b>	According to MHVRA study 2022, there is no risk of Cyclone/Tsunami in Sukkur district.

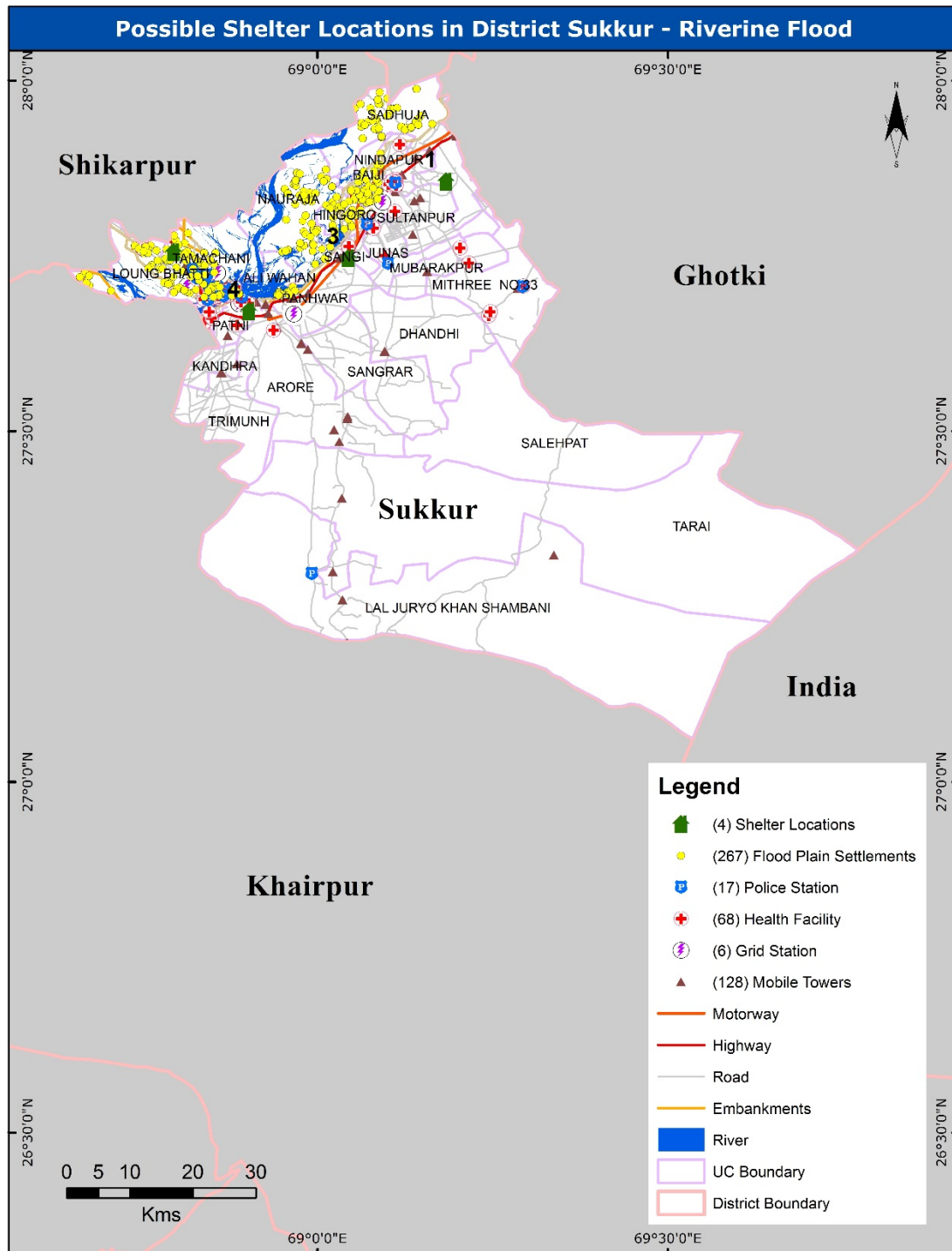
<b>Drought</b>	
<b>UCs at Risk</b>	<b>All UCs</b>
<b>General Description</b>	<ol style="list-style-type: none"> <li>1. Climatic condition of the district can be categorized as Hot and Arid (Climate Classification of Pakistan (Khan <i>et al.</i>, 2010)</li> <li>2. Rainfall is very insufficient, average annual rainfall received during a year across the district is 96.5 mm</li> <li>3. 55.8% of the total district area is covered with bare areas with sparse natural vegetation, Achhro (white desert) covers the east, south and west regions of the district.</li> <li>4. River Indus is flowing along western boundary of the district.</li> <li>5. Orchards are abundant, mostly at north and western corner of the district. Range lands with natural herbs and shrubs are mostly found at western side of the district.</li> <li>6. Small water bodies are prevalent from north to south and at west. Natural vegetation is found along both sides of river bed scattered from north to south-west of the district.</li> <li>7. Irrigated crop fields are at 20.92% of the total district area, scattered from north to south and at west.</li> <li>8. Canal irrigation is prevalent, while river is also used for irrigation purpose.</li> <li>9. According to MHVRA study 2022, <ol style="list-style-type: none"> <li>a. Meteorological drought hazard for district Sukkur is <b>“Extreme”</b></li> <li>b. Meteorological drought risk for district Sukkur is <b>“Medium to Extreme”</b></li> <li>c. Agricultural drought hazard for district Sukkur is <b>“Mild to Extreme”</b></li> <li>d. Agricultural drought risk for district Sukkur is <b>“Low to Extreme”</b></li> </ol> </li> </ol>
<b>Disaster Management Measures</b>	
<b>Preparedness</b>	
<ol style="list-style-type: none"> <li>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.</li> <li>2. Implementation of water supply and demand management and encouragement of efficient irrigation systems in agriculture.</li> <li>3. Research and promote drought resistant agriculture crops.</li> <li>4. Resilience and improvement of adaptive capacity of farmers.</li> <li>5. Monitoring of temperature, precipitation, potential evapotranspiration, soil moisture, stream flow, groundwater levels, lakes, and reservoirs for drought forecasting.</li> <li>6. Control ground water extraction from upper and lower aquifers to be within the sustainable yield limits.</li> </ol>	
<b>Response</b>	
<ol style="list-style-type: none"> <li>1. Assess data about the nature of drought conditions and their impact.</li> <li>2. Provision and installation of solar water pumps for availability of clean drinking water.</li> <li>3. Public information campaign for water management and saving.</li> </ol>	

### **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.

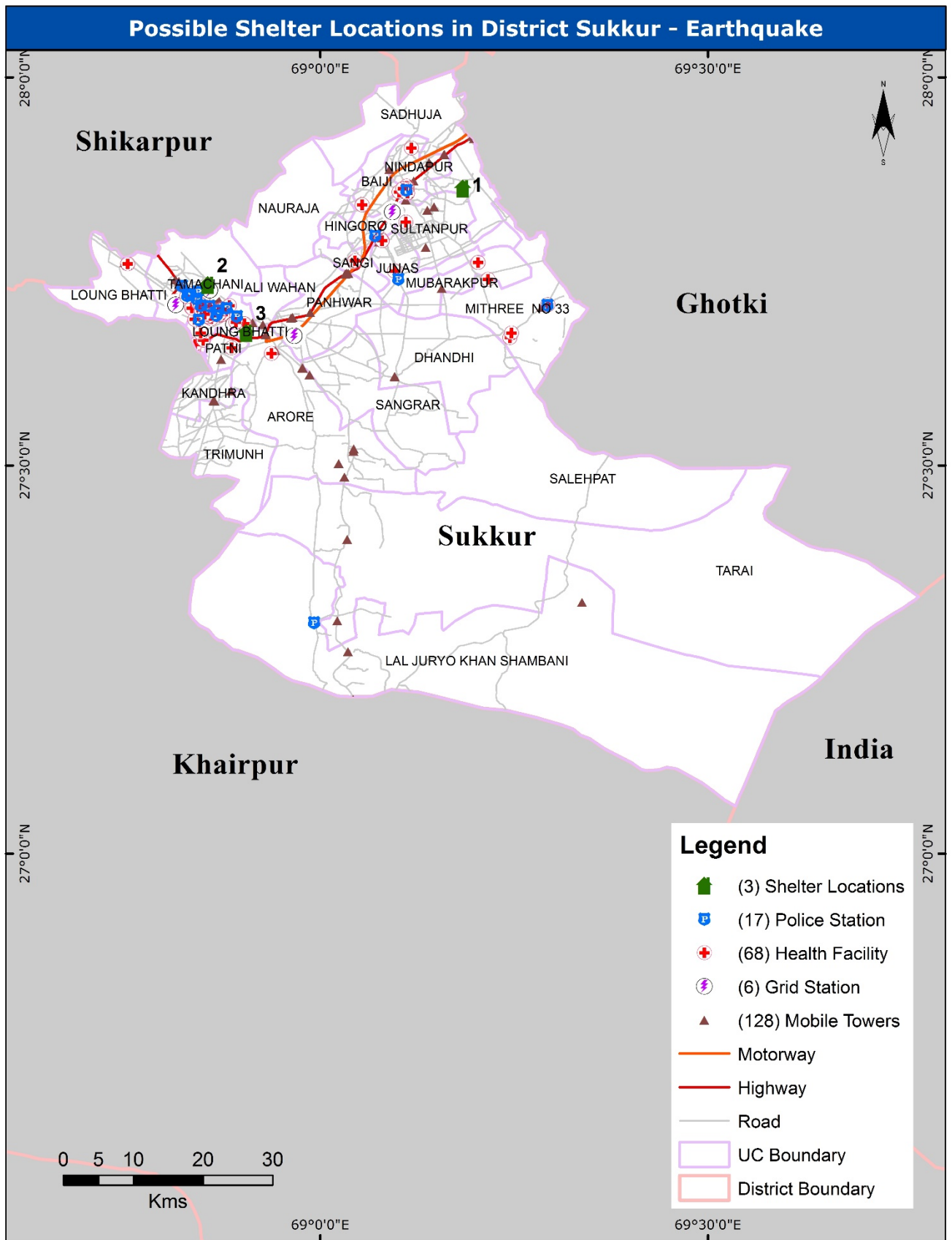
## SHELTER LOCATION MAP

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 Sukkur. 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
<b>Riverine Flood</b>	
1. Geomorphological study of flood plain & river course modelling	Conduct flood plain study for identification of bottlenecks, including elevated islands ( <b>Annex – D</b> ) 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 ( <b>Annex – E</b> ).	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.
<b>Earthquake</b>	
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.
<b>Drought</b>	
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 – SUKKUR DISTRICT

The existing nature of disasters in Sukkur district can be categorized as low to Extreme. The prominent hazards in the district is drought and flood. The drought risk in the district ranges from low to extreme. There is no risk of storm surge, cyclone and Tsunami in the district. The risk of earthquake is determined to be low. As far as Heatwave is concerned Sukkur district is at low to high-risk. As far as riverine flood is concerned the settled areas of few UCs in the district are likely to be effected in breaching scenario of flood protection embankments of river Indus. As far as population living within the flood plain is concerned, they are well aware of flood risk and live on their own risk, therefore, government functionary is recommended to be mobilized for dissemination of warnings and alerts to population, safe evacuation and providing temporary shelters. Based on the results of the MHVRA study the hazards of the district can be managed through soft and enhanced management measures. In this scenario, cost benefit analysis of proposed interventions is appended in table below:

**Table9: Cost Benefit Analysis of Disaster Risk Measures in District Sukkur**

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 Sukkur, as these can accommodate large number of people during disasters. Gradually, permanent multi-purpose shelters specially in near river Indus and at safe location can be established in future to avoid use of education facilities.	Shelter places are highly beneficial at times of disaster as it offers a unified accommodation place for displaced people. Shelter place also help administration in effective management of displaced people and provide them with much needed relief. Shelter space keeps people off the highways during and after disaster. Shelters are often the only safe heaven for those without the financial means to take other protective measures.
2.	Early warning system for disasters	The international and regional early warning system for flood and drought can be used to cost-effectively disseminate warnings to vulnerable communities, minimize the impact of disaster and save precious lives, and crucial infrastructure.	Early warnings give people time to flee from a floods, or drought; enable local authorities to evacuate or shelter large numbers of people in advance; provide information on the occurrence of a public health hazard; and enable a faster response to problems of food and water insecurity. Warnings issues well before an event also enable people to protect some property and infrastructure. For example, reservoir operators could reduce the water levels gradually to accommodate incoming flood waters; local authorities could position equipment for emergency response; aid agencies can mobilize sooner; hospitals could be prepared to receive more patients. In general, the longer the lead time, the greater amount of property and infrastructure that can be protected.
3.	Awareness campaigns for disasters	Public private partnership and use of electronic/print media for raising public awareness is a cost-effective approach to build society resilience and improved disaster risk management capabilities of vulnerable	Public awareness and public education for disaster reduction helps to reduce disaster risks. It mobilizes people through clear messages, supported with detailed information. People who know how to react in case of a disaster, community leaders who have learned to warn their people in time, and whole social layers who

		communities.	have been taught how to prepare themselves for natural hazards can contribute to better mitigation strategies and dissemination of information on the consequences of hazards. Education and knowledge can provide people with tools for vulnerability reduction and life-improving self-help strategies.
4.	Strengthening of mobile health care facilities	In the aftermath of a natural disaster, most of medical functions are provided from temporary locations to avoid difficulty in patients' transportation to permanent hospital facilities. Mobile health care units are already available with government of Sindh, their mobilization to disaster management will ensure lifesaving.	Mobile health facilities play a very significant role in the mitigation of disaster because of their particular function in treating the injured and handling outbreaks of disease. The systematic organization and easy mobilization of the staff, equipment and medical supplies in a safe environment are crucial if disaster response is to be prompt and effective.

## ANNEX – A – VULNERABLE SETTLEMENTS PRONE TO RIVERINE FLOOD

### List of Vulnerable Settlements (267) within flood Plains Prone to Riverine Flood

S.No	Name	Longitude	Latitude	Area (acres)
1	Abad Lakha	68.823	27.732	31.41
2	Abdullah Shar	68.806	27.754	8.16
3	Aerazi Saidki	69.074	27.827	5.83
4	Allah Bux Jamali	68.759	27.760	6.87
5	Arain	68.799	27.734	13.68
6	Bachal Shah Goth	68.839	27.692	92.67
7	Bagarji	68.752	27.754	111.50
8	Baghpai	69.049	27.792	10.24
9	Bahji Sharif	69.077	27.849	1.91
10	Baigy Shareef	69.087	27.842	7.95
11	Balochpur Bahadur	69.018	27.763	2.21
12	Bangal Khoso	68.802	27.766	1.93
13	Baroch	68.772	27.743	12.35
14	Barrage Colony	68.852	27.692	120.61
15	Basheerabad	68.844	27.700	24.32
16	Bhandki	69.038	27.824	3.51
17	Botch Goth	69.141	27.989	21.93
18	Bukkur Island	68.889	27.696	13.90
19	Bumbo Asmani	69.059	27.856	9.83
20	Cattle Colony Sukkur	68.811	27.753	5.52
21	Chungha	69.070	27.859	19.98
22	Chutto Lakhan	68.796	27.779	3.44
23	Dater Dino	69.065	27.830	5.29
24	Delhi Muslim Housing Society	68.820	27.720	1.56
25	Dildar Samejo	69.052	27.831	7.16
26	Faiz Muhammad Jatoi	69.022	27.794	8.37
27	Farrukhpur	69.067	27.845	8.92
28	Fazul Shah	68.755	27.763	4.96
29	Ghumra	68.759	27.754	17.40
30	Golimar Colony	68.858	27.709	410.86
31	Gosarji	68.784	27.746	13.21
32	Goth	69.082	27.931	3.42
33	Goth Abbdullad Shah	69.028	27.834	2.67
34	Goth Abdul Sattar	68.838	27.710	126.17
35	Goth Abdur Rahman Narejo	68.669	27.725	6.00
36	Goth Adam	69.062	27.967	3.00
37	Goth Allah Warayio	68.785	27.760	10.34
38	Goth Amin Shah	68.969	27.858	-
39	Goth Azizpur	69.021	27.849	1.70

S.No	Name	Longitude	Latitude	Area (acres)
40	Goth Bagh Pai	69.049	27.792	10.24
41	Goth Bahadar Khan	69.114	27.961	14.03
42	Goth Bakhsh	69.089	27.984	8.10
43	Goth Baqaabad	69.062	27.815	16.55
44	Goth Bhotra	68.955	27.757	7.42
45	Goth Bindo Faiz Mohammad Narejo	68.671	27.712	11.98
46	Goth Dengro	68.815	27.783	11.90
47	Goth Deraja	69.021	27.772	-
48	Goth Dil Murad Chachar	69.076	27.961	1.47
49	Goth Dost Muhammad	69.148	27.950	8.75
50	Goth Dreha	68.798	27.767	28.32
51	Goth Faqir Mohammad	69.144	27.945	5.24
52	Goth Farash	68.792	27.751	7.48
53	Goth Gahi Faqir	69.078	27.956	4.20
54	Goth Gant Ali Jatoi	68.759	27.733	-
55	Goth Ghani Khoso	68.853	27.739	18.01
56	Goth Ghumro	68.740	27.765	105.79
57	Goth Haji Khan Chachar	69.086	27.880	34.71
58	Goth Haji Nehal Kahan Khoso	68.840	27.737	43.79
59	Goth Hakim Ali Mehar	68.979	27.800	6.37
60	Goth Halim	69.022	27.794	8.37
61	Goth Hasan Beli	68.969	27.824	36.36
62	Goth Hot Lakhani	68.811	27.769	1.63
63	Goth Imam Bakhsh Areja	68.965	27.706	4.16
64	Goth Iso Lakhani	68.848	27.744	8.54
65	Goth Jafarabad	68.820	27.751	36.07
66	Goth Jumani	68.771	27.758	10.79
67	Goth Kalhuri	68.746	27.761	10.51
68	Goth Khan Belo	69.091	27.921	13.66
69	Goth Milan Jatoi	69.031	27.821	3.25
70	Goth Miral Jatoi	69.026	27.787	6.47
71	Goth Mohammad Mor Jattoi	68.706	27.700	8.51
72	Goth Mohammad Rafiq Jamali	68.674	27.722	-
73	Goth Mohoub Chachar	69.134	27.934	1.67
74	Goth Moka	69.088	27.842	7.95
75	Goth Muhammad Yaqub	68.992	27.796	11.78
76	Goth Noral	69.140	27.941	2.04
77	Goth Phul	69.100	27.975	7.67
78	Goth Phulani	69.079	27.943	8.78
79	Goth Qadri	68.990	27.777	2.00
80	Goth Qasim Mahar	69.023	27.805	10.97
81	Goth Raza Mahar	69.009	27.857	28.32
82	Goth Rehmatullah Chachar	69.125	27.930	1.85

S.No	Name	Longitude	Latitude	Area (acres)
83	Goth Rojhan Jatoi	69.025	27.782	2.87
84	Goth Sabhon	69.119	27.934	30.62
85	Goth Sabu Chachar	69.087	27.973	3.99
86	Goth Sadiq Shah	69.072	27.834	6.59
87	Goth Sumra	69.024	27.823	24.04
88	Goth Surho Khan Narejo	68.661	27.720	6.24
89	Goth Tahir	69.144	27.937	10.61
90	Goth Tariq Chachar	69.088	27.932	17.44
91	Goth Ural	69.090	27.896	14.50
92	Goth Waria Katper	68.968	27.700	14.24
93	Goth Wariam	69.053	27.808	3.18
94	Goth Wasir	69.035	27.819	9.77
95	Gullu Jo Goth	68.983	27.808	6.60
96	Hyder Shah	68.762	27.765	4.58
97	Indal Goth	69.063	27.863	-
98	Jabra	68.799	27.703	-
99	Jaffria Cooperative Housing Society	68.831	27.716	31.71
100	Jamal Din Indher	69.060	27.837	5.87
101	Janga	69.006	27.863	7.64
102	Khan Jatoi	69.044	27.803	19.32
103	KHAN Shah Village	69.048	27.843	6.50
104	Lakha Mahalah	68.752	27.757	111.50
105	Latifabad	68.848	27.704	51.35
106	Mahil Jo Goth	68.790	27.744	-
107	Mahrab Khan	69.066	27.871	5.85
108	Makoro Kala	69.070	27.826	14.65
109	Malook Shar	68.813	27.743	3.06
110	Manga Jo Goth	68.795	27.698	-
111	Manka Goth	69.086	27.831	2.99
112	Marri	68.960	27.695	4.08
113	Maulabad	68.840	27.723	12.44
114	Mazari Jo Goth	68.781	27.712	7.93
115	Memon Mohalla	68.859	27.694	330.09
116	Miandad Khan Khoso	68.853	27.726	16.37
117	Miyani	68.798	27.773	6.69
118	Nasir Abad	68.827	27.746	18.79
119	Nauraja	69.054	27.835	20.02
120	Nawa Goth	68.850	27.703	51.35
121	New Pind	68.861	27.706	410.86
122	New Shahpur	68.807	27.728	17.16
123	Nouraja	69.054	27.835	20.02
124	Old Sukkur	68.881	27.706	187.84
125	Panhwari	69.018	27.818	36.26

S.No	Name	Longitude	Latitude	Area (acres)
126	Phullu	69.013	27.860	16.11
127	Pir Mian Miro Bukhari	69.090	27.880	2.19
128	Rab Nawaz Jatoi	68.997	27.738	8.48
129	Ranjho Khan Lakhan	68.838	27.755	10.70
130	Razaq Khan Goth	69.081	27.871	18.34
131	Sadabad Goth	68.787	27.710	6.56
132	Sadhuja	69.109	27.960	11.83
133	Sasti Basti	68.809	27.751	14.76
134	Sattar Dino Samejo	69.045	27.828	1.57
135	Shahpur	69.100	27.950	24.12
136	Sindh Co-operative Housing Society	68.829	27.722	94.25
137	Sukkur	68.862	27.696	330.09
138	Sukkur	68.850	27.707	51.35
139	Sumar Goth	68.815	27.757	6.79
140	Thermal Colony	68.884	27.700	5.90
141	Untitled Settlement	68.818	27.697	7.30
142	Untitled Settlement	68.945	27.699	2.23
143	Untitled Settlement	68.946	27.698	2.23
144	Untitled Settlement	68.958	27.699	3.87
145	Untitled Settlement	68.814	27.699	4.25
146	Untitled Settlement	68.805	27.704	2.18
147	Untitled Settlement	68.808	27.703	10.43
148	Untitled Settlement	68.804	27.705	10.98
149	Untitled Settlement	68.834	27.739	6.24
150	Untitled Settlement	68.832	27.742	15.41
151	Untitled Settlement	69.010	27.746	7.73
152	Untitled Settlement	68.994	27.757	3.00
153	Untitled Settlement	69.007	27.760	8.80
154	Untitled Settlement	68.976	27.762	4.14
155	Untitled Settlement	68.981	27.765	7.29
156	Untitled Settlement	68.976	27.769	12.16
157	Untitled Settlement	69.048	27.795	1.47
158	Untitled Settlement	69.041	27.807	3.40
159	Untitled Settlement	69.050	27.812	7.01
160	Untitled Settlement	69.048	27.814	3.44
161	Untitled Settlement	69.024	27.822	1.51
162	Untitled Settlement	69.060	27.830	7.17
163	Untitled Settlement	69.053	27.830	10.97
164	Untitled Settlement	68.991	27.831	6.39
165	Untitled Settlement	68.990	27.837	2.32
166	Untitled Settlement	68.989	27.839	2.21
167	Untitled Settlement	68.989	27.841	4.54
168	Untitled Settlement	68.981	27.843	7.05



S.No	Name	Longitude	Latitude	Area (acres)
169	Untitled Settlement	69.053	27.845	2.14
170	Untitled Settlement	68.954	27.845	9.31
171	Untitled Settlement	69.087	27.855	6.70
172	Untitled Settlement	69.060	27.856	2.18
173	Untitled Settlement	69.063	27.935	81.46
174	Untitled Settlement	69.063	27.940	8.42
175	Untitled Settlement	69.073	27.941	3.06
176	Untitled Settlement	69.085	27.943	3.72
177	Untitled Settlement	69.105	27.960	8.25
178	Untitled Settlement	69.089	27.967	2.24
179	Untitled Settlement	69.053	27.960	4.31
180	Untitled Settlement	69.088	27.967	2.97
181	Untitled Settlement	69.067	27.937	16.49
182	Untitled Settlement	69.084	27.945	1.52
183	Untitled Settlement	69.083	27.944	3.82
184	Untitled Settlement	69.085	27.930	2.68
185	Untitled Settlement	69.102	27.953	6.77
186	Untitled Settlement	69.065	27.918	23.86
187	Untitled Settlement	69.092	27.919	0.68
188	Untitled Settlement	69.132	27.932	2.91
189	Untitled Settlement	69.126	27.933	1.86
190	Untitled Settlement	69.164	27.938	16.94
191	Untitled Settlement	69.012	27.873	6.82
192	Untitled Settlement	68.971	27.869	10.03
193	Untitled Settlement	68.975	27.867	9.42
194	Untitled Settlement	68.970	27.858	4.90
195	Untitled Settlement	68.966	27.853	9.29
196	Untitled Settlement	68.970	27.850	6.91
197	Untitled Settlement	68.968	27.855	2.09
198	Untitled Settlement	68.958	27.839	26.48
199	Untitled Settlement	68.975	27.836	7.06
200	Untitled Settlement	68.998	27.840	23.96
201	Untitled Settlement	68.992	27.828	3.16
202	Untitled Settlement	68.982	27.829	3.05
203	Untitled Settlement	68.981	27.837	4.07
204	Untitled Settlement	68.956	27.802	12.01
205	Untitled Settlement	68.981	27.785	5.36
206	Untitled Settlement	68.994	27.788	0.21
207	Untitled Settlement	68.995	27.787	6.70
208	Untitled Settlement	69.000	27.788	3.52
209	Untitled Settlement	68.998	27.784	1.72
210	Untitled Settlement	68.984	27.781	6.53
211	Untitled Settlement	68.958	27.759	4.90

S.No	Name	Longitude	Latitude	Area (acres)
212	Untitled Settlement	68.950	27.756	9.21
213	Untitled Settlement	68.994	27.767	0.15
214	Untitled Settlement	68.995	27.766	17.88
215	Untitled Settlement	69.038	27.789	4.42
216	Untitled Settlement	69.022	27.827	2.40
217	Untitled Settlement	69.013	27.823	3.31
218	Untitled Settlement	69.029	27.817	6.02
219	Untitled Settlement	69.029	27.818	0.01
220	Untitled Settlement	69.046	27.807	4.95
221	Untitled Settlement	69.069	27.842	6.49
222	Untitled Settlement	69.073	27.838	2.72
223	Untitled Settlement	69.061	27.833	3.16
224	Untitled Settlement	69.077	27.828	4.58
225	Untitled Settlement	69.089	27.843	3.78
226	Untitled Settlement	69.064	27.864	5.01
227	Untitled Settlement	69.061	27.863	5.83
228	Untitled Settlement	69.082	27.862	8.42
229	Untitled Settlement	69.085	27.859	8.65
230	Untitled Settlement	69.087	27.881	21.72
231	Untitled Settlement	68.675	27.708	27.46
232	Untitled Settlement	68.775	27.743	17.80
233	Untitled Settlement	68.764	27.737	4.35
234	Untitled Settlement	68.762	27.734	5.94
235	Untitled Settlement	68.775	27.731	23.04
236	Untitled Settlement	68.788	27.713	2.39
237	Untitled Settlement	68.787	27.713	2.39
238	Untitled Settlement	68.790	27.711	4.15
239	Untitled Settlement	68.789	27.744	11.23
240	Untitled Settlement	68.786	27.743	5.15
241	Untitled Settlement	68.810	27.701	-
242	Untitled Settlement	68.855	27.754	7.06
243	Untitled Settlement	68.827	27.702	-
244	Untitled Settlement	68.794	27.721	-
245	Untitled Settlement	68.779	27.732	-
246	Untitled Settlement	68.962	27.701	6.14
247	Untitled Settlement	68.965	27.701	3.49
248	Untitled Settlement	68.960	27.699	5.24
249	Untitled Settlement	68.879	27.694	5.33
250	Untitled Settlement	68.878	27.694	5.33
251	Untitled Settlement	68.948	27.696	6.46
252	Untitled Settlement	68.947	27.694	6.20
253	Untitled Settlement	68.943	27.694	4.72
254	Untitled Settlement	68.945	27.694	4.72

S.No	Name	Longitude	Latitude	Area (acres)
255	Village A Rehman Mochi	69.045	27.811	16.48
256	Village Arbab Jhandir	69.031	27.821	3.25
257	Village Bambho Aalmani	69.073	27.850	18.12
258	Village Daphar Jatoi	69.061	27.811	16.52
259	Village Din Mohammad Bhayo	69.064	27.841	5.36
260	Village Fark Pur	69.067	27.845	8.92
261	Village Goth Mustafa Jatoi	69.050	27.816	1.63
262	Village Guhram Goth	69.056	27.844	3.39
263	Village Gul Muhammad Waseer	69.034	27.819	9.77
264	Village Haroon Jatoi	69.062	27.816	16.55
265	Village Peeral Aalmani	69.072	27.840	6.92
266	Village Rawran	69.080	27.847	7.75
267	Yara Moko	69.085	27.835	5.73

## 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°51'43.83"N 69°11'27.05"E Upper left corner: 27°51'27.52"N 69°10'33.23"E Lower right corner: 27°51'25.37"N 69°11'32.00"E Lower left corner: 27°50'58.84"N 69°10'33.93"E	290	~13,000	213
2	Upper right corner: 27°45'39.00"N 68°47'50.35"E Upper left corner: 27°45'23.43"N 68°47'13.58"E Lower right corner: 27°45'19.61"N 68°48'7.23"E Lower left corner: 27°45'3.66"N 68°47'35.52"E	205	~9,000	199
3	Upper right corner: 27°45'0.32"N 69° 2'48.58"E Upper left corner: 27°44'51.08"N 69° 2'29.81"E Lower right corner: 27°44'45.45"N 69° 2'44.53"E Lower left corner: 27°44'41.08"N 69° 2'36.24"E	36.8	~1,600	202
4	Upper right corner: 27°40'29.31"N 68°54'27.27"E Upper left corner: 27°40'21.14"N 68°53'46.26"E Lower right corner: 27°40'15.41"N 68°54'32.99"E Lower left corner: 27°40'6.89"N 68°53'47.50"E	133	~5,900	225

A total of 4 shelter locations have been selected as Flood shelter places across district Sukkur. 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 29,500 tents (tent with size of 45 sq. m each) can be set up within the demarcated shelter places.

## ANNEX – C – SHELTER LOCATIONS DESCRIPTION – EARTHQUAKE

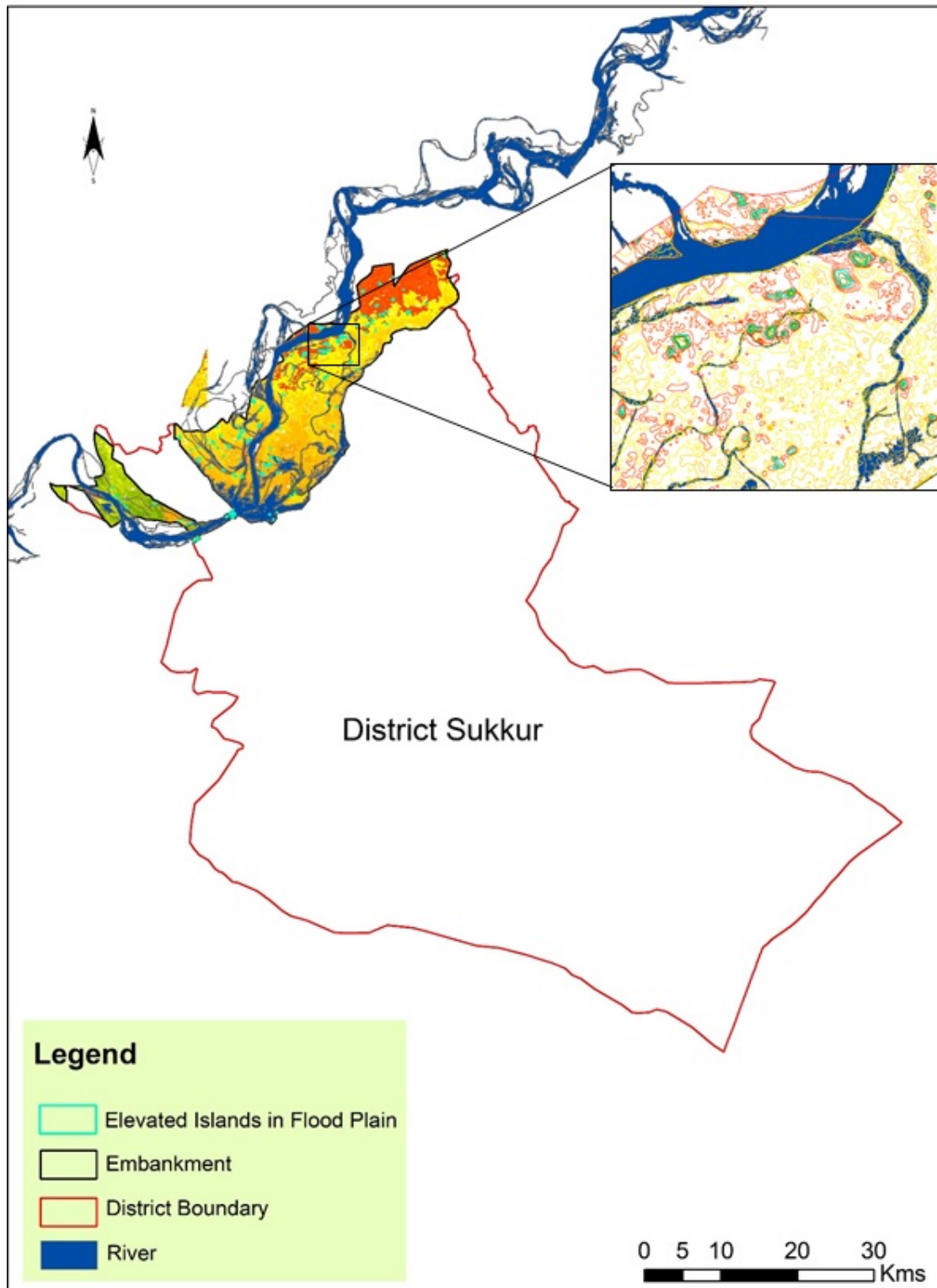
The given shelter locations for earthquake are proposed on the findings of the MHVRA 2022 study and information obtained through satellite technology and online verifiable sources. It is recommended to conduct on ground physical surveys to evaluate their suitability.

Shelter location	Co-ordinates	Area (acres)	Estimated Tents (numbers)	Avg. elevation (ft)
1	Upper right corner: 27°51'43.49"N 69°11'30.71"E	279	~12,000	205
	Upper left corner: 27°51'27.84"N 69°10'28.91"E			
	Lower right corner: 27°51'24.40"N 69°11'35.81"E			
	Lower left corner: 27°51'6.33"N 69°10'36.07"E			
2	Upper right corner: 27°43'55.52"N 68°51'30.08"E	69	~3,100	198
	Upper left corner: 27°44'9.29"N 68°51'14.60"E			
	Lower right corner: 27°43'43.82"N 68°51'18.52"E			
	Lower left corner: 27°43'53.82"N 68°51'5.08"E			
3	Upper right corner: 27°40'41.44"N 68°54'39.60"E	722	~32,000	220
	Upper left corner: 27°40'33.48"N 68°53'48.29"E			
	Lower right corner: 27°39'56.14"N 68°55'6.97"E			
	Lower left corner: 27°39'45.67"N 68°53'32.43"E			

A total of 3 shelter locations have been selected as Earthquake shelter places across district Sukkur. 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 47,100 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 SUKKUR

Total 100 elevated islands have been identified within the embankments in district Sukkur, with a cumulative area of approximately 595.55 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 Sukkur district are safe from riverine flood. However, settled areas of the district may be endangered to severe flooding condition if any breaching occurs in river embankment.

### **Embankment breach due to Normal River flow meandering:**

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

### **Below figure illustrate the concept:**



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

## ANNEX – F – LIST OF EQUIPMENT AVAILABLE IN DISTRICT SUKKUR

Equipment	Quantity
De-watering Machine	9
Buildozers / Dozers	1
Excavator	5
Fire Brigade / Engine / Tender	12
Tractor / Trolley / Blade	30
Vehicle / Bus/ Van/Truck/	8
Loader	2
Diesel / Petrol Engine	17
Water Booser	6
Ambulances	32
Riksha Container	3
Power Generators	2
Sucker Machine	1
Earth Levelers	1

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