



GOVERNMENT OF SINDH
Irrigation Department

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Samlee, Sehryoon, Paro Jo Wandhio, Jaganwari, Darigh and Tungwari Small Dams



SINDH RESILIENCE PROJECT (IRRIGATION COMPONENT)

October 2020

**PROJECT MANAGEMENT TEAM
SINDH RESILIENCE PROJECT
(IRRIGATION COMPONENT)
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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	1
2. INTRODUCTION	6
2.1 Background.....	7
2.2 Objectives of ESMP	7
2.3 Sub-Project Justification.....	8
2.4 Sub-Project Categorization.....	9
2.5 Subproject Screening Procedure	9
2.6 Sub-Project Duration.....	10
2.7 Policy, Legal and Administrative Framework	10
2.7.1 National/ Provincial Legislation	10
2.7.2 The World Bank Operational Policies	12
2.8 Compliance with ESMP	14
2.9 Study Team	15
2.10 Data Collection	15
3. DESCRIPTION OF SUB-PROJECTS	16
3.1 Background.....	16
3.2 Location of Sub-projects.....	20
3.3 Subproject Salient Features and Key Statistics	24
3.4 Construction Activities.....	26
3.5 Construction Materials	26
3.6 Contractor's Camps	27
3.7 Borrow Material	28
3.8 Machinery & Equipment.....	28
3.9 Manpower Requirement	29
3.10 Project Area of Influence.....	30
4. ANALYSIS OF ALTERNATIVES	32
4.1 Selection of Dam site location.....	32
4.2 The Available Alternatives for Sub-projects	34
4.2.1 Option 0: No Project Alternative.....	35
4.2.2 Option 1: Construction of Gabion Dam	35
4.2.3 Option 2: Construction of Diversion Dams	36



4.2.4	Option 3: Construction of Recharge / Storage Dams (Earthen embankments with Concrete Spillways)	37
5.	DESCRIPTION OF ENVIRONMENT.....	42
5.1	Introduction.....	42
5.2	Physical Environment	42
5.2.1	Geography.....	42
5.2.2	Geology.....	45
5.3	Climate and Rainfall	51
5.4	Water Resources and Quality	56
5.4.1	Ambient Air Quality	60
5.4.2	Noise	60
5.4.3	Soil	61
5.5	Biological Environment.....	62
5.5.1	Flora and Fauna of the Sub-projects Area	62
5.5.2	Trees	70
5.5.3	Characteristics of Run of Kutch	71
6.	SOCIO-ECONOMIC PROFILE OF THE SUB-PROJECT AREA	72
6.1	Methodology	72
6.2	Social Aspect for Study.....	72
6.3	Population.....	73
6.4	Languages.....	74
6.5	Family System	74
6.6	Religious Affiliation	74
6.7	Occupations, Sources of Livelihood and income levels.....	75
6.8	Village wise losses due to drought	76
6.9	Livelihood improvements due to the small dams	76
6.10	Social Cohesion and Conflict	77
6.11	Social Vulnerability.....	77
6.12	Conflict Resolution within Tribes and Villages.....	78
6.13	Housing	78
6.14	Literacy and Education Facilities	79
6.15	Health Facilities	80
6.16	Transport.....	80
6.17	Telecommunication	81
6.18	Energy Sources	81
6.19	Drinking Water and Sanitation.....	82
6.20	NGOs.....	83



6.21	Priority Needs of Community.....	84
6.22	Archaeological and Cultural Heritage	84
7.	STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE	86
7.1	Consultation.....	86
7.2	Consultation Workshop for overall Project	86
7.3	Community Consultation for Sub-projects	87
7.4	Second round of consultations	91
7.5	Information Disclosure.....	94
8.	ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATIONS .	95
8.1	Impacts and Mitigations	95
8.1.1	Major Environmental Impacts and Mitigations.....	95
8.1.2	Temporary Impacts during Construction Phase	96
8.1.3	Health and Safety of Community and Construction Staff/Workers	96
8.1.4	Health and Safety Related Mitigations	96
8.1.5	Health and Safety of Community and Construction Staff/Workers related to COVID-19.....	97
8.1.6	COVID -19 Related Mitigations.....	97
8.1.7	Noise Pollution	98
8.1.8	Noise related mitigation.	98
8.1.9	Air Pollution	98
8.1.10	Air Pollution Mitigation Measures.....	99
8.1.11	Water Related Impacts	99
8.1.12	Water Related Mitigations.....	104
8.2	Potential Positive Impacts and Benefits	105
8.2.1	Income and Employment.....	105
8.2.2	Land and Property Value	106
8.2.3	Development of Borrow Land	106
8.2.4	Reclamation of Land.....	106
8.2.5	Development of Roads	106
8.2.6	Land Use Changes.....	106
8.2.7	Biodiversity	106
8.2.8	Watershed Erosion and Sedimentation.....	107
8.2.9	Downstream Erosion and Siltation	107
8.2.10	Wastewater Discharge.....	107
8.2.11	Socio Economic Impacts	108
8.2.12	Commulative Impacts of the Project	110
9.	GRIEVANCE REDRESS MECHANISM (GRM)	113
9.1	Public Complaints Centre (PCC)	113



9.2	Grievance Redress Committee (GRC).....	114
9.3	Grievance Focal Points (GFPs).....	114
9.4	Role and Responsibilities of PCC	114
9.5	GRM Steps and Timeframe	115
9.6	Reporting	116
9.7	Conclusion.....	116
10.	ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN	117
10.1	Objectives	117
10.2	Institutional Arrangement	117
10.2.1	Project Management Responsibilities	117
10.2.2	Project management Team (PMT).....	119
10.2.3	Project Implementation Support and Supervision Consultants (PISSC).....	119
10.2.4	Environmental/Social Monitoring and Evaluation (ESMEC) Consultant.....	120
10.2.5	Contractor.....	120
10.3	Environmental Code of Practices (E.CoP)	120
10.4	Contractor's Plans.....	120
10.4.1	Corona Virus Management Plan (COVID-19)	121
10.4.2	Pollution (Air, land, and water) Control Plan	121
10.4.3	Waste Management Plan	121
10.4.4	Traffic Management Plan.....	121
10.4.5	Plan for Handling of Hazardous Materials.....	121
10.4.6	Occupational Health and Safety	122
10.4.7	Environmental and Social Awareness Training Plan.....	122
10.4.8	Emergency Response Plan	123
10.4.9	Tree Plantation and Maintenance Plan.....	123
10.4.10	Emergency Preparedness Plan in case of Dam Break.....	123
10.5	Mitigation and Monitoring	123
10.6	Compliance and Effects Monitoring	124
10.7	Environmental Non-compliances and Corrective Measures	126
10.8	Communication Reporting and Documentation	126
10.9	Environmental and Social Management and Monitoring Cost	128



LIST OF TABLES

Table 1: Applicability of the World Bank’s Safeguard Policies.....	14
Table 2: Study Team	15
Table 3: Details of Sub-projects.....	23
Table 4: Salient Features of the Sub-projects	24
Table 5: Estimated Quantities of Construction Materials.....	27
Table 6: Details of the Camps site for each sub-project	28
Table 7: List of Machinery and Equipment to be used on each sub-projects	29
Table 8: List of Required Manpower	29
Table 9: Primary Impact Zone.....	30
Table 10: Determination of Impact Significance.....	34
Table 11: Analysis of Alternatives: Construction of Small Dams.....	39
Table 12: Seismic Data of Dam Site	49
Table 13: Nearest Meteorological Stations	51
Table 14: Climatological Data of Sub-project Areas.....	51
Table 15: Nearest Wetlands in Sub-Project Area	56
Table 16: Groundwater Quality Analysis for Dams	59
Table 17: Ambient Air Quality Results	60
Table 18 : Ambient Noise Levels in Sub-project Areas.....	61
Table 19: Soil Analysis of Sub-project Area.....	61
Table 20: Fauna in Qubba Qadir Bux Sub-project Areas (Nara Region).....	62
Table 21: Flora in Qubba Qaddir Bux (Nara Regio)	64
Table 22: Fauna in Nangarparkar Study Area.....	66
Table 23: Flora of Nangarparkar Study Area.....	68
Table 24 : Trees Identified on the Sub-projects	71
Table 25: Villages Visited for Socio-economic Baseline Data.....	73
Table 26: Population and Tribes on Sub-Projects	73
Table 27: Village wise losses due to drought in 2018-2019	76
Table 28: Education Facilities in the Sub-Project Area.....	79
Table 29: Transport Facilities in the Project Area	80
Table 30: Drinking Water Sources in the Sub-Project Areas	82
Table 31: NGOs Working in the Sub-project Areas	84
Table 32: List of villages visited during first round of consultations	87
Table 33: List of villages visited during second round of consultations	91
Table 34: Site Wastes	100
Table 35: Quantification of water diverted to dams	101
Table 36: Summary of Dam Break Study.....	103
Table 37: Consulted villages located in downstream of the dam sites	110
Table 38: Environmental and Social Awareness Training Plan.....	122
Table 39: Cost of Environmental / Social Management and Monitoring	128
Table 40: Environmental, Social and COVID Management and Monitoring Plan.....	131



LIST OF FIGURES

Figure 1: Location of the SRP Project Area	17
Figure 2: Location Plan of Dams in Tharparkar Region	18
Figure 3: Location Plan of Dams in Khairpur Region	19
Figure 4 : Location Map of Samlee Dam	20
Figure 5 : Location Map of Paro Jo Wandhio Dam	21
Figure 6: Location Map of Sehryoon Dam.....	21
Figure 7: Location Map of Jaganwari Dam	22
Figure 8: Location Map of Darigh Dam.....	23
Figure 9: Location Map of Tungwari Dam	23
Figure 10: Gabion Dam/Weir.....	35
Figure 11: Diversion Dam	36
Figure 12: Recharge/Storage Dam with Earth Embankment and Concrete Spillway	37
Figure 13: Cross-sections of Recharge and Storage Dams	38
Figure 14: Geographical Map of Sindh	44
Figure 15: Geological Map of Sindh	46
Figure 16: Regional Geological Map of Nagarparkar	47
Figure 17: Regional Geological Map of Nara region (Khairpur).....	48
Figure 18: Seismic Zones of the Project Area	50
Figure 19: Annual Rainfall in Project Area	53
Figure 20: Monthly Average Rainfall at Rohri.....	53
Figure 21: Monthly Average Rainfall at Nagarparkar	53
Figure 22: Monthly Average Temperature at Rohri	54
Figure 23: Monthly Average Temperature at Nagarparkar	55
Figure 24: Monthly Average Evaporation at Rohri.....	55
Figure 25: Monthly Average Evaporation at Nagarparkar	55
Figure 26: Map Showing Groundwater Quality.....	58
Figure 27: Picture Gallery of Nara Study Area	66
Figure 28: Picture Gallery of Nagarparkar Study Area.....	70
Figure 29: Archaeological Map of the Study Area	85
Figure 30: <i>Watershed of Nagarparkar Dam, streams and Runn of Kutch</i>	102
Figure 31: Organizational Chart of Sindh Resilience Project.....	118



LIST OF ANNEXURES

Annexure-I: Screening Criteria	142
Annexure II: Ground Water & Ambient Air Quality Labortory.....	154
Annexure III: Land use maps of proposed dam sites.....	160
Annexure IV: Environmental Social Impacts Questionnaires	168
Annexure V: Photographs	169
Annexure VI: Location map of Settleemnts near Dam sites.....	171
Annexure VII: Environmental Code of Practices	177
Annexure VIII: SRP SOPS for Management of COVID-19	200
Annexure IX: Proposed campsites Location Maps.....	..212



LIST OF ACRONYMS

ACE	Associated Consulting Engineers (Pvt) Ltd
BP	Bank Policy
BOQ	Bill of Quantity
CoI	Corridor of Impacts
DC	Deputy Commissioner
EC	Electrical Conductivity
ECA	Employment of Child Act
EIA	Environmental Impacts Assessment
EMU	Environment Management Unit
EPA	Environmental Protection Agency
ESA	Environmental and Social Assessment
ESIA	Environmental and Social Impacts Assessment
ESMEC	Environmental/Social Monitoring and Evaluation Consultants
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMU	Environmental and Social Management Unit
ESU	Environmental and Social Unit
FGDs	Focus Group Discussions
GFP	Grievance Focal Point
GoS	Government of Sindh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
IBIS	Indus Basin Irrigation System
IEE	Initial Environmental Examination
ISDS	Integrated Safeguards Data Sheet
IUCN	International Union for Conservation of Nature
LAA	Land Acquisition Act
MEAs	Multilateral Environmental Agreements
NCS	National Conservation Strategy
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
NGO	Non-Governmental Organization
OP	Operational Policy
P&DD	Planning and Development Department
PAP	Project Affected Person
PCC	Public Complaint Centre
PC-I	Pakistan Planning Commission Form – 1 Appraisal of Development Project
PCRWR	Pakistan Council for Research in Water Resources
PD	Project Director
PDMA	Provincial Disaster Management Authority
PEPC	Pakistan Environmental Protection Council
pH	Power of Hydrogen



PID	Project Information Document
PISSC	Project Implementation, Support and Supervision Consultant
PIU	Project Implementation Unit
PKR	Pakistani Rupee
PMT	Project Management Team
POPs	Persistent Organic Pollutants
PSC	Project Steering Committee
RAP	Resettlement Action Plan
RoW	Right of Way
SEPA	Sindh Environmental Protection Agency
SEPC	Sindh Environmental Protection Council
SID	Sindh Irrigation Department
SRP	Sindh Resilience Project
WB	World Bank



1. EXECUTIVE SUMMARY

The Government of Sindh (GoS) has undertaken a World Bank-financed Project - the Sindh Resilience Project (SRP) through the Sindh Irrigation Department (SID) and Provincial Disaster Management Authority (PDMA) in various parts of Sindh Province. Physical interventions under SRP Irrigation Component include rehabilitation/ improvement of existing earthen embankments along River Indus and construction of small rainwater recharge dams in the water-scarce areas of the province. During the last two years of the SRP implementation, fifteen dams were constructed which are at completion stage. Now, the Government of Sindh is planning to construct the six small rainwater recharge dams in two districts of Sindh. Samlee, Sehryoon, and Paro Jo Wandhio Dams are located in District Tharparkar, while three proposed dams namely Jaganwari, Darig, and Tungwari are located in Taluka Nara of District Khairpur.

In compliance with the national/ provincial regulatory requirements and World Bank safeguard policies an environmental and social assessment was carried out to address the potentially negative impacts of the proposed interventions under SRP. Environmental categorization of the subprojects was done using the environmental and social assessment checklist. These subprojects are likely to cause low to moderate levels of environmental and/or social impacts, therefore, fall under category “B” under environmental categorization criteria as specified in the ESMF document prepared for the project and approved by World Bank. This ESMP has been prepared accordingly to meet the World Bank Category “B” project requirements for the subject works.

This ESMP covers information on the prevailing physical, biological, socio-economic, and environmental aspects of the subproject areas. It provides a set of mitigation measures during the project implementation and operation to eliminate environmental and social negative impacts, up to an acceptable level.

The sub-project areas are located in (i) Qubba Qadir Bux & Chhatan Shah Hills (Nara region) (ii) Nagarparkar region of Sindh.

Qubba Qadir Bux and Chatan Shah Hills area in the Nara region is similar to the Thar region. It consists of parts Sanghar (Khipro and Sanghar talukas), Khairpur (Talukas: Nara, Thari Merwah, and Kot-Deji), Sukkur (Talukas: Rohri, Pano Aqil) and Ghotki (Taluka: Daharki, Mirpur Mathelo, and Obhawaro) districts. The hills separates two environmentally very different regions, the fertile cultivated plain of the Indus to the west and poorly vegetated fossils sand dunes of the Thar Desert in the east.

The local settlements in project areas are also using subsurface and groundwater for irrigation. The groundwater depth varies from 80 to 200 ft in different parts of the Qubba Qadir Bux and Chhatan Shah Hills in Nara region. If the rains are absent for more than 2 years, the



subsurface water gets dried making the local population get zero harvests. The proposed initiative by building groundwater recharge dams in Qubba Qadir Bux and Chhatan Shah Hills Nara region would sustain the groundwater availability for a longer time. Water collected in the dams would also serve the local livestock drinking water facility closer to the rangeland. The constructed structures would reduce the flood velocity, and there will be fewer losses of the fertile soil erosion, public amenities like link roads, electricity polls, and local human settlements.

Due to the absence of water, agriculture in the area is affected. As a result, rain-fed crops areas have been reduced with productivity going down due to moisture stress. Millet, sorghum and castor beans are the main traditional summer rain-fed crops, while barely and mustard are grown during the winter. In addition to producing grains for human consumption, these crops are the primary sources of stalk/crop residue for livestock feeding.

Livestock has been a major asset base of the local population. Lack of drinking water and vegetation in the areas has badly affected the health of livestock. Milk production of livestock has declined, which has serious implications for the nutritional status and income level of the households. Due to fodder unavailability, people are compelled to move their livestock to irrigated areas, which are also facing water shortages.

The recharge dams in Nagarparkar region in Tharparkar district will augment the groundwater aquifers through percolation. The groundwater will be utilized through dug or tube wells for drinking. In addition to recharging of fresh groundwater aquifers, these investments will provide safe drinking water to local communities and livestock. Sub-projects are not financing the construction of any water supply channels / and tube wells. The main objective of the construction of small dams is to recharge groundwater and is not deliberately designated to promote agriculture activities.

While, the water from storage dams (Samlee, Sehryoon and Paro Jo Wandhiyo dam in Nagarparkar) will be taken directly from the reservoir for drinking and domestic use and drinking of livestock and wild animals. The treatment and supply system for villages may be constructed by local government at a later stage.

The Nagarparkar region lies in the desert arid zone. The availability of water in the region is scarce and the land surface consists of stunted scrub and bushes. The main natural ground cover is provided by grasses, which are nutritive and palatable fodder for the livestock. Babul, Talhi, Neem, Jar, and Kikar are some of the other trees and bushes found in the area. The major water resource in the area is seasonal precipitation that enables the groundwater recharge and increases the vegetation covers on the top surface and produces wild grass for animal feed. In some parts of the area direct rainfall moisture is utilized for local crop production. The rainfall water drains in different Nais (streams) that ultimately end up Runn of Kutch area. The major sources of drinking water are the dug wells, and its depth ranges vary



from 70 to 80ft in different parts of the Nagarparkar region. The other seasonal source of water is traditional manmade earthen ponds that are made by digging the ground and filled up by the surface runoff. These ponds get filled during the rainy season mainly in summer months upon the occurrence of rains and provide water for 2-6 six months for human use and livestock. They also help in recharging of groundwater aquifer. The women folks use to fetch water from an average distance ranging from 8-10 km from their villages from the existing earthen ponds. In the Nagarparkar region three small dams Samlee, Sehriyoon and Paro Jo Wandhio are proposed under SRP. These dams are in village Kharryoon, village Sehryoon and village Sodhran respectively of Taluka Nagarparkar District Tharparkar. The proposed structures will resolve the drinking water scarcity and comparatively sweet water will be available to the local population for longer time through the year. Due to construction of these dams total number of 1821 households with 12890 male and female population will be benefitted with project intervention. Whereas, 490 households with 3560 male and female population will be benefitted in Nara region. In addition to this 1331 households with 9330 male and female population will be benefitted with project interventions in Nangarparkar region.

The absence of significant rainfall in the last three to four seasons has triggered drought emergency in the Tharparkar and other arid parts of Sindh Province. According to the Sindh drought assessment conducted by FAO and EU in 2017, 100% of the area of Tharparkar was facing severe water scarcity. As of 2018, the situation has become worse due to the continuing lack of rainfall in the monsoon season. The national average for rainfall has been -24.4% below average with the Sindh region suffering most, receiving rainfall -69.5% below average. This situation is leading to adverse effects on the agricultural and domestic needs of the local communities in the area, further exacerbating the prevalent problems of poverty and child malnutrition. In the district of Tharparkar alone, nine infants have been reported dead during the month of August 2018, while a total of 375 children have died due to malnutrition in 2018. Due to protracted low crop production, the food insecurity and malnutrition issue has further worsened as families are forced to sell the goods that they otherwise would have consumed themselves. Access to clean water has also severely been limited causing water-borne diseases and compromising the health of the residents.

The Pakistan Met Department has predicted no adequate rainfall soon meaning that the situation will only worsen with diminishing resources. Crop production will continue to drop while the death of livestock will rise. The health of the community will continue to suffer more as the water and food supplies decline.¹

No acquisition of any private land is required for these subprojects because nais and nalas (Rainwater Rivers) are the state-owned properties. Also, no demolition of structures will be involved and no one will be required to be resettled; as subproject areas are lying in the less populated areas and the population is scattered. However social and environmental impacts may arise only due to temporary use of privately owned or government owned uncultivated

¹ (<http://www.actalliance.org>)



land for camps construction/ excavation of borrow material, and due to influx of external workforce, loss of vegetation, unattended residual wastes, and occupational health and safety issues for labors and community, therefore ESMP has been prepared.

The small dam sub-projects involve the construction of 10 to 15ft high earthen embankments and concrete structures of spillways. The construction-related impacts such as air pollution, noise and use of community resources can be well mitigated through the proper implementation of the mitigation measures. Moreover, the construction of dam sub-projects is not going to change adversely ecological conditions of flora and fauna in the subproject areas significantly. Rather, in the long run, it would improve ecological conditions. However, mitigation measures recommended in the report would need to be strictly ensured by the contractor during the construction period.

Anticipated negative impacts can be mitigated through proper inspection and maintenance of vehicles and machinery to reduce exhaust emissions, using noise suppressors or mufflers for heavy equipment, watering of unpaved roads, control of adverse impacts from construction debris/ residual wastes by proper handling and immediate removal, control of water pollution through proper storage and handling of oil wastes and treatment of wastewater at the site, control of solid waste through sanitary storage and frequent collection for sanitary disposal.

The occupational health and safety will be ensured through continuous inspection to prevent disease and accidents, awareness-raising among labour and community, sanitation measures, COVID-19 management & Monitoring and emergency response and rescue procedures, provision of adequate sanitary facilities, potable water, and garbage bins for workers. The subprojects, after implementing the mitigation measures detailed in this ESMP, will not have any significant and lasting negative impact on the physical, biological or socio-economic environment of the area, rather it will have significant positive impacts that will ultimately result in sustainable development in the area.

Besides, it outlines a specific description of institutional arrangements for carrying out the mitigation measures and their monitoring; capacity building and training of field staff; implementation and cost estimates; and Grievance Redressal Mechanism (GRM). As a part of the ESMP, consultations with the stakeholders particularly the local communities were carried out.

E&S Safeguard monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be carried out at three levels. At the PMT level, the environment and social specialists will carry out safeguard monitoring to ensure that the mitigation plans are being effectively implemented, and will conduct field visits regularly. At the field level, more frequent safeguard monitoring will be carried out by the relevant staff of Project Implementation Consultants (PISSC). At third level, PISSC and ESMU of PMT will produce monthly, quarterly and annual reports for ESMP implementation.



The overall responsibility for implementing the SRP project as well as the present ESMP rests with the Project Management Team (PMT), Sindh Irrigation Department, headed by the Project Director. The PMT is supported by the Environmental and Social Management Unit (ESMU) established within the team. PMT has also engaged Project Implementation, Support, and Supervision Consultants (PISSC), responsible for construction supervision.

PISSC also have environmental and social safeguard specialists to supervise and monitor ESMP implementation. Finally, the construction contractor will also have environmental, social and health safety inspectors/officers to implement mitigation measures and other requirements defined in the present ESMP. Appropriate clauses will be included in the construction contracts for this purpose. PMT has also engaged Environmental/Social Monitoring and Evaluation Consultants (ESMEC) to carry out external monitoring or third party validation of the sub-project activities.

It is estimated that 90 trees will be felled for the construction of the above mentioned 6 dams. The replanting of 5 times trees against the number of cuts down trees would cost **Rs 450,000** considering the rate of Rs 1,000/- per tree. A total budget of **Rs 118,271,440.-** has been allocated for the implementation of the ESMP including the management of COVID-19. For general community support an amount of **Rs. 10,000,000/** has been also allocated for each dam site. This has been incorporated as provisional sum item in ESMP bill of each dam and BOQ.

2. INTRODUCTION

The Government of Sindh (GoS) has initiated World Bank financed Sindh Resilience Project (SRP) in various parts of Sindh Province, through the Sindh Irrigation Department (SID) and Provincial Disaster Management Authority (PDMA). Physical interventions under Irrigation Component of SRP include: i) rehabilitation / improvement of existing protective earthen embankments along River Indus and ii) construction of small rainwater recharge/storage dams in the water-scarce areas of the province. Six such dams were taken up during the first year of the SRP implementation and during the second year of the SRP implementation, nine small dams has been procured which are now under construction phase. Moreover, during third year of SRP implementation, Govt. of Sindh has planned to construct six small dams in water scarce districts of the Sindh province, which are subject of present document.

In compliance with the national/provincial regulatory requirements and World Bank safeguard policies, an environmental and social assessment has been carried out to address the potentially negative impacts of the proposed interventions under SRP. As an outcome of this assessment, the present Environmental and Social Management Plan (ESMP) has been prepared for the works to be carried out during the third year of SRP implementation. In addition, an Environmental and Social Management Framework and Resettlement Policy Framework (ESMF/RPF) – provided under separate cover.

Samlee, Sehryoon, and Paro Jo Wandhio Dams are located in Nangarparkar region of District Tharparkar, while proposed dams of Qubba Qadir Bux & Chhatan Shah Hills in Nara region are Jaganwari, Darig Nai and Tungwari located in Taluka Nara of District Khairpur.

The height of these all dams is ranges between 14 to 21 ft. The water from storage dams will be taken directly from reservoirs for drinking and domestic use and drinking of livestock and wild animals. The recharge dams in Nagarparkar and Qubba Qadir Bux & Chhatan Shah Hills in Nara region will augment the groundwater aquifers through percolation. The ground water will be utilized through dug or tube wells for drinking, livestock and agriculture purpose as it is presently in practice at the sub-project areas. These dams are not deliberately designated to promote agriculture needs. There will be no temporary or permanent road construction during the project activities to access the site.

The main components of each sub-project are 10-15ft high earthen embankments, concrete structures of spillways, and construction of one room building for dam supervision staff. Out of three dams in Nagarparkar area, one dam nnamey Sehryoon is the Storage dam. While two dams namely Samlee and Paro Jo Wandhio are the ground water recharge dams. In Nara region one dam site namely. Main activities involved in the construction works include concrete works, obtaining soil from borrow areas and transporting it to the dam site, soil compaction,



stone pitching on slopes of embankments and stone riprap apron on upstream and downstream of spillways. The Contractor will also need to establish some temporary facilities as well, including material yard and construction camp for workforce.

2.1 Background

Pakistan is exposed to a number of adverse natural events and has experienced a wide range of disasters over the past 70 years, including floods, earthquakes, droughts, cyclones and tsunamis. Exposure and vulnerability to hazards is further exacerbated by a rapid population growth, growing urbanization, environmental degradation and shifting climatic patterns that can result in the occurrence of increasingly severe natural disasters. Over the past decade, damages and losses resulting from natural disasters in Pakistan have exceeded USD 18 billion; as the population and asset base of Pakistan increases, so does its economic exposure to natural disasters.

The Government of Sindh has undertaken a project to enhance disaster and climate resilience; increase the technical capacity of Government entities to manage natural disasters and climate variability; construction of small dams and support restoration of flood protection infrastructure on Indus River. The project designated as Sindh Resilience Project (SRP) is financed by World Bank and will be completed in five year period.

The subprojects planned in this regard may potentially cause environmental and social impacts in the existing condition of the area. The environmental and social safeguards rapid screening depict that the subprojects (i) will not require land acquisition; (ii) will not involve any involuntary resettlement. However, there may be low to moderate adverse environmental and social impacts due to excavation of borrow areas, operation of machinery and vehicles, haulage routes and temporary damage to property due to establishment of Contractor's camp. This ESMP has been prepared through identification of a set of responses to potentially adverse impacts; determining requirements for ensuring that those responses are made effectively and in a timely manner; and describing the means for meeting those requirements.

2.2 Objectives of ESMP

The primary objectives of the ESMP are as follows:

- i. Identify social and environmental impacts of the subproject and related activities.
- ii. Suggest suitable mitigation measures for identified impacts at planning, designing and implementation stage of the subprojects and to eliminate or reduce their adverse impacts if any.



- iii. Propose environmental monitoring program to ensure that mitigation measures are implemented during the subprojects execution and timely corrective actions are taken where required and
- iv. Propose the institutional arrangements required to implement and monitor the ESMP.

2.3 Sub-Project Justification

Pakistan has experienced an increase in the frequency and severity of drought due a rise in temperatures, adverse effects of El Nino and a decrease in rainfall during the monsoon season. As per the Pakistan Meteorological Department (PMD), severe drought-like conditions have emerged over much of southern Pakistan, with an expectation for further deterioration over the next 4 years.

Sindh province faces drought in the northern and eastern region on a recurring basis. The drought from 1998 – 2002 affected 1.4 million people, 5.6 million heads of cattle and 12.5 million acres of cropped area, triggering the spread of malnutrition-based diseases in the population and food scarcity in the province due to poor overall crop output. Similarly, the ongoing drought situation in the province since 2013 has affected 4.9 million heads of cattle and 0.5 million people, resulting in the death of 750 persons. These drought events have also generally coincided with the El Niño phenomena. The strongest El Niño event in recorded history was 1998 which triggered a three-year long drought in Pakistan. Another El Niño emerged in 2015 causing weaker monsoons over parts of Pakistan, including most parts of Sindh, and a strong heat wave in June-July 2015 which caused more than 1200 fatalities from heatstroke and dehydration, mostly in Karachi (the provincial capital).² In 2018 Pakistan received reduced rainfall during the monsoon season (May to August), with Sindh 69.5 per cent below the average.³

For the last ten years, 50 percent of the overall population of Tharparkar region, one of the sub-project areas have migrated to barrage areas to find food, because during droughts it becomes hard for them to even find water to drink, leave alone for growing crops. ⁴

A large number of sheep, camels, cows and goats had died in the reported sub-project areas during previous droughts. The loss of livestock has added to the severity of the situation as many people in these areas are farmers that depend on their animals for revenue.

There are number of positive effects of the proposed sub-project which in general will improve the socio-economic and environment conditions of the sub-project areas, including:

² PAD for SRP, Report No: PAD 1684

³ Source: Project Appraisal Document (PAD) for SRP, Report No: PAD 1684)

⁴ Source: <https://dailytimes.com.pk/105392/drought-and-migration-a-brief-story-of-tharparkar>



- The project will help in recharging the groundwater and provide water ponds in the areas where it is crucial for the drinking, domestic use and livestock.
- The project will help in the improvement of the domestic water supply.
- With the availability of water, more people and more livestock will sustain, thus helping in the social uplift of the local population.
- Due to the project intervention water will be available for a longer period which will augment to uplift socio-economic activities.

Since all the proposed sub project sites are located in arid zone of Sindh, which experience frequent drought and are highly dependent on rainfall. Hence, Qubba Qadir Bux & Chhatan Shah hills in Nara region (Distt. Khairpur Mir's and Nagarparkar region (Distt. Tharparkar) are most suitable sites in Sindh Province to construct small dams, delay action dams and weirs to retain the runoff generated from storm rainfall

2.4 Sub-Project Categorization

The ESMF defines that: i) a full ESIA and ARAP/RAP will be carried out for subprojects requiring new construction or having significantly irreversible and widespread impacts or involving significant degradation of forests of sensitive areas, requiring land acquisition or dam height more than 15m; ii) an ESMP (and a ARAP/RAP if needed) will be prepared for medium-sized sub-projects involving the rehabilitation of existing structures, potentially causing low to moderate level of negative but reversible and localized impacts; and iii) Environmental and Social Checklists will be filled for smaller subprojects resulting in low/negligible impacts.

The initial screening carried out as per the criteria defined above has revealed that the proposed sub-project of construction of small storage/recharge dams is likely to cause low to moderate levels of environmental and/or social impacts, therefore, this sub-project falls under category B under characterization criteria described above. The present ESMP has been prepared accordingly to meet the Category B subproject requirements.

2.5 Subproject Screening Procedure

The sub-projects screening was performed through a set of the checklist in which major environmental and social issues including storage volume and surface area of the reservoir, loss of community assets, basic facilities and services, livelihoods and income, possible affected ethnic minorities, archaeological sites and gender. Surveys were conducted to fill individual checklists and a summary of environmental and social concerns noted during surveys is given below.



- Total 90 number of trees would be felled by due to the construction of six dams
- None of the dam is to be constructed in Khirthar National Park
- No archaeological site observed near the dam and no physical cultural resources at or near the proposed dam site is observed which may likely to be affected by construction activities.
- No, any settlement observed near the all 6 proposed dam sites
- During the construction of dams, some natural habitats might be disturbed, with negligible impact.
- No forests observed near all dam sites.
- Ambient Air Quality, ambient noise level is within acceptable limits of SEPA standards.

2.6 Sub-Project Duration

The execution works of the subproject are proposed to be completed in twelve months.

2.7 Policy, Legal and Administrative Framework

This section presents an overview of the policy and legal framework relevant to the environmental and social aspects of the subproject. More details have already been provided in the ESMF prepared for SRP.

2.7.1 National/ Provincial Legislation

Sindh Environmental Protection Act, 2014

The provisions of Article 270 AA (6), as amended by section 96 of the 18th Amendment, SEPA 2014, shall continue to remain in force until repealed or amended by the competent authority, which is now the Provincial Assembly in respect of the Sindh Province.

The Act provides the framework for protection and conservation of species, wildlife habitats and biodiversity, conservation of renewable resources, the establishment of standards for the quality of the ambient air, water and land, establishment of Environmental Tribunals, the appointment of Environmental Magistrates, Initial Environmental Examination (IEE) and EIA approval. Penalties have been prescribed for those contravene the Act.

The categories are defined in the Sindh Environmental Protection Agency (SEPA) Review of IEE and EIA Regulations, 2014. The sub-projects are categorized based on a storage volume and surface area of the reservoir mentioned in Schedule-I, section - G, subsection-I "Dams and Reservoirs with Storage volume less than 25 million cubic meters of surface area less than 4 sq.-km". Therefore, all sub-project dams are within limits given in Schedule-I of IEE and EIA Regulations, 2014, so this sub-projects fall under Schedule "I" so it will require an



IEE/ESMP. However, an ESMP has been prepared to satisfy the requirements of the World Bank for such type of projects.

Sindh Wildlife Protection Ordinance, 2001

Sindh Wildlife Protection Ordinance 2001, provides for the Preservation, Protection, and Conservation of wildlife resources directly and specifies restrictions on hunting/poaching of wild fauna. The present park area was declared as a wildlife sanctuary in 1972 under the provisions of Sindh Wildlife Protection Ordinance 1972 and in 1974 this Sanctuary was converted into Khirthar National Park.

National Park means the area declared as such under sub-section (1) of section 15 of the Sindh Wildlife Protection Ordinance 2001.

With a view to the protection and preservation of scenery, flora, and fauna in the natural state, The Government may, by notification in the Official Gazette, declare any area of outstanding scenic merit and natural interest to be a national park and, may demarcate it in such manner as may be prescribed.

- A national park shall be accessible to the public for recreation, education, and research. The following acts shall be prohibited in a national park:
- Hunting, shooting, trapping, killing or capturing of any wild animal in a national park or within three miles radius of its boundary;
- Firing any gun or doing any other act which may disturb any animal or bird or doing any act which interferes with the breeding places;
- Felling, tapping, burning or in any way damaging or destroying, taking, collecting or removing any plant or tree there-from;
- Clearing or breaking up any land for cultivation, mining or for any other purpose;
- Polluting water flowing in and through the national park: Provided that Government may for scientific purpose or betterment of the national park authorize the doing of the above mentioned prohibited acts.
- Once an area is identified the specific rules about that area should be sought from the provincial forestry and wildlife department.

During the survey of phase –III small dams it is observed that, no any dam site is planned to be constructed within the boundary any protectd Area or National Park.

Sindh Forest Act, 2012

The sub-projects will be executed in accordance with the Forest Act, 2012 and no unauthorized tree cutting will be allowed to worker or labour. Additional plantation will be made and for that purpose funds have been allocated in the contract under ESMP implementation cost bill.



During the Survey of Small dams it was observed that, No any dam site falls within any protected forest.

Antiquity Act, 1975

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. This act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade and export. Antiquities have been defined in this act as “Ancient products of human activity, historical sites, sites of anthropological or cultural interest and national monuments etc.”

This Act will be applicable to the physical interventions such as construction activities to be carried out for the sub-projects covered under this ESMP. No protected or unprotected antiquity has been identified in the primary impact zone of the sub-project areas that may be affected by the project interventions. However a chance find procedure has been included in this ESMP in case of any, as yet, unidentified antiquity.

2.7.2 The World Bank Operational Policies

The World Bank OP 4.01 Environmental Assessment EA. This policy defines the Environmental Assessment (EA) process and various types of EA instruments. The impacts anticipated are only during the construction period and for less than one year. The sub-project have positive impacts in the long run. Therefore; an ESMP is prepared in accordance to the WB OP 4.01 and this policy is applicable for this sub-project.

Natural Habitat (OP 4.04): The conservation of natural habitats is essential for long-term sustainable development. The World Bank, therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions. The aim of the policy is to limit circumstances under which conversion or degradation of natural habitats can occur. The policy can prohibit projects which are likely to result in significant loss of critical natural habitats. Some interventions are likely to be carried out near important habitats. Therefore; this OP is applicable for this sub-project.

Pest Management (OP 4.09): No pesticides, herbicides or fungicides will be used in any of the subproject activities and hence this policy is not applicable for this sub-project.

Indigenous People (OP 4.10): The term “Indigenous People” is used in a generic sense to refer to a distinct, vulnerable, social, and cultural group possessing the following characteristics in varying degrees.

- Self-identification as members of distinct indigenous groups and recognition of the identity by others.
- Collective attachment to geographically ancestral territories in the project area and to the natural resources in these habitats and territories.



- Customary cultural, economic social, or political institutions that are separate from those of the dominant society and culture.
- An indigenous language is often different from the official language of the country or region.
- The OP defines the process to be followed if the project affects the indigenous people.

There is no known indigenous group as defined by OP 4.10 in the project area, therefore, this policy is not applicable for this sub-project.

Cultural Property (OP 4.11): The World Bank safeguards require full protection to physical cultural heritage on the World Bank-financed project sites. As the sub-project area, does not have any site of cultural, archeological, historical or religious significance so, this policy is not applicable for this sub-project.

Involuntary Resettlement (OP 4.12): This policy protects the involuntary resettlement of the project affected persons. However, sub-projects covered in this ESMP are to be constructed on government own land. Therefore; this OP 4.12 does not apply to this sub-project. However, this OP 4.12 is triggered on the overall project and the Resettlement Policy Framework (RPF) has been prepared as part of the overall project instruments.

Safety of Dams (OP 4.37): This Policy relates to dam safety, but is equally applicable to reservoirs and ponds. The selected sub-projects are falling under the definition of Small Dams as specified in OP 4.37. As part of due diligence and considering that Bank's OP 4.37 is applicable.

International Waterways (OP 7.50): This OP is related to the types of projects falling within the ambit of international waterways like (a) any river, canal, lake, or a similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states. The sub-projects are to be constructed on Nais and Nalas which cannot be considered as rivers that form a boundary between or any river or body of surface water that flows through two or more states. Therefore this OP 7.50 does not apply to this sub-project.

World Bank Policy on Access to Information 2010: The World Bank's disclosure policy requires the environmental and social assessment report to be disclosed to the public, and a copy of the report to be sent to the Bank's Info Shop, before the Bank commences the project appraisal. Under this Policy, ESMF has been disclosed to the public and has been placed on the official website of the Sindh Irrigation Department. The applicability status of World Bank environmental and social safeguard policies is given in **Table-1**.



Table 1: Applicability of the World Bank's Safeguard Policies

	Subject	Policy Reference	Triggered	Not Triggered	Remarks
1	Environmental Assessment	OP/BP/GP 4.01	✓		As per PID/ISDS of the SRP Project, the proposed sub-project involves the construction of rain water-fed recharge dams, less than 10 meters in height, that are likely to cause low to moderate levels of negative but reversible and localized impacts. Therefore, this OP is triggered.
2	Natural Habitats	OP/BP 4.04	✓		The ESMP includes a screening process for the subprojects, some interventions are likely to be carried out within or near important habitats. Therefore; this OP 4.04 is triggered.
3	Involuntary resettlement	OP/BP 4.12	✓		There is no involuntary resettlement resulting in relocation or adverse impact on livelihood and/or sources of livelihood. Because sub-projects to be constructed on Government-owned land. Therefore; this OP 4.12 is triggered on the overall project, but not relevant for the proposed sub-project under consideration.
4	Project in International waterways	OP/BP 7.50	✓		The sub-projects are proposed to be constructed on Nais and Nalas of hilly areas which cannot be considered as rivers that form a boundary between or any river or body of surface water that flows through, two or more states/ countries, Therefore; this OP 7.50 is triggered on the overall project.
5	Safety of Dams	OP/BP 4.37	✓		The selected sub-projects are falling under the definition of Small Dams as specified in OP 4.37. As part of due diligence and considering that Bank's OP 4.37 applicability, Dam Safety Expert has been engaged by the World Bank to undertake a technical review of sites.

2.8 Compliance with ESMP

This ESMP forms part of the Bid Documents and its compliance is mandatory. The contractor may request amendments in ESMP for aligning it with ground realities and requirements for each subproject/sites mentioned in this ESMP. If there is any change required, the contractor shall make such request to PISSC. The E&SS team of PISSC shall validate the amendments and consult with E&SS team of PMT. If acceptable, the amendments would be communicated to the contractor by PISSC. These site-specific ESMPs will then be embedded into the civil works contracts and therefore will be legally binding on the contractor. The amended Site-Specific ESMP would be approved by PMT and Project Implementation Support and Supervision Consultants (PISSC).

The contractor will be required to prepare other site plans as mentioned in Section 7 including a traffic management plan, HSE plan, waste management plan, COVID management plan, etc. The site-specific plans must be submitted to the PIU/Supervising Engineer for review and



clearance within 30 days of the signing of the contract or before mobilization on-site, whichever date is earlier.

2.9 Study Team

ESMU-PMT consists of the following members conduct the study. A list of team members is given in Table-2.

Table 2: Study Team

S.NO	Name	Designation	Organization
1.	Arshad Hussain Memon	Environment Safeguard Consultant	ESMU-PMT
2.	Nasir Ali Panhwar	Social Safeguard Consultant	ESMU-PMT
3.	Abdul Latif	Environment Officer-I	ESMU-PMT
4.	Taha Tariq Khokhar	Environment Officer-II	ESMU-PMT
5.	Himat Kumar	Environment Officer-III	ESMU-PMT
6.	Marvi Baloch	Social Safeguard Officer-I	ESMU-PMT
7.	Sajid Memon	Social Safeguard Officer-II	ESMU-PMT

2.10 Data Collection

This report has utilized primary and secondary data, collected through field surveys, field tests and observations, laboratory testings, environment monitoring in the field, data acquisition from concerned departments, corner meetings, interviews and filling of questionnaires and sifting through published material to establish a baseline profile of physical, biological and socio-economic environmental conditions. The following activities were performed for data collection.

- Site Reconnaissance
- Detailed site visits
- Analysis of Maps and Plans
- Literature Review
- Desk Research
- Public consultations and interviews
- Field observations and studies
- Laboratory Analysis



3. DESCRIPTION OF SUB-PROJECTS

3.1 Background

Pakistan is exposed to several adverse natural events and has experienced a wide range of disasters over the past 70 years, including floods, earthquakes, droughts, cyclones, and tsunamis. Exposure and vulnerability to hazards are further exacerbated by rapid population growth, growing urbanization, environmental degradation, and shifting climatic patterns that can result in the occurrence of increasingly severe natural disasters. Over the past decade, damages and losses resulting from natural disasters in Pakistan have exceeded USD 18 billion; as the population and asset base of Pakistan increases, so does its economic exposure to natural disasters.

This sub-component will support the construction of small rainwater-fed dams, less than 10 meters in height, in Qubba Qadir Bux & Chhatan Shah hills area and Nagarparkar regions. The height of these all dams is ranging between 14 to 21ft.

Out of three dams in Nagarparkar region one dam namely Sehryoon will be storage dam, while two dams namely Samlee and Paro Jo Wandhyo will be groundwater recharge dams. In Nara region one dam site namely Jagan Wari will be storage dam and two namely Tang Wari and Darigh will be ground water recharge dams. Location of SRP Project area is shown as Figure-1, and regionwise locations of sub-projects is shown as Figure-2 and Figure-3 respectively.

In addition to recharging of fresh groundwater aquifers, these investments will provide safe drinking water to local communities and livestock. Sub-projects are not financing the construction of any water supply channels / and tube wells. The main objective of the construction of small dams and weirs is to recharge groundwater and is not deliberately designated to promote agriculture activities.

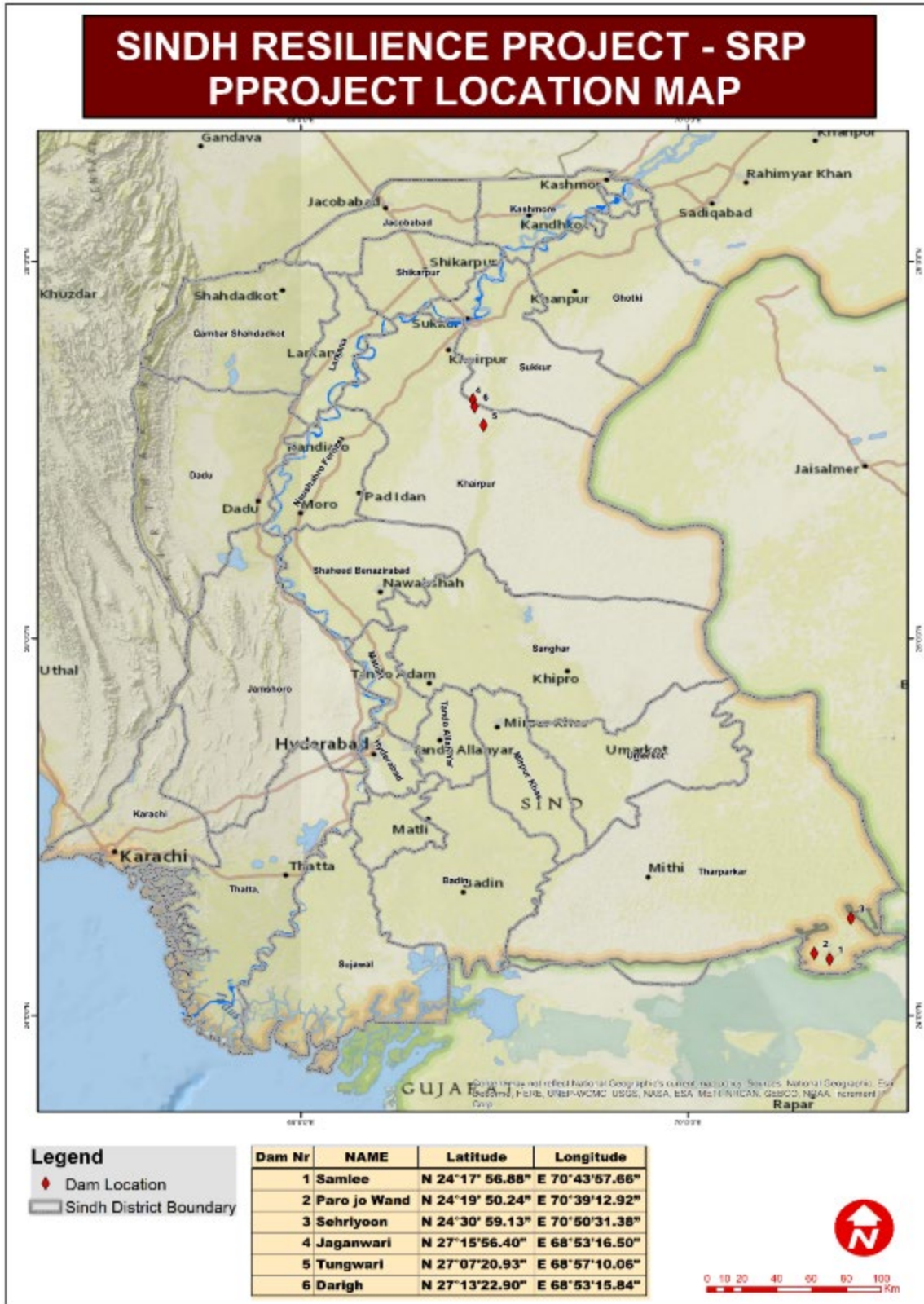


Figure 1: Location of the SRP Project Area

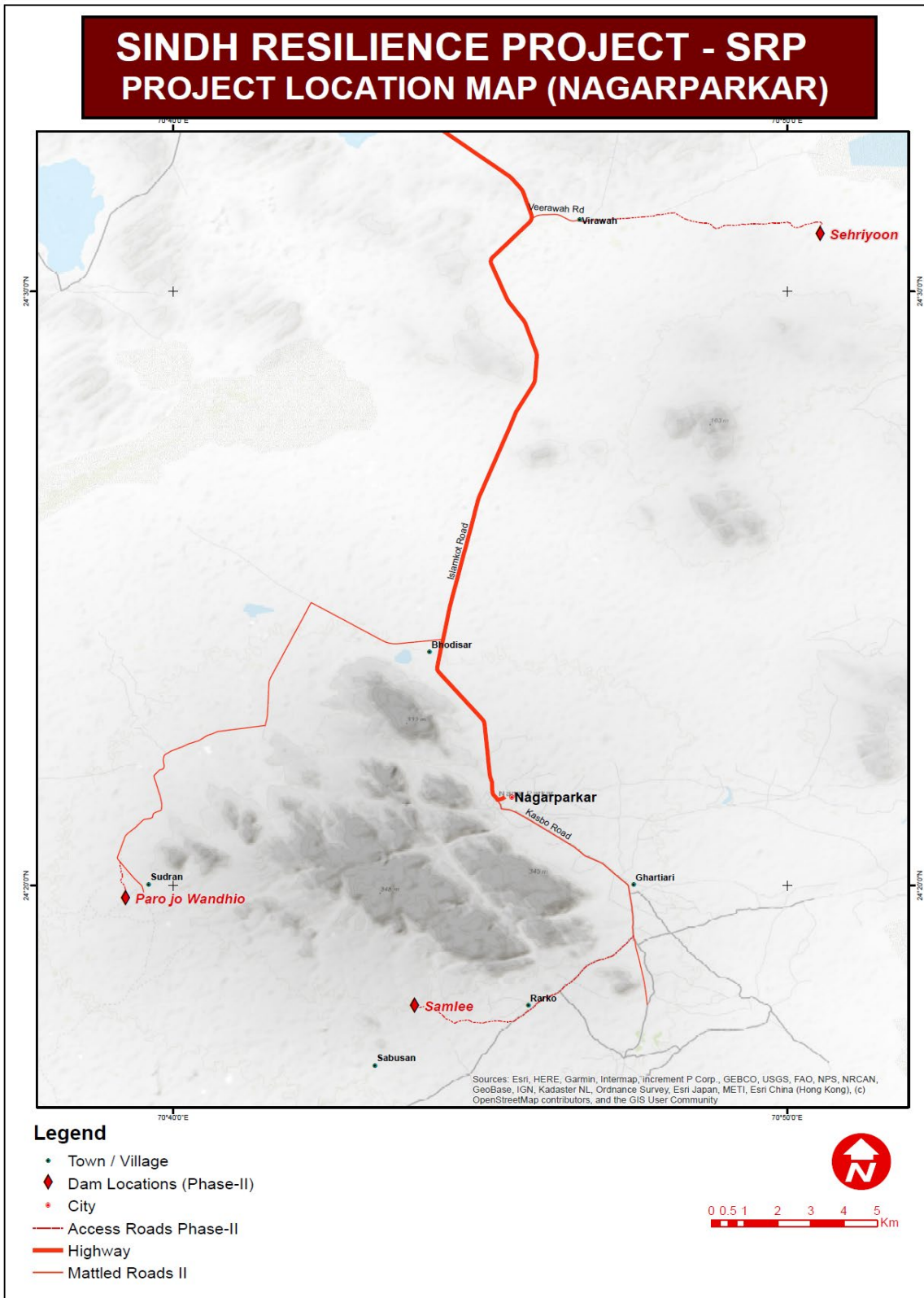


Figure 2: Location Plan of Dams in Tharparkar Region

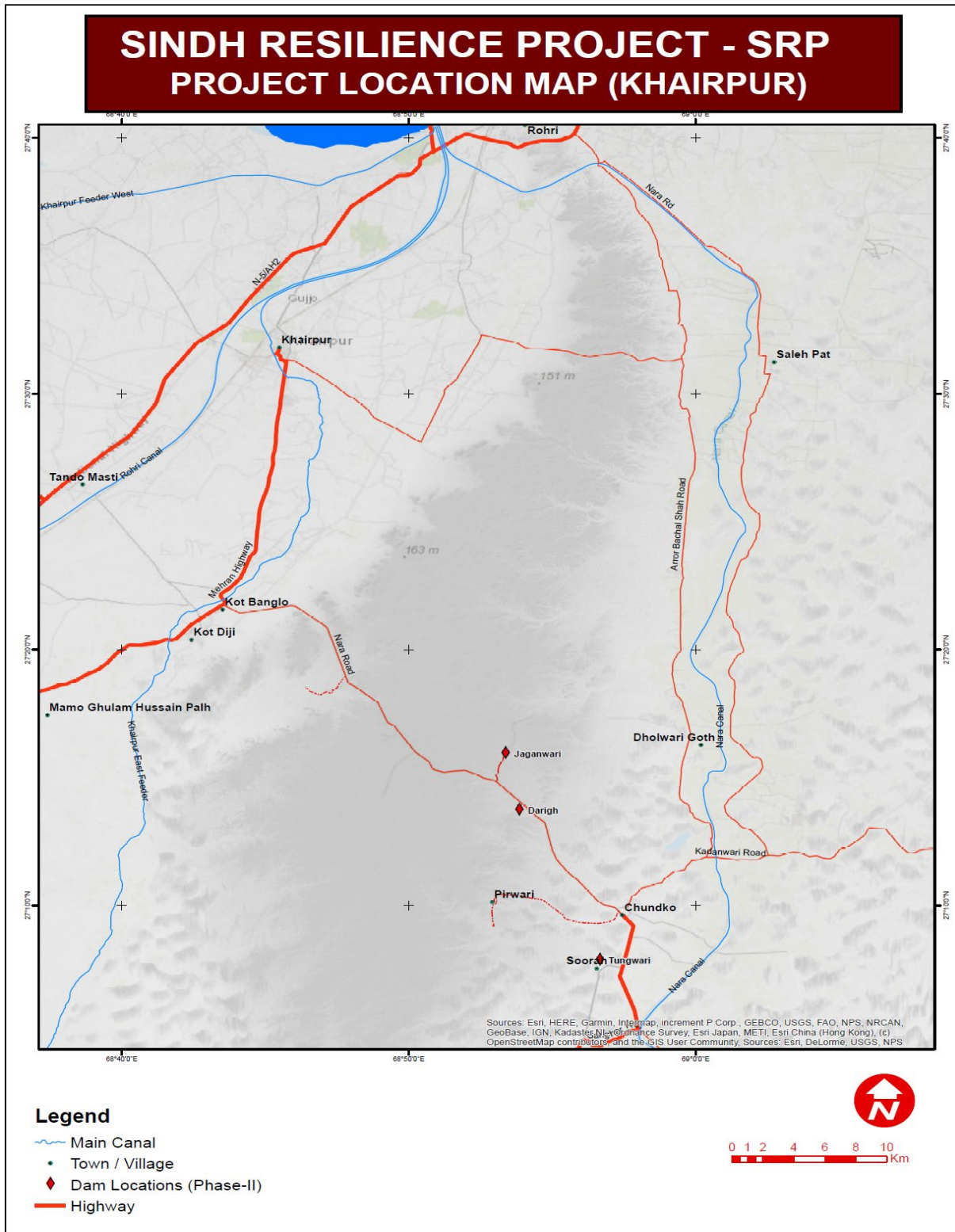


Figure 3: Location Plan of Dams in Khairpur Region

3.2 Location of Sub-projects

The sub-projects are scattered in Tharparkar, and Khairpur districts of the Sindh Province of Pakistan. The proposed investments are clustered in two regions: (i) the Nagarparkar region of district Tharparkar; and (ii) Qubba Qadir Bux and Chatan Shah Hills in Nara region Khairpur Districts. The description of each sub-project is given below. (For details, please see table:3)

I. Samlee Dam

The Samlee Dam is located near village Khariyoon Taluka Nagarparkar, District Tharparkar. The small dam will be constructed on a rainwater river namely Samlee. No temporary/permanent road would be constructed for the approach to the dam site. Location map of Samlee Dam is shown as Figure-4.



Figure 4 : Location Map of Samlee Dam

II. Paro Jo Wandhio

The Paro Jo Wandhio Dam is located near village Sodhran Taluka Nagarparkar, District Tharparkar. No temporary/permanent road would be constructed for an approach to the dam site. Location map of Paro Jo Wandhio dam site is shown as Figure-5.

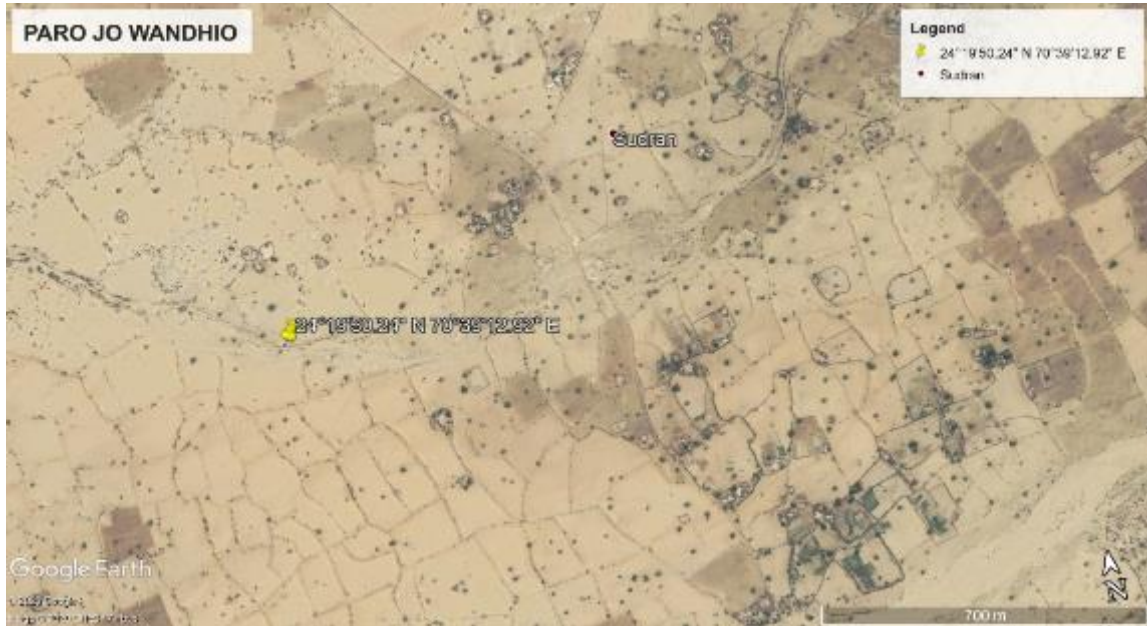


Figure 5 : Location Map of Paro Jo Wandhio Dam

III. Sehryoon Dam

The Sehryoon Dam is located near village Sehryoon Taluka Nagarparkar, District Tharparkar. The site is approachable by Mithi to Nagarparkar main road. No temporary/permanent road would be constructed for an approach to the dam site. The Sehryoon dam location map is shown as Figure-6.



Figure 6: Location Map of Sehryoon Dam



IV. Jaganwari Dam

Jaganwari dam site is located in village Sawan Khan Bhambhro at 12 km from Kot Bangalow town in East UC Chondko, Taluka Nara District Khairpur. No temporary/permanent road would be constructed for the approach to the dam site. The location map of Jaganwari dam site is shown as Figure-7.



Figure 7: Location Map of Jaganwari Dam

V. Darigh Dam

Darigh Dam proposed to be constructed across a non-perennial dry stream – Darghan Wari Nai in village Lala Bux Bhambhro. No temporary/permanent road would be constructed for the approach to the dam site. The location map of Darigh Dam is shown as Figure-8.



Figure 8: Location Map of Darigh Dam

VI. Tungwari Dam

The Tungwari Dam proposed to be constructed in village Sorah. The dam site is about 45 km away from Kot Bangalow and 20 Km from Chondko town in South-East. No temporary/permanent road would be constructed for the approach to the dam site. The location map of Tungwari dam site is shown as Figure-9.



Figure 9: Location Map of Tungwari Dam

The details of each sub-project is provided in below Table-3:

Table 3: Details of Sub-projects

S. No	Sub-project Name	Major Village	U.C	Taluka	District	Coordinates	Distance from main road/highway
1	Samlee Dam	Khariyoon	Adhigam	Nagarparkar	Tharparkar	24° 17' 56.88' N, 70° 43' 57.66' E.	20 km from Islamkot-Nagarparkar road
2	Paro Jo Wandhio	Paro Jo Wandhio	Adhigam	Nagarparkar	Tharparkar	24° 19' 50.24' N, 70° 39' 12.92' E	15 km from Islamkot-Nagarparkar road
3	Sehryoon Dam	Sehryoon	Virawah	Nagarparkar	Tharparkar	24° 30' 59.13' N, 70° 50' 31.38' E	15 km from Islamkot-



S. No	Sub-project Name	Major Village	U.C	Taluka	District	Coordinates	Distance from main road/highway
							Nagarparkar road
4	Jaganwari Nai Dam	Sawan Bhambhro	Chondko	Nara	Khairpur	27° 15" 56.40' N, 68° 53" 16.50 E	1 km from Kot Bangalo-Chondko road
5	Darigh Nai	Lal Bux Bhambhro	Chondko	Nara	Khairpur	27° 13" 22.90' N, 68° 53" 15.84' E	1 km from Kot Bangalow-Chondko road
6	Tungwari Nai	Sorah	Chondko	Nara	Khairpur	27° 07" 20.93' N, 68° 57" 10.06' E.	1 km from Chondko-Sanghar road

The envisaged investments in all planned dams construction are expected to raise the water table from the current depth of around 300 feet up to 35-55 feet.

3.3 Subproject Salient Features and Key Statistics

The main components of the sub-project are the construction of small rain water-fed dams, less than 10 meters in height, in Nagarparkar region and Qubba Qadir and Chatan Shah hills in Nara region. Out of three dams in Nangarparkar region one dam namely Sehryoon will be storage dam while two will be groundwater recharge dams. In Nara region one dam site namely Jagan Wari will be storage dam and two namely Tungwari are Darigh will be ground water recharge dams. The main objective of the construction of small dams and weirs is to recharge groundwater and is not deliberately designated to promote agriculture activities. Salient features of sub-projects are given in Table-4 below.

Table 4: Salient Features of the Sub-projects

Description	Samlee	Paro Jo Wandhio	Sehriyoon	Tungwari	Darigh	Jaganwari
Type of dam	Recharge	Recharge	Storage	Recharge	Recharge	Storage
Catchment Area (sq.mile)	2.19	0.95	1.62	21.74	12.08	2.80
Design Flood (cfs)	5530.00	1900.00	2114.00	2930.00	2610.00	1800.00
El.of River Bed (ft)	264.00	189.00	65.00	176.00	223.00	280.00
El.of Spillway Crest (ft)	275.00	199.00	79.00	183.00	231.00	287.00
Spillway Width (ft)	270.00	120.00	125.00	150.00	150.00	150.00



Description	Samlee	Paro Jo Wandhio	Sehriyoon	Tungwari	Darigh	Jaganwari
Head Over Crest (ft)	3.00	2.50	2.64	2.90	2.69	2.10
High Flood Level (ft)	278.00	201.52	81.64	185.90	233.69	289.10
Spillway Hight above Riverbed, (ft)	11.00	10.00	14.00	7.00	8.00	7.00
EI.Dam of Crest (ft)	281.00	204.60	84.70	189.00	236.70	292.10
Dam Height above Riverbed (ft)	17.00	15.60	19.70	13.00	13.70	12.10
Reservoir Area, acre	15.00	20.00	15.00	85.30	54.00	10.70
Reservoir Storage, ac-ft	56.00	100.00	54.00	205.00	102.00	20.00

Some photos of the dam sites are shown in Annex-V.

The proposed dams in two regions will augment the groundwater aquifers through percolation. The groundwater will be utilized through dug or tube wells for drinking and livestock purposes as it is presently in practice at the sub-project areas. The proposed dams are not deliberately designated to promote agriculture needs.



3.4 Construction Activities

The Construction activities for various sub-project dams will span 12 months. The related activities are the establishment of contractor's camp and stockyards for cement, steel, and aggregate, shifting of necessary machinery and equipment to site and exploitation of borrow areas, construction of concrete spillways, earth fill embankments and one-room building for dam O&M staff. The major activities are briefed below:

- i. Contractor's mobilization: After awarding the contract the selected Contractor shall be mobilized in the field and arrange the camp for their staff and labor. The machinery and other necessary equipment shall be shifted.
- ii. The concrete structures will be constructed with contraction joints. PVC water stopper shall be provided at these joints.
- iii. The borrow areas will be excavated as per specifications. The borrow material will be loaded and transported by tractor trolleys through the approved traffic management plan.
- iv. Formation of embankments/ bunds for the reservoir with the soil obtained from borrow areas. Activities involve unloading the soil on embankment, leveling, and compaction of soil in layers.
- v. The stone shall be loaded and transported from nearby quarries or by approved material quarries to the site through trucks and unloaded/stacked at designated places.
- vi. Stone pitching works shall be carried out as per specification.
- vii. Restoration of campsite and Contractor's demobilization.

3.5 Construction Materials

The following construction materials are foreseen to be used in the construction of concrete spillways and earthen bunds:

- a) Embankment fill
- b) Fine and coarse filters
- c) Toe drain stones
- d) Gravel bedding
- e) Riprap stones
- f) Cement
- g) Fine and coarse aggregates
- h) Reinforcement
- i) Water
- j) PVC water stops

Estimated quantities of construction material required are given in Table-5.



Table 5: Estimated Quantities of Construction Materials

Dams	Earthwork (Cft)		Cement Concrete	Reinforcement	Stones Protection	Filter		PVC Waterstop	Water for Concrete and Earth fill
	Excavation	Fill	(Cft)	(Cwt)	(Cft)	Fine (Cft)	Coarse (Cft)	(ft)	(Cft)
Samlee	658,269	511,342	430,253	12,165	187,970	114,669	117,802	1,297	658,269
Sehriyoon	479,914	544,834	230,328	8,464	213,687	105,309	121,753	1,012	479,914
Paro Jo Wandhio	433,654	561,720	200,682	7,677	179,178	122,040	127,515	957	433,654
Jaganwari Nai	398,185	279,334	226,892	8,179	139,329	77,005	84,664	998	398,185
Darigh Nai	468,212	407,762	226,814	8,194	238,254	97,394	124,594	1,001	468,212
Tungwari Nai	428,717	461,828	225,686	8,115	166,920	106,694	108,416	996	428,717
Total	2,866,951	2766820	1,540,655	52,794	1125338	623,111	684,744	6261	2,866,951

The natural materials such as coarse aggregate, toe drain stones, riprap stones, and coarse filters can be obtained from crush plants of local suppliers which are abundant near all sub-project dam sites. The fine aggregate and fine filters may be obtained by screening of river bed sand.

The water can be obtained from nearby existing tube wells or tube wells installed by Contractors. The aquifers of the water suitable for use in concrete are present at the vicinity of each dam site.

Cement is supposed to be procured from Mirpur Khas, Khairpur, Sukkur, and Islamkot cities. Most of the other construction supplies such as fuel, steel, and lubricants can also be arranged from big cities like Mirpur Khas and Sukkur. Some other construction materials such as rolled steel bars, PVC water stops, and steel plates for formwork, pump installation material may be brought from Hyderabad and Karachi.

3.6 Contractor's Camps

For the construction of dams and appurtenant works, camps will be established on the government or private land near the dam sites but must be minimum 500 m away from settlements. In the case of private land, a rent agreement will be made between Contractor and Landowner along with the restoration of land in the original condition after completion of work. As construction works are confined only to the dam's site, therefore, camps will be placed as per designated sites. The contractor will give preference to local people for unskilled labor from the communities with the consultation of elders of different communities in an equitable manner and there would be no need of setting up large scale camp.



Only 15 to 20 workers will be accommodated in each camp. Most of the laborers will go back to their nearby homes after completion of the daily work. The contractor will be bound to provide facilities like kitchen/washing/bathing/ latrine with septic tanks and medical checkups to laborers. The health screening of laborers and workers will be conducted at the start of the project. The contractor will prepare workers' code of conduct plans and Camp layout plan and get it approved by the Resident Engineer and PMT for implementation at site. The camp will be established after the approval of the layout plan. Details are given in below Table 6.

Table 6: Details of the Camps site for each sub-project

S.No	Sub-project Name	Coordinates		Away from the Dam site	Land Required
		Northing	Easting		
1	Samlee	N 24 30 01.9	E 70 73 19.45	250 Meters	4 Acers
2	Sehriyoon	N 24 31 06.9	E 70 51 19.2	300 Meters	4 Acers
3	Paro Jo Wandhio	N 24 32 46.10	E 70 66 14.9	200 Meters	4 Acers
4	Jaganwari Nai	N 27 27 16.90	E 68 89 49.83	100 Meters	4 Acers
5	Darigh Nai	N 27 26 28.76	E 68 89 33.92	200 Meters	4 Acers
6	Tungwari Nai	N 27 09" 14.0'	E 68 52" 42.0'	200 Meters	4 Acers

Prospective campsites location map are shown as Annexure-IX

3.7 Borrow Material

The fill for the earthwork/embankment can be obtained from borrow areas near dam sites where suitable soil is available. The areas of suitable borrow areas for each dam site are shown in Figures 10 to 15 above. The Contractors will be allowed to choose their own borrow areas as per their arrangement. The contractor will, however, be bound to take the borrowed material from uncultivated land and shall be restricted to take borrow from private land. As all dam sites are in less populated and scattered areas. A large area of government-owned land is available for borrow material. Quantities of fill material are given in **Table-5**.

3.8 Machinery & Equipment

The construction work includes earthwork and concrete work. These works will require earthmoving machinery such as excavators, dumpers, graders and rollers, transit mixtures, etc. the concrete works will involve medium-size batching plant and concrete placing equipment. All these equipment will be directly managed by the contractors. The estimated machinery and equipment required are given in Table-7. However, the actual number of equipment required on the site will be determined by the contractor to carry out the strengthening work.



Table 7: List of Machinery and Equipment to be used on each sub-projects

S.No	Machinery/Equipment	Sub-project Names						Total
		Samlee	Sehriyoon	Paro Jo Wandhio	Jaganwari	Darigh	Tungwari	
1	Loader	3	4	4	3	3	5	33
2	Tractor Trolley dumper	10	10	10	10	10	12	92
3	Earth leveler machine	2	2	2	2	2	3	19
4	Excavator	4	4	5	4	4	5	38
5	Transit Mixtures	5	4	5	4	4	5	42
6	Batch Plant	1	1	1	1	1	1	9
Total		25	25	27	24	24	31	233

3.9 Manpower Requirement

The manpower required by the contractor during the execution of the sub-projects is given in Table-8. For unskilled laborers, local people will be preferred. Machinery Loader/ Dumper/Trucks/ Tractor Trolley will be used for bringing earth material from the designated sites. Local operators/drivers will be preferred with valid driving licenses having experience of driving vehicles like (Truck, dumpers, and Dozers etc.). This does not include the drivers which will carry the stone from the quarry and other items like cement and steel from the local market. Manpower requirement is based on best estimates and subject to revision. The final requirement would be determined after the finalization of bid documents by the contractor(s).

Table 8: List of Required Manpower

S.No	Type of Manpower	Sub-Project Name					
		Samlee	Sehriyoon	Paro Jo Wandhio	Jaganwari Nai	Darigh Nai	Tungwari Nai
1	Construction Supervisor	1	1	1	1	1	1
2	Environment and Social Safeguard Staff	4	4	4	4	4	4
3	Surveyor	3	3	3	3	3	4
4	Skilled laborer	4	4	4	4	5	6
5	Semi-skilled laborer	5	5	6	5	6	7
6	Unskilled laborer	15	15	15	15	17	20
7	Drivers/operators	30	30	30	30	25	35



3.10 Project Area of Influence

The Corridor of Impact (Col) for the sub-projects has been considered carefully keeping in view the proposed interventions and associated impacts during construction, operation, and maintenance phases. The Col would cover the footprint of the temporary and permanent works or the working area required to complete the works, the anticipated impacts during construction and operation phases. The spatial extent of the subproject area when preparing the ESMP has been focused on keeping in view the proposed interventions and broad impacts of the sub-project after completion. The Col is classified as described below.

1) Primary Impact Zone

The primary corridor of impact area was surveyed physically and scanned through the HECRAS and google maps softwares to estimate expected loss during the construction and in case of dam break, 100 years flood and combined impact of dam break + 100 years flood. The below Table 9, and Table-36, shows the expected loss in terms of Trees cut, disturbance to track routes, agriculture land, archeological sites, and handpumps. Since the out of six dams, four are recharge dams, in which the estimated loss or disruption will be for few days and temporary as the water will percolate to aquifer. Whereas in case of storage dams expected loss is forty nine (49) trees at two location, and four (04) kacha tracks of villages. For each site landuse maps have been developed which are attached as Annexure -III.

Table 9: Primary Impact Zone

S.N O	Name of Project	Dam Type	Road Type	Trees	Agriculture Land Area	Archeological Site (if any)	Hand pump/Well
					(Acres)		
1	Samlee	Recharge	Kacha Track (1)	6	24.09	0	0
2	Sehryoon	Storage	-	4	0	0	0
3	Paro Jo Wandhiyo	Recharge	Kacha Track (1)	9	30.9	0	0
4	Jaganwari	Storage	Kacha Track (2)	4	0	0	0
5	Darigh	Recharge	-	11	0	0	0
6	Tungwari	Recharge	-	15	0	0	0
Total			4	49	54.99	0	0

2) Secondary Impact Zone



The secondary impacts zone will be considered the area that is affected by droughts.



4. ANALYSIS OF ALTERNATIVES

4.1 Selection of Dam site location

The selection of sub-project dams made on three previous feasibility studies carried out by two consultants separately i.e. M/S Associated Consulting Engineers Pvt Limited (ACE) for dams in Nagarparkar and Kotdiji hills and dams in Kohistan region by M/S Mott-MacDonald Pakistan (MMP). Under those studies about 120 dam sites were investigated and 70 dams were recommended for construction. The present six (06) dam sites were selected from that list by following criteria as given in below. The feasibility study for the selected sub-projects was updated in 2019.

Selection Criteria	Status
(i) Dam is located in water scarce area which solely depends for water on groundwater and rain runoff for drinking and agriculture purposes.	(i) All six sub-project dams are located in highly water scarce areas of Sindh Province.
(ii) Dam is able to either: a) Effectively recharge groundwater or b) Create a storage pond which will supply water for a long period of time	(ii) a) The Samlee, Paro-Jo-Wandhio, Darigh and Tungwari dams will recharge groundwater aquifers in vicinity of each dam. b) The Sehryoon and Jaganwari will be storage dams, from where local people will use water for drinking and domestic purposes and livestock.
(iii) The topographical and geotechnical conditions at dam site provide suitable condition for safe and economical structure.	(iii) The topographical and geological conditions at all six dams are such that they provide most economic and safe dams.
(iv) The negative effect of dam on lower riparian's is negligible.	(iv) All six dams retain a small portion (0.5 to 5%) of total inflows passing through streams on which these dams will be built. Thus, there will be negligible negative impact on lower riparians. On the other hand in recharge dams the



Selection Criteria	Status
	maximum benefit will reach the downstream communities.
(v) No or small land acquisition or resettlement is involved due to construction of dam.	(v) In all six dams no land is to be acquired and no resettlement is involved as all sub-projects will be built on lands owned by government of Sindh and there are no settlements which need to be displaced.
(vi) There is minimum negative social or environmental impact of dam or on the other hand there is a positive long term positive impact on environmental and social conditions.	(vi) This is true for all six sub-projects.
(vii) The project is economic viability.	(vii) The economic analysis has shown that the sub-projects are economically viable with a benefit cost ratio of 3.01.

An analysis of alternatives has been performed to review and assess different ways of meeting the project objectives that might have fewer environmental or socio-economic impacts.

The consideration of alternatives is a proactive method of environmental and social assessment as it enhances the project design by examining options and ruling out option(s) that are deemed to be environment or socially damaging, instead of only focusing on mitigations to reducing adverse impacts of a single design. This calls for a systematic comparison of feasible alternatives for the proposed project site, technology and operational alternatives.

The designs for sub-project works on the Samlee, Paro jo Wand, Sehryoon, Jaganwari, Tungwari and Darigh small dams are a result of an iterative design approach in which alternatives have been reviewed against for their functionality and socio-environmental impacts. The alternative project activities have been considered and the reasons for their rejection are discussed under the following headings.

This section presents an overview assessment of the impacts of each option under the following categories:

- Economic;
- Environmental; and
- Social



The assessment considers the magnitude and duration of both positive and negative impacts to assign impact significance as given in **Table 10**.

Table 10: Determination of Impact Significance

Impact Magnitude	Impact Significance	
	Short-term Duration	Long-term Duration
Major Positive	Moderate Positive	Major High positive
Moderate Positive	Minor Positive	Moderate Positive
Minor Positive	Negligible	Minor Positive
Neutral	Negligible	Negligible
Minor Negative	Negligible	Minor Negative
Moderate Negative	Minor Negative	Moderate Negative
Major Negative	Moderate Negative	Major Negative

For the alternatives considered in this chapter, each category is assigned an impact significance according to the criteria given in **Table 11**.

4.2 The Available Alternatives for Sub-projects

The subject small dams are planned to be constructed in arid zones of Kotdiji Hills in Khairpur District and Nagarparkar region in Tharparkar District of Sindh. The geographical location of these regions is such that the source of water to these regions is rain water which normally falls for few days of a year and the ground water. The water from Indus cannot reach these areas without lifting. The proposed small dams will primarily contribute to provision of water to communities during dry period by recharging of underground aquifers and formation of storage ponds.

To develop resilience against draughts the following alternative may be considered:

- Option 0 : Do nothing
- Option 1 : Construction of Gabion Dams
- Option 2 : Construction of Diversion Dams
- Option 3 : Construction of Small Earthen Dams with proper overflow Spillways

The scope of SRP is only small dams are to be considered and as per World Bank and ICOLD criteria the small dams shall not be higher than 10 m and reservoirs not larger than of 2400 Acft (3 million cubic meter) capacity. Thus large dams are not considered as an Option of this study.

4.2.1 Option 0: No Project Alternative

In the No Project Scenario, the following issues are expected to continue:

- Communities will suffer hardships of dry seasons, particularly during long periods of draughts.
- People may increase the extraction of groundwater resulting its depletion and deterioration of groundwater quality and quantity.
- Due to shortage of water local people may resort to migrations which may increase social problems and economic burdens.
- Due reduction in crop production and livestock people may develop social vices such as armed robbery and terrorism.

4.2.2 Option 1: Construction of Gabion Dam

The gabion dams are the structures constructed across rivers / nallas / nais by placing stones in boxes / crates of steel wire mesh is an option to obstruct flows of water and recharge groundwater. This option is considered not suitable for the purpose for following reasons.



Figure 10: Gabion Dam/Weir

- Gabion dams do not have long life. The steel meshes get rusted and enclosed stones get washed away during nalla / river flows.
- Gabion dams are vulnerable to vandalism. People cut the mesh wires and steal them for their own uses. A broken gabion gets easily damaged and washed away by subsequent flows.

- The heights of gabions are not kept more than 6 to 10 feet. The required heights of sub-project dams vary from 10 to 18 feet.
- The gabion dams can be used as recharge delay action dams only. Due to their porous body the gabion dams cannot be used as storage dams. Whereas two out of six dams of sub-projects are storage dams. Thus this type of dam cannot be adopted for 2 storage dams i.e. Sehryoon and Jaganwari.

In view of above reasons, the gabion dams are not considered technically feasible for the sub-projects.

4.2.3 Option 2: Construction of Diversion Dams

The small diversion dams can be constructed across rivers / nallas to divert river flows to adjoining lands for spate irrigation. There are following observations on this option:

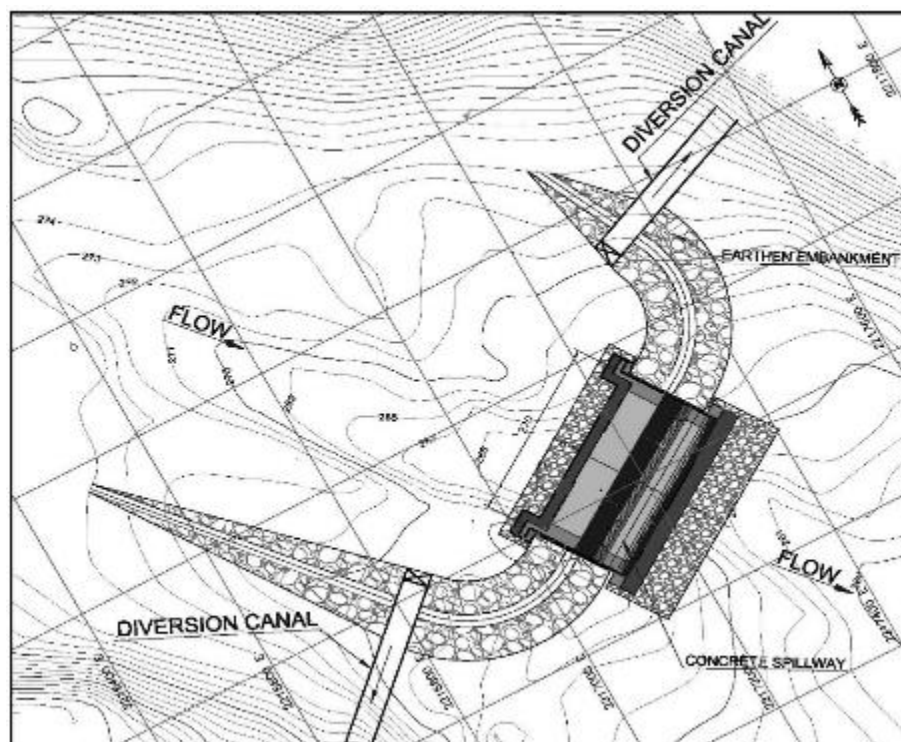


Figure 11: Diversion Dam

- This option is suitable in cases where river / nallas flow for a long duration of time. Whereas in arid zones of Sindh the rains are very scanty and are of short duration. Though discharges in Nais / Nallas are very high but occur for a period of 7 to 15 days in a year. So this type of dam will not be beneficial.

- There are chances that diversion of flow may become uncontrolled which may badly inundate the adjoining crops and villages and may create shortage of water in the downstream area.

Due to above reasons, the diversion dam option is not adopted for the sub-projects.

4.2.4 Option 3: Construction of Recharge / Storage Dams (Earthen embankments with Concrete Spillways)

The best options for Nagarparkar and Kotdiji Hills are construction of recharge dam on Nais, where the dam will cause recharge of groundwater through entry of nai / nalla flow through river alluvium and underlying jointed rocks by delay action / storage and high head caused by the dams. These dams can be constructed to 10 to 18 ft height. Normally water remains in these reservoir for a period of 2 to 3 weeks. The recharged groundwater is also safe from the loss by evaporation and impurities.

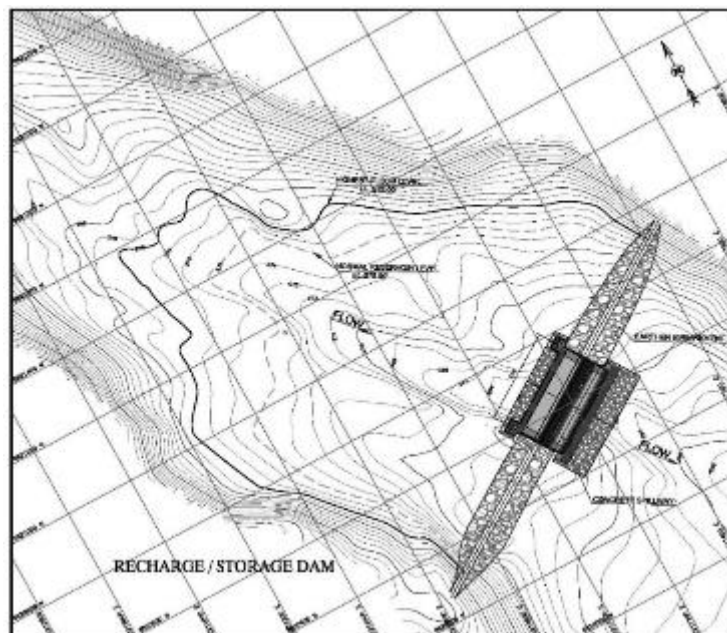


Figure 12: Recharge/Storage Dam with Earth Embankment and Concrete Spillway

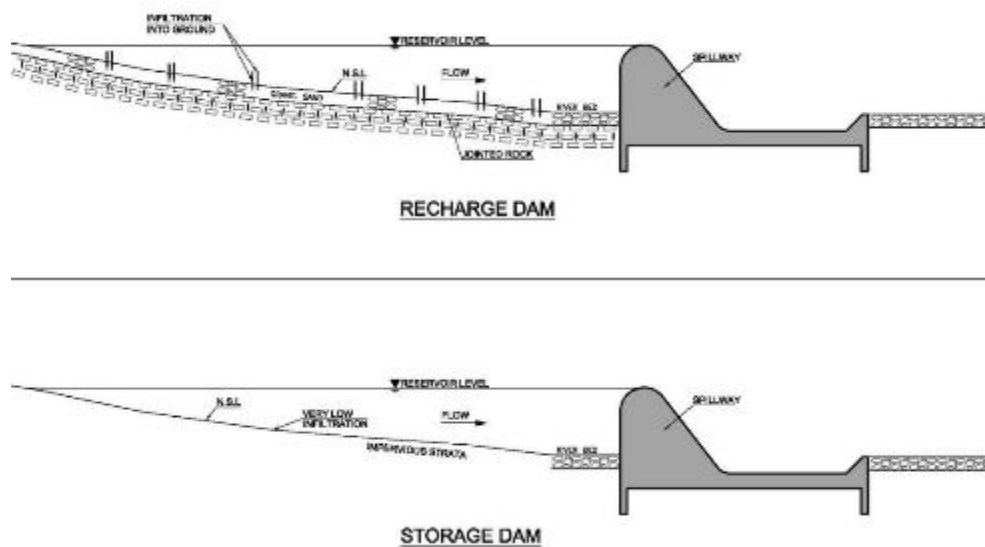


Figure 13: Cross-sections of Recharge and Storage Dams

In streams where due to watertight beds, the recharge dam cannot be workable (such as at dams Sehriyoon and Jaganwari, storage dams are proposed. In these dams, though there will be some loss in evaporation, still surface water will be available for a period of 5 - 6 months. Communities and their livestock can utilize water directly from these reservoirs.

The dams shall be constructed as earthfill embankments using local materials of earthfill, fine and coarse filters and stone protection. Where large size stones are not available for riprap for upstream slope protection, it can be obtained from limestone quarries. A concrete spillway will be provided in the central part of the dam to allow safe passage of high river flow.

This type of small dams are very useful, use local materials and construction industry, store more water for long duration of time in form of groundwater recharge, are thus recommend as most suitable option to achieve the project objectives.

Table 11 reviews the alternative inventions considered to improve resilience against draughts in the project area.



Table 11: Analysis of Alternatives: Construction of Small Dams

Option No.	Action	Economic Impacts		Environmental Impacts		Social Impacts	
		Positive	Negative	Positive	Negative	Positive	Negative
0	Without project	None	<ul style="list-style-type: none"> • Cost of relief to be provided during draughts (major, long term) • Loss of agriculture production and livestock (major, long term) 	<ul style="list-style-type: none"> • No disturbance to environment (neutral) 	<ul style="list-style-type: none"> • Loss of trees, crops and livestock (major, long term) 	None	<ul style="list-style-type: none"> • Hardships to people and livestock during draughts (major, long term) • Migration of population from draught affected areas, increase in hardships especially in female population (major, long term). • Increase in social vices such as armed robbery and terrorism (major, long term).
1	Construction of Gabion Weir for groundwater recharge	<ul style="list-style-type: none"> • Employment during construction (Moderate, short term) • Increase in crop production and livestock (Moderate, short term as) 	<ul style="list-style-type: none"> • Moderate capital cost to implement (Moderate short term); • Due to short life not more than 5-7 years the benefit will be short lived • Due to short heights, the economic benefits 	<ul style="list-style-type: none"> • Improvement in water availability (Moderate, short term as compared to Options 2 and 3) • Improvement in crop production (Moderate, short term as compared to Options 2 and 3) 	<ul style="list-style-type: none"> • Felling trees in construction area (Moderate short term); • Quarrying of stone (Minor long term) • Greenhouse gas emissions from machinery 	<ul style="list-style-type: none"> • Resilience against draught (Moderate, short term as compared to Options 2 and 3) • Improvement in standard of 	<ul style="list-style-type: none"> • Minor loss of displacement of people due to stone pitching and widening of bunds (Minor long term) • Construction stage disturbance (Moderate short term)





Option No.	Action	Economic Impacts		Environmental Impacts		Social Impacts	
		Positive	Negative	Positive	Negative	Positive	Negative
		compared to Options 2 and 3)	will be low (moderate long term) <ul style="list-style-type: none"> Storage of water not possible (major, long term) Short lived benefit 	<ul style="list-style-type: none"> Improvement in ecology, and green cover (Moderate, short term as compared to Options 2 and 3) 	during construction (Minor short term)	life (Moderate, short term as compared to Options 2 and 3) <ul style="list-style-type: none"> Reduction in migration of communities (Moderate, short term as compared to Options 2 and 3) 	
2	Construction of diversion dam	As for Option No. 1	<ul style="list-style-type: none"> Moderate capital cost to implement – higher than alternative #3 (Moderate short term); Moderate on-going maintenance costs (Moderate, long term) Due to reduction floods in downstream reduction in crop production and livestock in downstream area 	As for Option No. 1	<ul style="list-style-type: none"> Felling trees on new alignment (Moderate short term); Quarrying of stone (Minor long term) Transport of earth material (Minor short term); Air emissions from heavy machinery during construction 	As for Option No. 1	<ul style="list-style-type: none"> Borrow areas and construction of structures (Major, long term); Construction stage disturbance (Moderate, short term) Downstream populations may face series shortage of water supply resources of their livelihood





Option No.	Action	Economic Impacts		Environmental Impacts		Social Impacts	
		Positive	Negative	Positive	Negative	Positive	Negative
					(Minor short term) • Serious decrease in water flows on the downstream affection of human life and ecology		
3	Construction of Recharge / Storage Dam of Earthen Dam with Concrete Spillway	<ul style="list-style-type: none"> • Increased economic activities • Prolonged availability of water 	Same as Option 2 <ul style="list-style-type: none"> • High capital cost to implement – higher than alternative #2 (Major, long term); • Moderate on-going maintenance costs (Moderate, long term) 	<ul style="list-style-type: none"> • Increase in greenery and plantation (after implementation) • Due to ground water recharging water will be available for longer time. • Improvement in water availability (major, long term) • Improvement in crop production (major, long term). • Only some amount of water of Nai will be stored / recharged, remaining water will overspill. No or negligible impact on lower riparian. 	<ul style="list-style-type: none"> • Felling trees on new alignment (Moderate short term); • Quarrying of stone (Minor long term) • Transport of earth material (Minor short term); • Air emissions from heavy machinery during construction (Minor short term) 	<ul style="list-style-type: none"> • As for Option No. 2 but more than Option 2 and 3. 	<ul style="list-style-type: none"> • Moderate loss of land to be acquired due to establishment of borrow areas and embankments (Major long term); • Construction stage disturbance (Moderate short term) • Removal of encroachment and resettlement issue.



5. DESCRIPTION OF ENVIRONMENT

5.1 Introduction

This section describes the existing environmental and socio-economic conditions of the SRP project area. The environmental and social baseline aims to provide a generic baseline against which the project impacts can be measured. This Section also identifies archaeological sites, protected areas, sensitive flora and fauna receptors in the project area. The potential impacts of the project and associated mitigation measures to address these impacts have also been discussed in this Section.

5.2 Physical Environment

5.2.1 Geography

Sindh can be divided into four distinct parts topographically: Khirthar range on the west, a central alluvial plain bisected by the Indus River in the middle, a desert belt in the east and south-east, and the Indus delta in the south which is shown in geogrphaical map of Sindh Figure-14.

Out of six proposed dams, three are located in Qubba Qadir & Chhatan Shah Hills in Nara region in Khairpur district and the remaining three dams are located in Nagarpakar area of the southeast of Tharparakr district. The geography features of these areas are described below.

i) Nagarparkar Region

Samlee, Sahriyoon, and Paro Jo Wandhio dams are located in the southeastern parts of the Nagarparkar region. The Nagarparkar is located in the extreme southeast corner of the Thar Desert with different geography and climatological condition than rest of the Thar. There is small hilly tract known as Karunjhar hills. These hills are about 20 kilometers in length from north to south and have height of about 300 meters. It consists of granite rocks probably an outlying mass of the crystalline rocks of the Aravalli range. The Aravalli series belongs to the Archean system, which constitutes the oldest rocks of the earth crust. The areas in plain lands are silty clay and sandy silts while the areas near the nais are mostly sandy.

Small nala/nadi and rivers originates form Karoonjhar hills and drain towards the Runn-of Kutch. None of the rivers is perennial and as such there is no base flow. Only flood flow keeps on flowing for few hours to couple of days after each sizeable rainfall event. Gordhro, Bhatiani, Jinjo, Adigoan, Surachand, Surdran, Kasbo, Mue and Mudro are main nais of Nagarparkar



which originate from Karoonjhar hills and fan out in the plains of Nagar and in case of very high rainfall the water reaches to Runn-of-Kutch.

Samlee, Sehryoon and Paro Jo Wandhio dams shall be located on a runoff streams which flow towards Runn of Kutch.

ii) **Qubba Qadir Bux and Chatan Shah Hills in Nara Region**

Jaganwari, Darigh, and Tungwari proposed project area are located in South East of Qubba Qadir Bux and Chatan Shah Hills between Indus River in the west and Nara Canal in the east of Tehsil Nara District Khairpur. These hills are about 40 kilometers (25 miles) long and 16 kilometers (9.9 miles) wide.

The hills separate two environmentally very different regions, the fertile cultivated plan of the Indus to the west and poorly vegetated fossils dunes of the Thar Desert in the east. Geomorphologically, Nara is similar to the Thar region. It consists of parts Sanghar (Khipro and Sanghar talukas), Khairpur (Talukas: Nara, Thari Merwah, and Kot-Deji), Sukkur (Talukas: Rohri, Panu Aqil) and Ghotki (Taluka: Daharki, Mirpur Mathelo, and Obaaro) districts. It descends from taluka Khipro and crossing Tar Ranaho southwards it ends while touching the border of Taluka Umerkot. Northern parts of the district of Khairpur are comparatively, thinly populated and the inhabitants are mostly nomadic herdsmen.

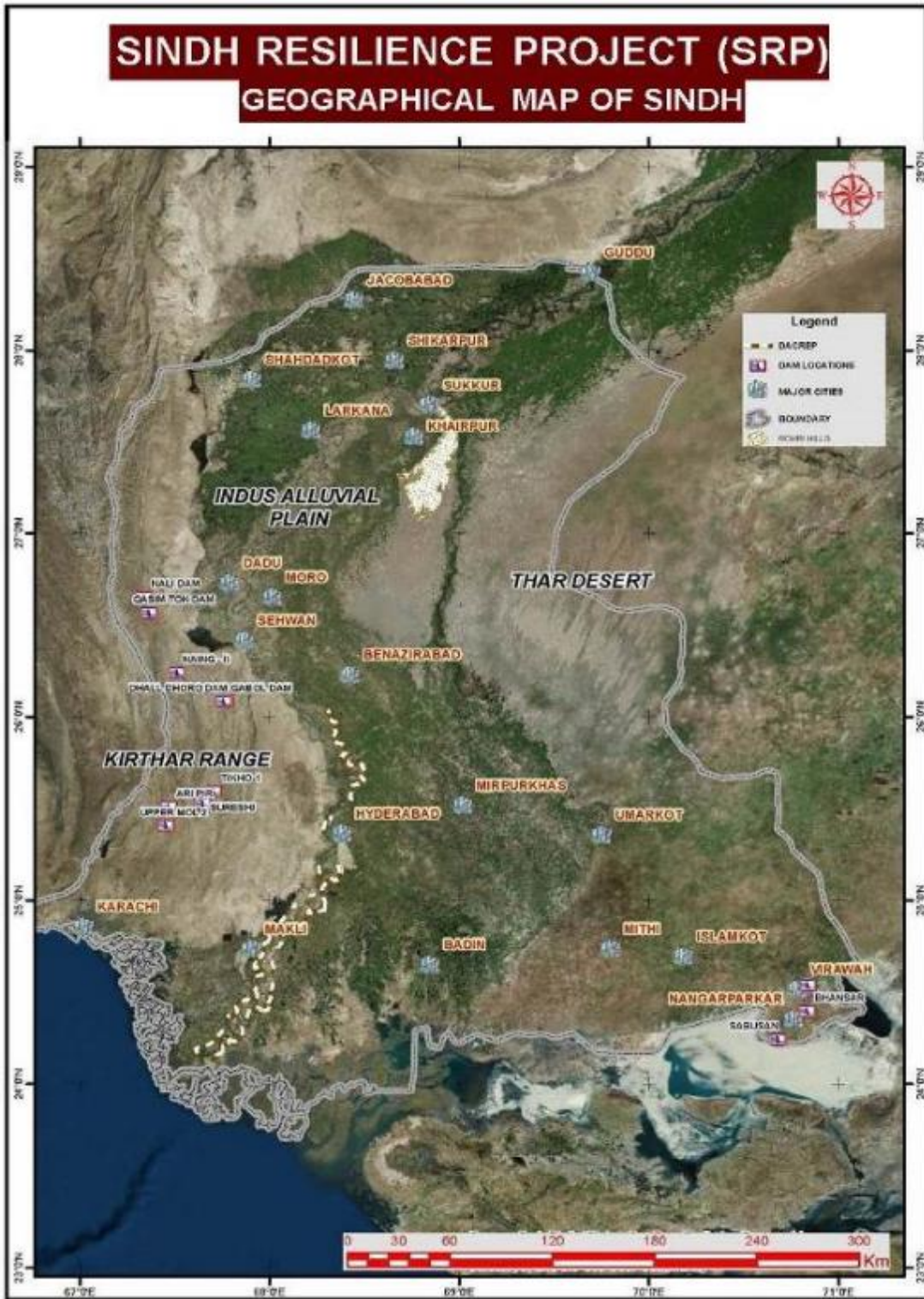


Figure 14: Geographical Map of Sindh



5.2.2 Geology

The geology of Sindh is divisible in three main regions, the mountain ranges of Khirthar, 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 Karunjhar Mountains, which is famous for Nagar Parkar Granite. In the north Sindh is enquired by rocks of Laki range extending to Suleiman range and its southernmost part is encircled by the Arabian Sea. The rocks exposed in this area belong to upper Cretaceous which are recent in age. The sub-surface rocks are about 20,000 feet thick and belong to Cretaceous and Pre-Cretaceous periods. Mostly the rocks are of sedimentary origin of clastic and non-clastic nature and belong to marine, partly marine and fluviatile depositional environments. Geological Map of Sindh is attached as Figure-15.

i) Nagarparkar

The geology of Nagarparkar Project area have remarkable features as it exhibits a variety of rocks from Pre-Cambrian basement rock to Tertiary sandstone and clays depicting a long tectonic history of the region. The desert to the south of Nagarparkar is believed to have grown over last 3,000 to 4,000 years, before that the region had more humid and tropical climate which favored growth of thick vegetation and habitation of wild animals such as peacock and deer. The presence of lignite coal of Thar Coal Field showed that a humid climate existed at the time. The eastward extension of desert condition was prevented by Aravalli Mountain range about 250km from Nagarparkar where moisture-bearing clouds of southwest monsoon precipitates. Since there are no hills across the direction of winds the southwest monsoon just passes over the Thar Desert.

The Nagarparkar region have three dams & their project specific geological map is shown as **Figure-16**. is surrounded on three sides by Runn of Kutch shelf which was a shallow arm of the sea during Pleistocene (1.6 My) which extended and locally submerged the sloping land. The Indus once flowed into it and is now silted up and forms an extensive and desolate salt marsh during dry period and tidal flat covered with little seawater during monsoon period.

ii) Qubba Qadir Bux and Chatan Shah Hills in Nara Region (Khairpur)

The Nara region have also three dams & their project specific geological map is shown as **Figure 17**. The geology of the project area is having remarkable features and exhibits rocks of Tertiary limestone, sandstone and shale depicting a history of the region. The Thar Desert is in the East of the Project area crossing Nara Canal.

The area is mostly composed of limestone with thin interbedded layers of sandstone and shale. The layers are dipping 10 to 20 towards South-East and surrounded by sand dunes. The aridity and temperature are the key factors to disintegrate the rocks and helping in the accumulation of sand which is disturbed by the action of wind. The limestone, shale, and sandstone are the units of Brauhi's formation.



The hills at Arore, Quba Qadir Bux, and Chatan Shah Hills are mostly composed of limestone with thin interlayers of sandstone and shale, while the remaining of the area is of sandstone and limestone. The area near Kot Diji and Sorah is localized with Sand dunes.



Figure 15: Geological Map of Sindh⁶

The geology is complex and Oligocene & Miocene formations are not easily recognized. The formations are dipping in general towards the west at about 15 to 25 degrees.

⁶ (Source: Geological Survey of Pakistan – GSP)

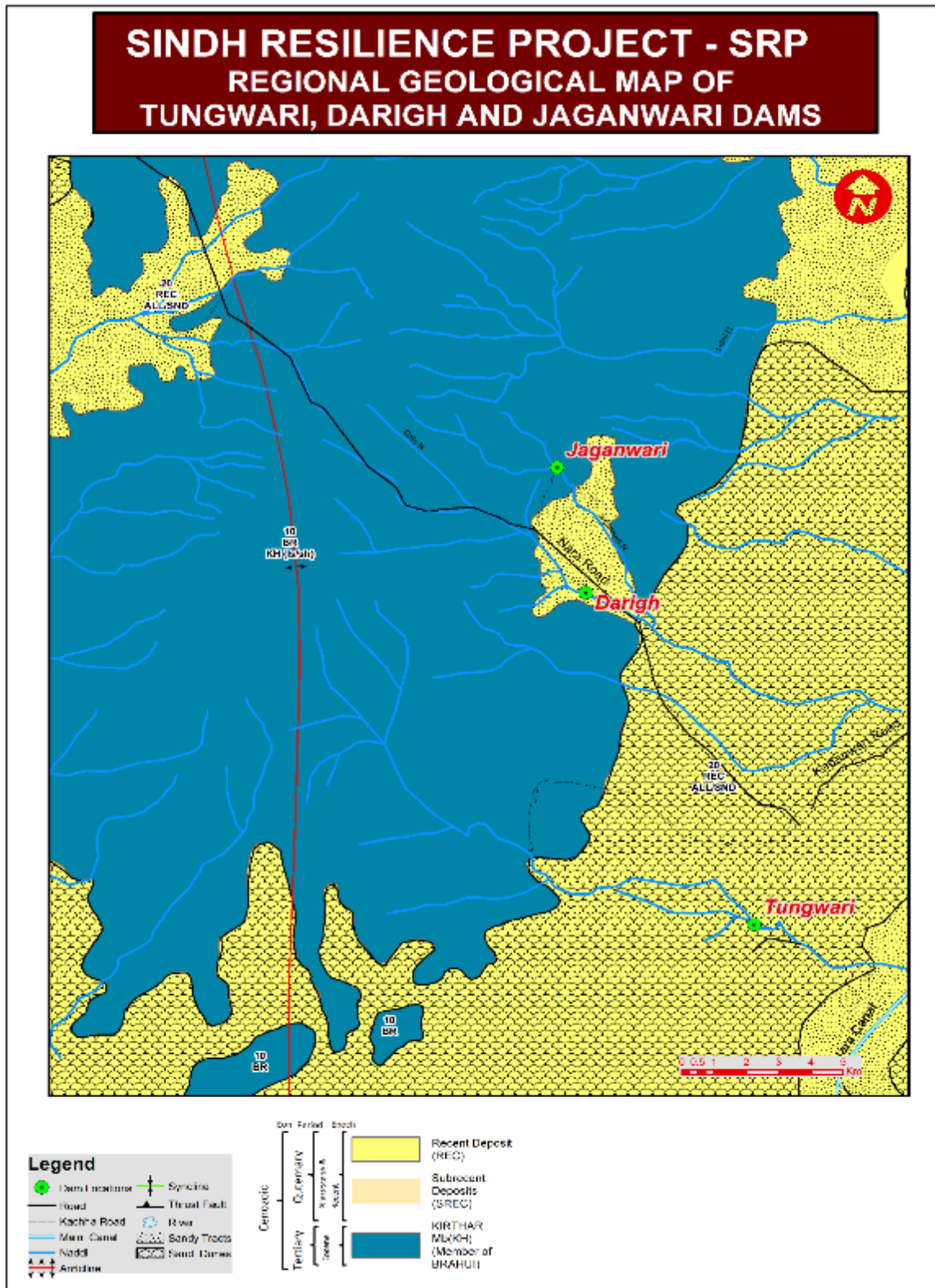


Figure 16: Regional Geological Map of Nagarparkar

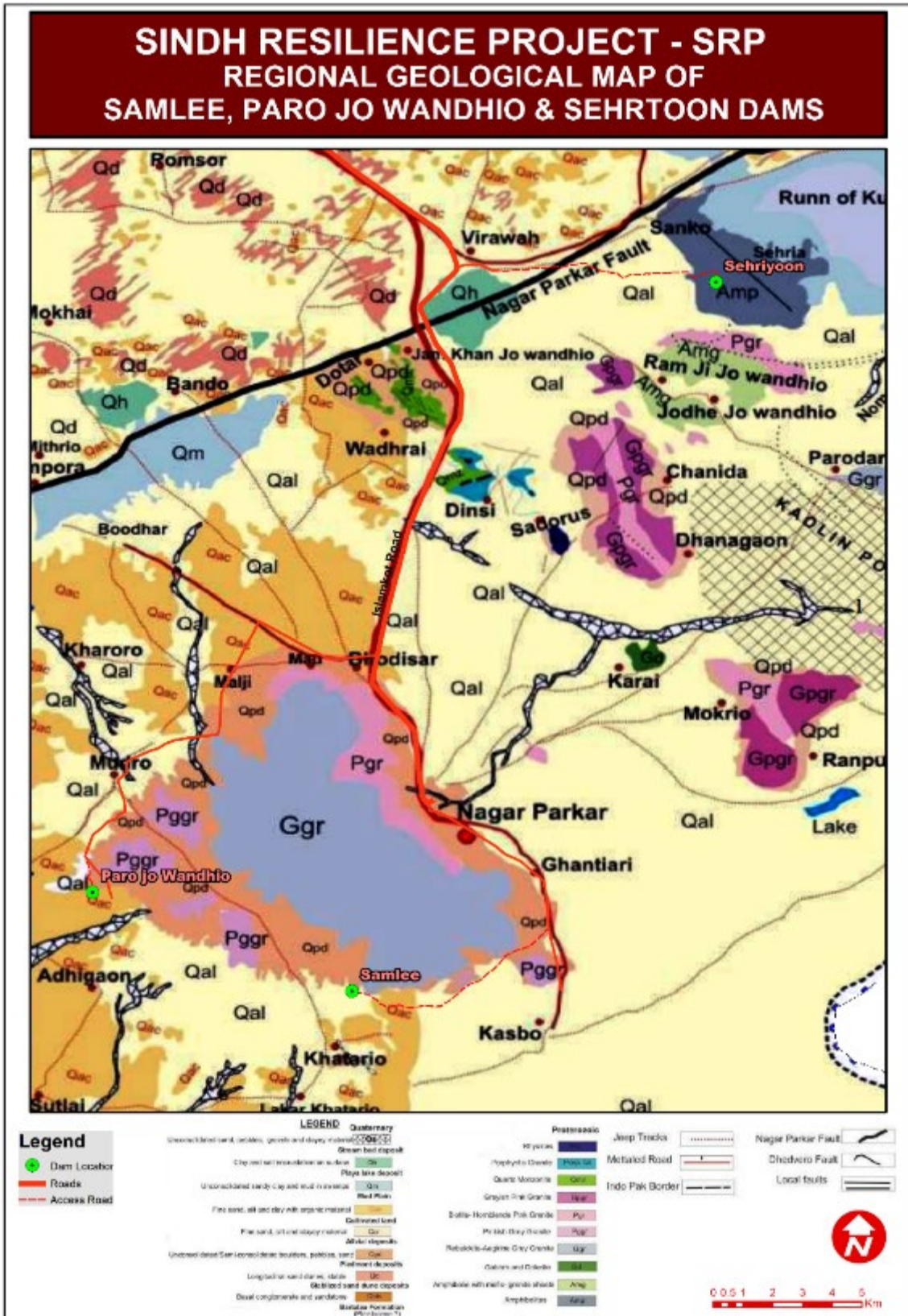


Figure 17: Regional Geological Map of Nara region (Khairpur)



iii) Seismicity

The map shown as **Figure 24** indicates that most of the SRP sub-projects area is falling in Zone 2A and Zone 2B, with peak ground acceleration (PGA) varying from 0.08g to 0.16g and 0.16 to 0.24g, respectively (Pakistan Building Code of Pakistan, 2007). While no any site is falling in Zone 4 which is called the High Damage Risk Zone and covers areas liable to MSK VIII. All dam site structures have been designed with the consideration of building codes of Pakistan.

PISSC team leader has vast experience of 30 years for dams designing at the National and International level. Structure Engineer having the vast experience of dynamic designing for dams is also on board.

Moreover, all structure designs will be reviewed by the World Bank dam expert. Details of seismic data of dam sites are given in Table 12 and Figure 18 below:

Table 12: Seismic Data of Dam Site

S.Nr.	Dam	Zone	Magnitude
1	Samlee	2 B	0.16g to 0.24g
2	Sehryoon	2 B	0.16g to 0.24g
3	Paro Jo Wandhio	2 B	0.16g to 0.24g
4	Jaganwari Nai	2 A	0.08g to 0.16g
5	Darigh Nai	2 A	0.08g to 0.16g
6	Tungwari Nai	2 A	0.08g to 0.16g

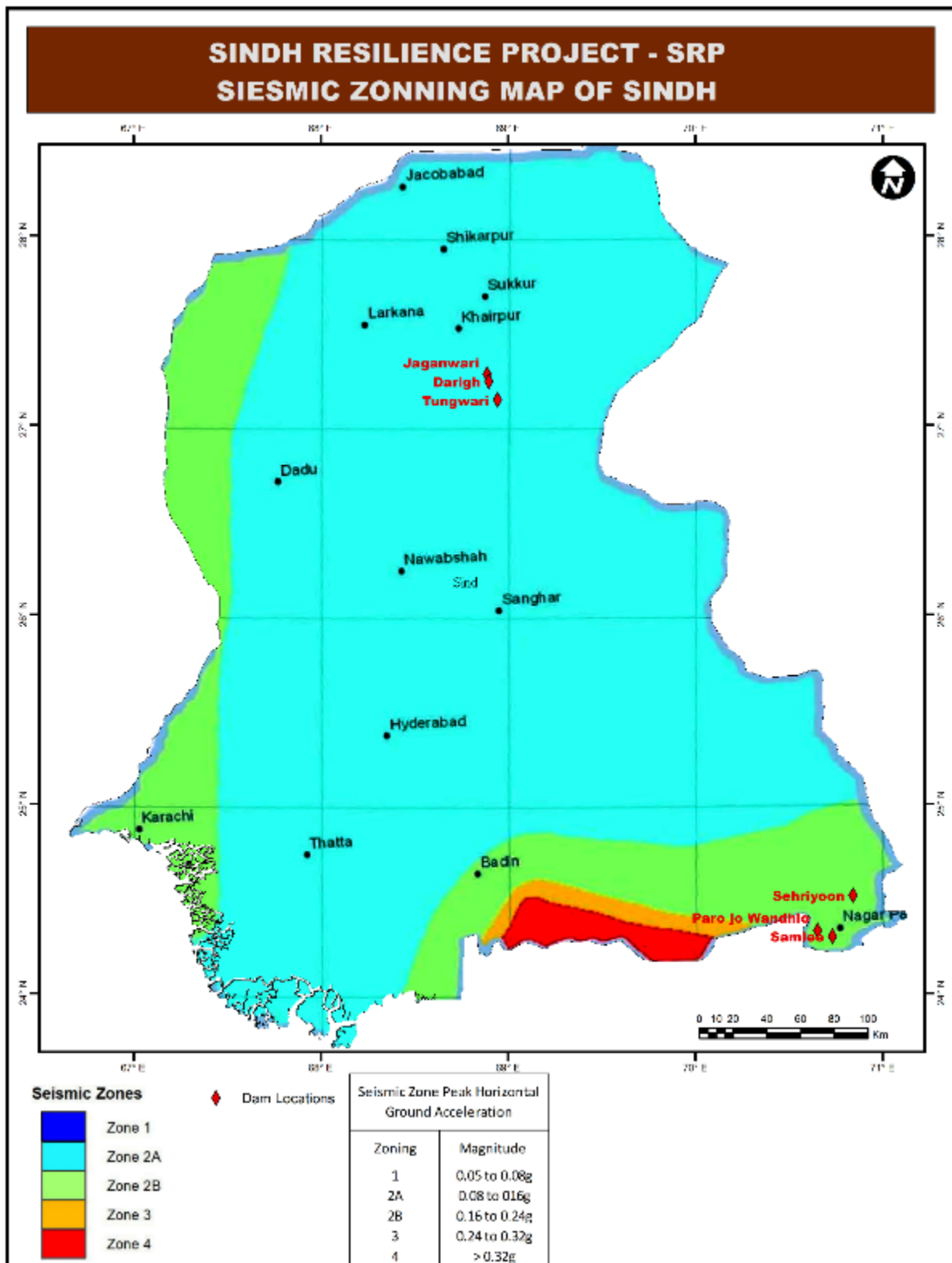


Figure 18: Seismic Zones of the Project Area⁷

⁷ (Source: Retrieved from <http://db.world-housing.net/building/176> on 11th Nov-2015)



i) Soil Morphology

In the Project area, the undulating flat plain is covered with variable soils mainly derived by erosion and residual weathering of the granites, granite gneisses, and amphibolites. Besides, the soil samples were collected from sub-project areas and have been analysed by Pakistan Council for Research in Water Resources (PCRWR) Karachi, considering sub-parameters such as Soil texture; pH; EC; Phosphorous; Potassium; Soluble and Exch Na; Soluble Ca+Mg; and Sodium Adsorption Ratio and are attached in the Annex-2.

5.3 Climate and Rainfall

The climate of Sindh is arid and hot. According to the classification made by UNESCO, the region has been divided into three zones: Coastal- South of Thatta; Southern- from Thatta through Hyderabad to Nawabshah; and Northern-from Nawabshah to Jacobabad. In an average year, sub-project sites receive a maximum rainfall of 135-230 mm (**Figure-19**).

The climatological conditions of dam sites are represented by the following meteorological station (Table 13).

Table 13: Nearest Meteorological Stations

Name of Dams	Meteorological Station
Jaganwari Nai, Darigh and Tungwari Nai	Rohri
Samlee, Sehriyoon and Paro jo Wandhio Dams	Nagarparkar

The mean monthly temperatures, rainfall and evaporation at these stations are shown in Figures 20-25. The mean monthly maximum and minimum limits of climatological data are given in Table 14.

Table 14: Climatological Data of Sub-project Areas

Meteorological Stations	Rainfall (inch)		Temperature (°C)		Evaporation (inch)	
	Min.	Max.	Min.	Max.	Min.	Max.
Rohri	0.01	1.81	1.72	48.26	1.24	13.46
Nagarparkar	0.04	5.63	17.80	34.00	2.48	11.83

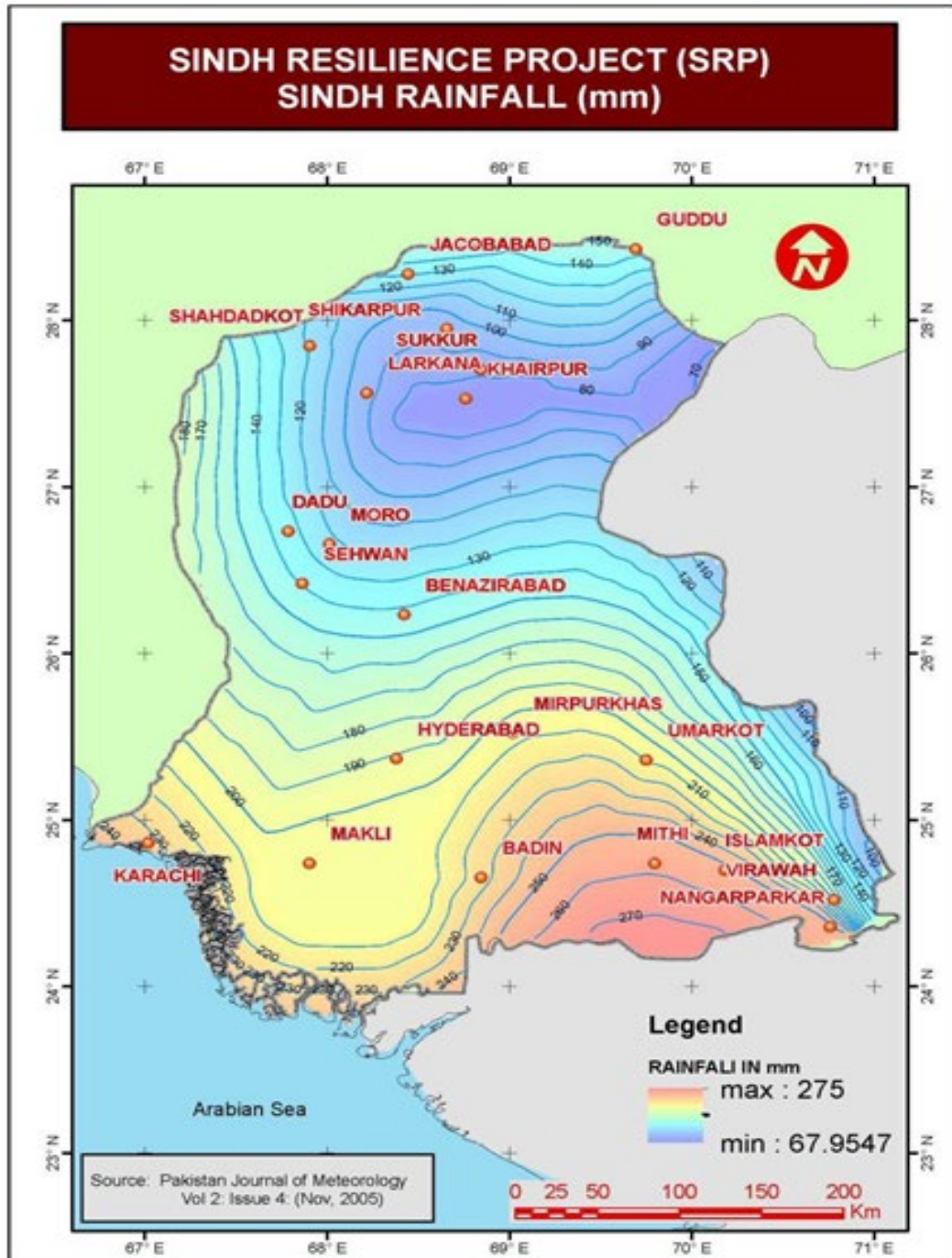




Figure 19: Annual Rainfall in Project Area

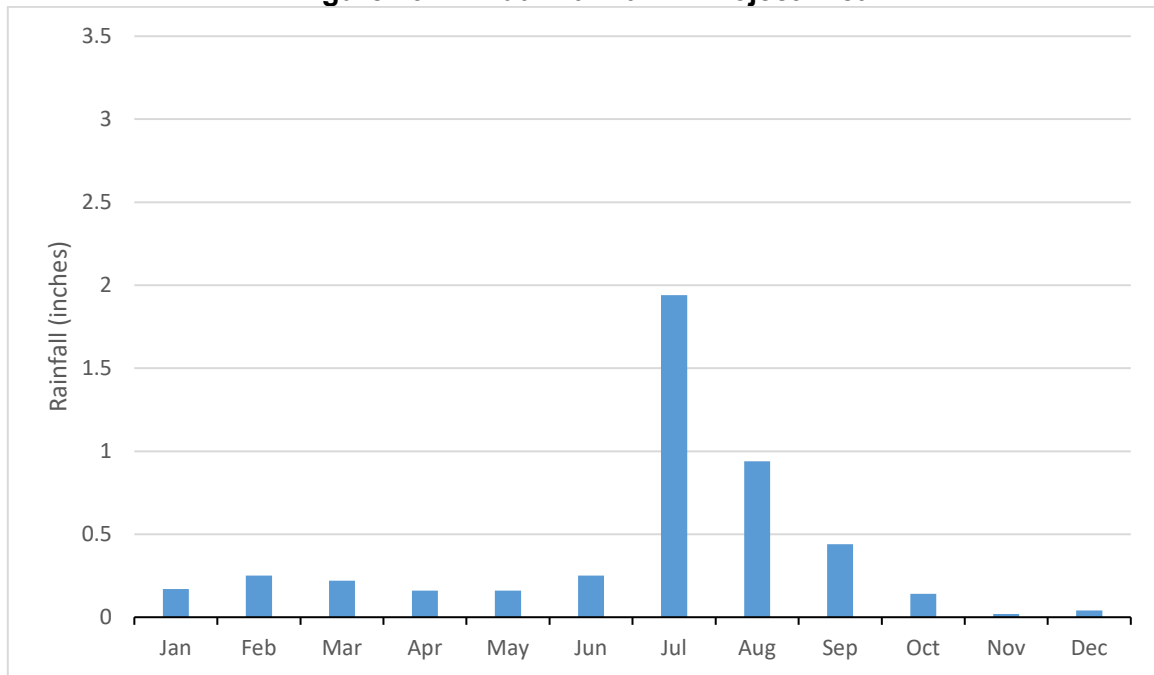


Figure 20: Monthly Average Rainfall at Rohri.

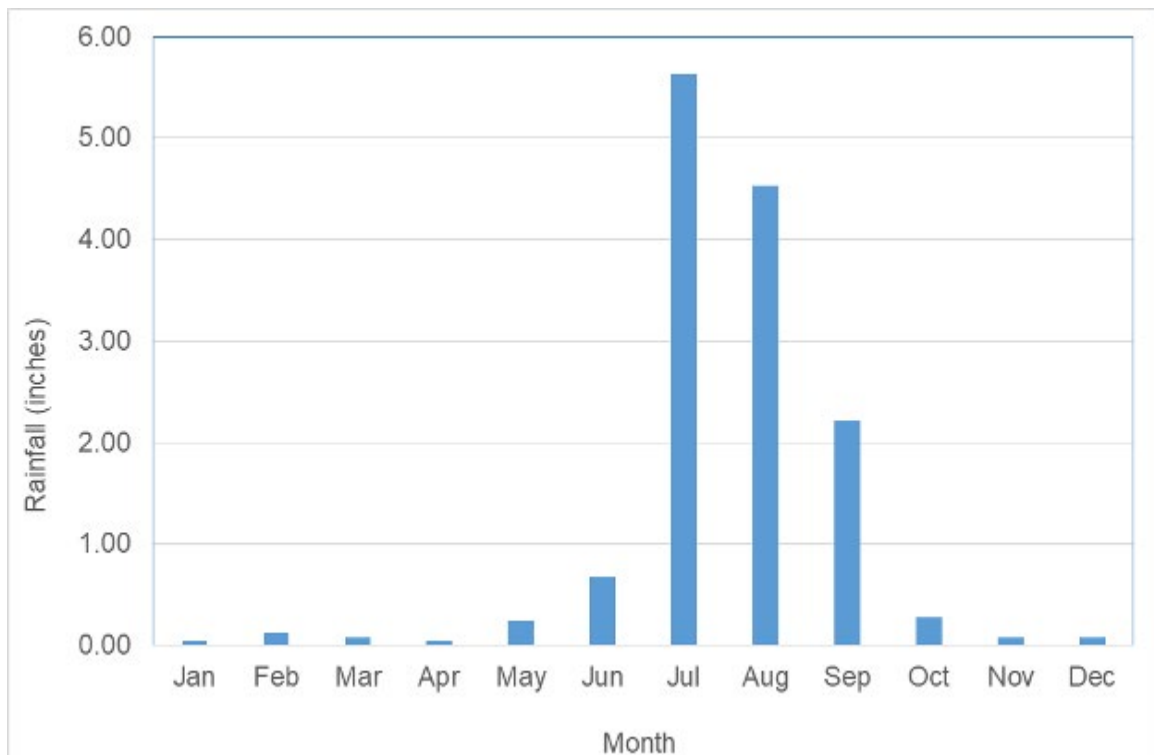


Figure 21: Monthly Average Rainfall at Nagarparkar

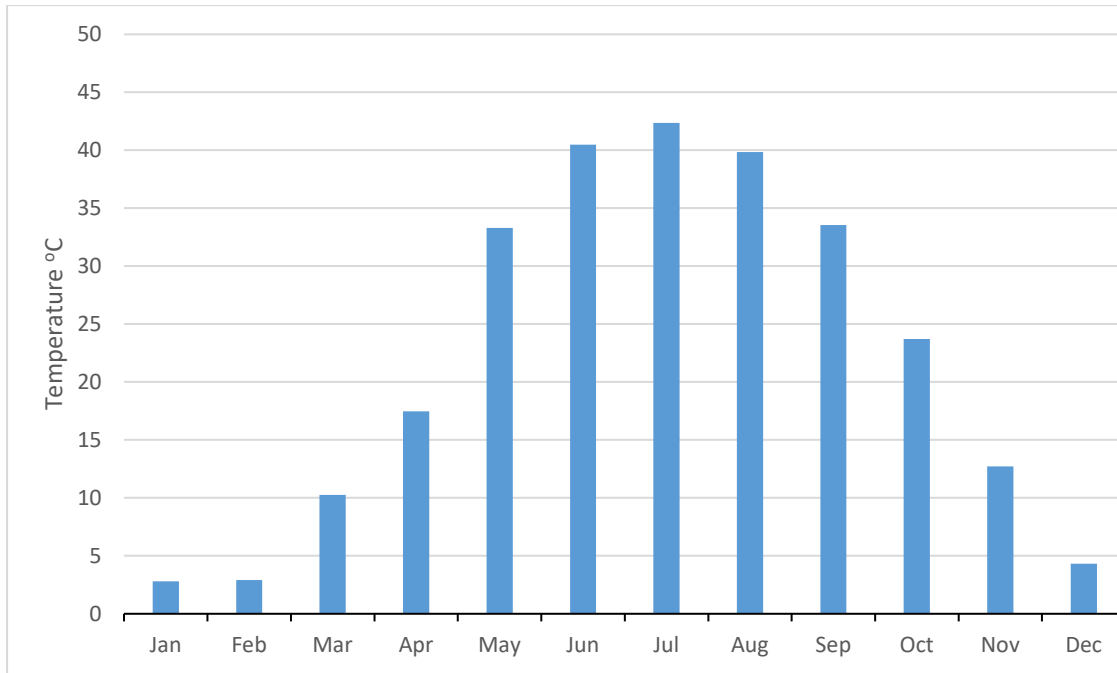


Figure 22: Monthly Average Temperature at Rohri

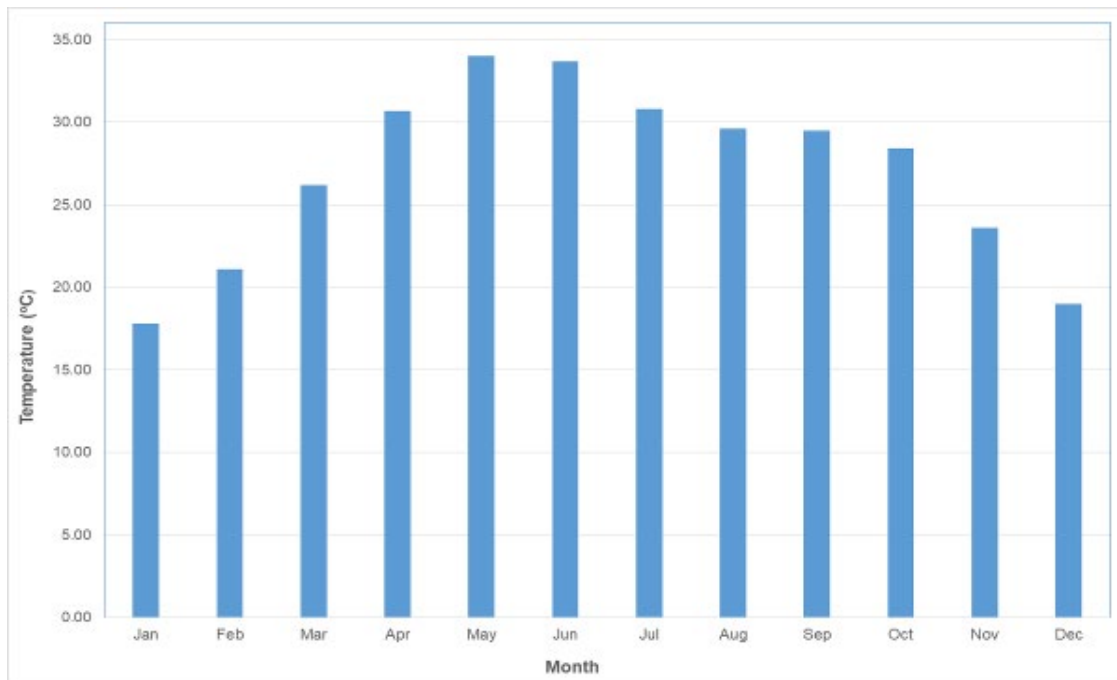




Figure 23: Monthly Average Temperature at Nagarparkar

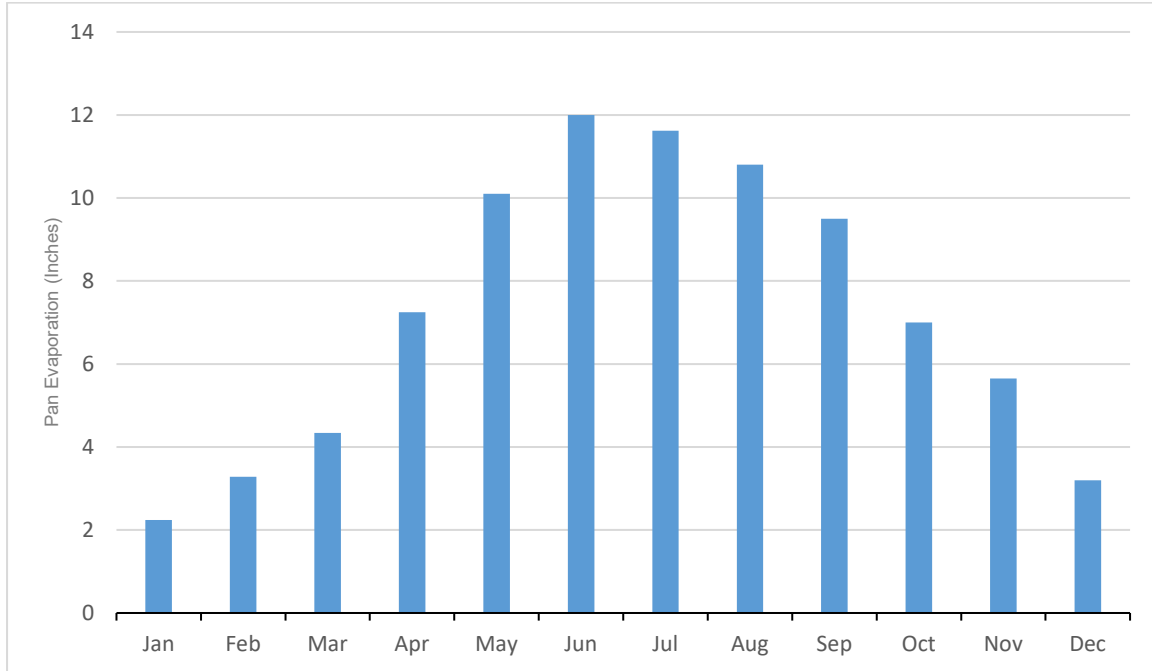


Figure 24: Monthly Average Evaporation at Rohri

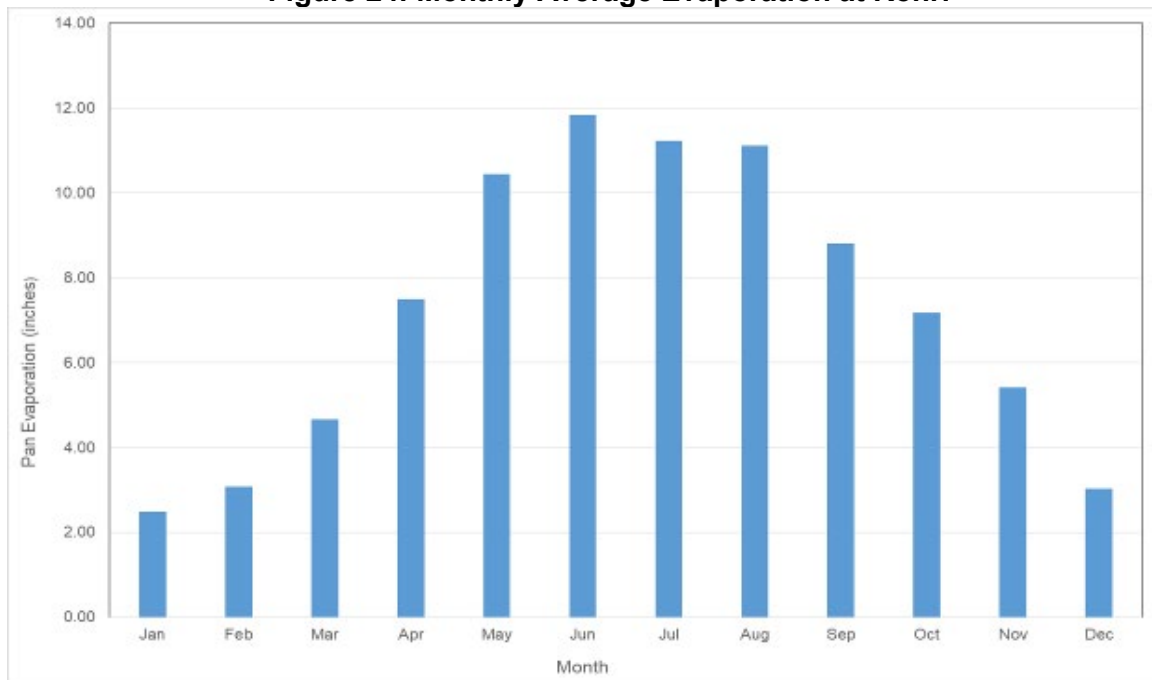


Figure 25: Monthly Average Evaporation at Nagarparkar



5.4 Water Resources and Quality

I) Surface Hydrology

The Indus River is the major source of surface water in the province. There are canals drawn from the rivers and several wetlands also exist in the province. Major important wetlands of the province are Keenjhar, Manchhar, and Haleji Lakes. However, Wetlands nearest to the sub-project area is Runn of Kutch. The details are provided in Table 15 below.

Table 15: Nearest Wetlands in Sub-Project Area

Name of Wetland / Lakes	District	Province	Away from the Project Area (kms)
Runn of Kutch	Tharparkar	Sindh	10 km away from Samlee Dam 02 Km away from Sehriyoon Dam 08 Km away from Paro Jo Wandhio

Sindh is one of the primary beneficiaries of the Indus Basin Irrigation System (IBIS). It has three major barrages on the Indus River that divert approximately 48 MAF of water annually to the 14 main canal commands in Sindh. These canal systems have an aggregate length of 13,325 miles, which serve a gross command area of 14.391 million acres. There are about 42,000 watercourses, which have an aggregate length of about 75,000 miles.

Characteristics of Streams / Nais/Nalas in Nagarparkar

Nagarparkar area has Small Nala/Nadi and rivers originate from Karoonjhar hills and drain towards the Run-of-Kutch. None of the rivers is perennial and as such, there is no base flow. Only flood flow keeps on flowing for a few hours to a couple of days after each sizeable rainfall event. Nagarparkar is situated in the extreme south-east corner of the Sindh Province extending in the Runn of Kutch. It is spread over an area of about 1,560 sq. km. In the Nagarparkar area, there exist the Karoonjhar hills, which are surrounded by plains. Several streams/nais are emerging from these hills where recharge and storage dams can be constructed. The average annual rainfall in the Nagarparkar area is 337 mm (13.25 inch). Due to rocky and granite formation of Karoonjhar hills, the runoff generally goes into Runn of Kutch. Some portion of this runoff goes to the groundwater recharge before reaching the Runn of Kutch. Similarly, some of the rainwater is stored in the open ponds in nullah beds, which is the major source of water for domestic use throughout the year. The rainwater can be harvested by the construction of recharge dams.

Characteristics of Streams / Nais/Nalas in Nara Region



There are hundreds of lakes low lying lakes in the region of Khairpur and Sanghar districts which are used to be filled up through the flood scapes of the Nara canal during high floods; but now most of them are dry as no extra water is available from the canal even during the high flood season. The rainfall is scanty and varies from region to region: The northern portion of Nara is extreme arid having an average rainfall of 150 mm.

II) Groundwater

One of the impeding factors for the irrigated agriculture in Sindh is the brackish groundwater. More than 80% of the irrigated land in Sindh is underlain with brackish water unfit for agriculture. The shortage of irrigation water coupled with drought conditions in Sindh has increased the importance of groundwater exploitation wherever freshwater is available.

Groundwater sources in sub-project areas of Nagarparkar and Qubba Qadir Bux area are from the dug wells and tube wells, whose depth ranges from 120 to 400 ft. The results of groundwater are summarized in **Table-16** and details are attached in Annex-2. These results reveal that all the parameters are within permissible limits of SEQs and WHO standards except Nitrite-N, while the microbiological parameters are exceeding the limits.

Above mentioned samples were obtained from groundwater of sub-project area, parameters mentioned above-exceeding limits is due to natural soil strata composition. Apparently, no other source of pollution has been observed during the survey.

The rainwater at dam site area will remain for few days and then percolate into underground aquifers, so there are fewer chances for water contamination, After construction of the recharge dams, the aquifer of the sub-project areas will increase and it is expected that current level of pollutants will decrease and better quality of groundwater can be extracted.

Groundwater is found mostly in a strip parallel to the left bank of Indus River and some pockets in other areas. Map is showing the Ground Water of namely Figure-26.

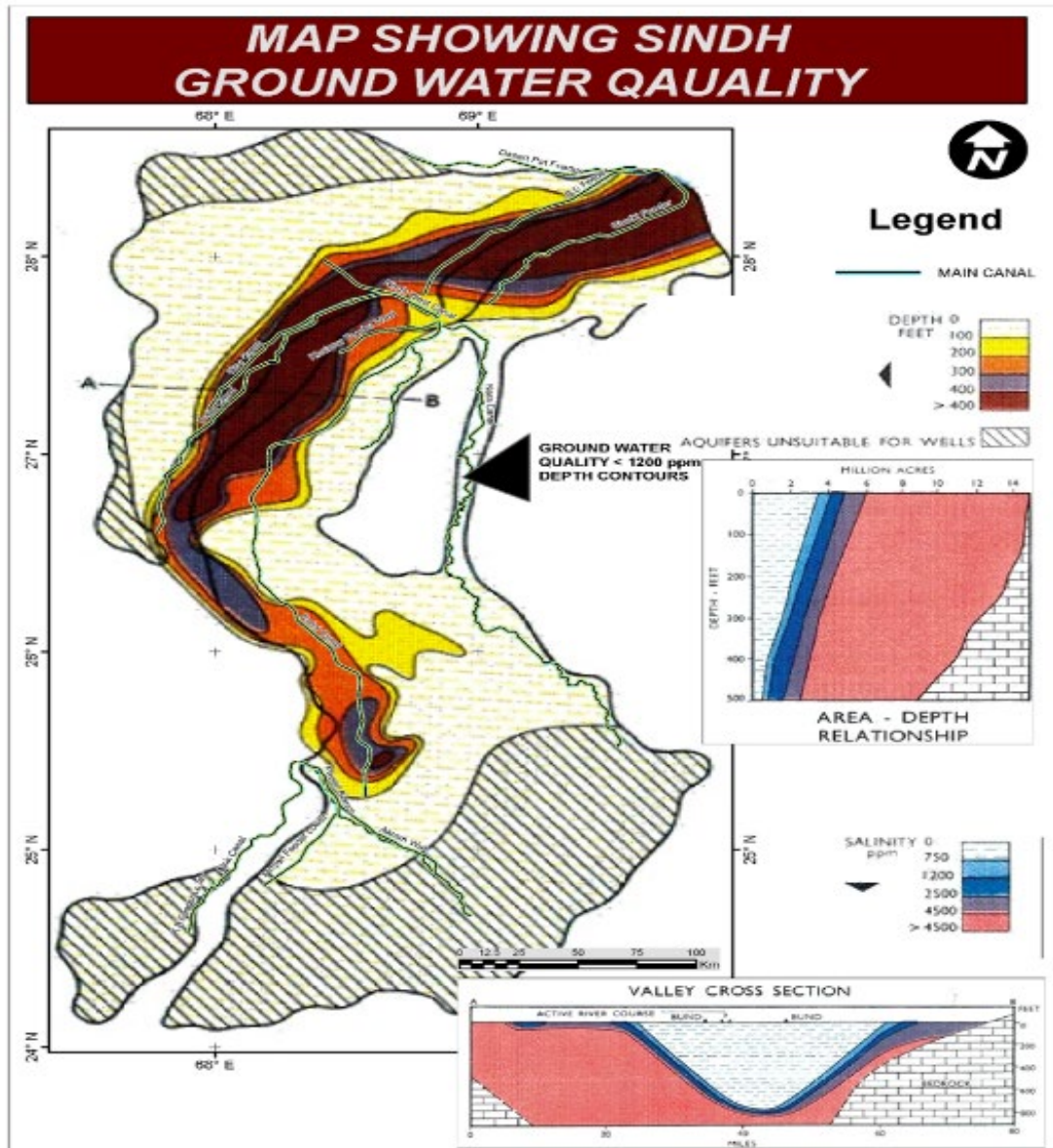


Figure 26: Map Showing Groundwater Quality⁸

⁸ Source: (Groundwater in Hyderabad and Khairpur Divisions by M. H. Panhwar)



III) Surface and Groundwater Analysis

During the Baseline survey, groundwater samples of reported sub-projects were collected for water quality evaluation. The samples were tested for pH, EC, TDS, TSS, Carbonate, Calcium, and Arsenic status from Pakistan Council of research in water resources PCRWR on 13-11-2019, 20-11-2019. These results are given in Table-16. Detailed ground water quality lab reports are attached as Annex 2.

Table 16: Groundwater Quality Analysis for Dams

Sr. #	Parameter	Unit	Groundwater Quality Results of Sub-projects (Dams)						Permissible Limits
			Samlee	Sehryoon	Paro Jo Wandhio	Jaganwari	Darigh	Tungwari	
1	Odor	-	Un-objectionable						Un-objectionable
2	pH	-	6.76	N/A	6.87	N/A	7.67	N/A	6.5-8.5 (WHO)
3	Color	-	Colorless						Colorless
5	Total Dissolved Solids (TDS)	mg/l	379	N/A	433	N/A	257	N/A	1000 (WHO)
6	Potassium	mg/l	1.6	N/A	2.9	N/A	4.5	N/A	12 (EC)
7	Nitrate(NO ₃)		5.43	N/A	2.74	N/A	2.41	N/A	10 (WHO)
8	Nitrite(NO ₂)	mg/l	0.012	N/A	0.588	N/A	0.009	N/A	0.02 (PSQCA)
9	Taste	-	Un-objectionable						Un-objectionable
10	Carbonate	mg/l	Nil	N/A	Nil	N/A	Nil	N/A	NGVS
11	Bicarbonate	mg/l	220	N/A	250	N/A	140	N/A	NGVS
12	Phosphate (PO ₄)	-	0.19	N/A	0.14	N/A	0.30	N/A	NGVS
13	Calcium	mg/l	40	N/A	32	N/A	40	N/A	75 (PSI)
14	Arsenic (ppb)	-	0	N/A	0	N/A	5	N/A	50 (PSQCA)
15	Chemical Oxygen Demand (COD)	mg/l	11	N/A	31	N/A	17	N/A	150 NEQS
16	Total Suspended Solids (TSS)	mg/l	22	N/A	27	N/A	34	N/A	200 NEQS
17	E.coli	cfu	0	N/A	0	N/A	0	N/A	cfu/100 NEQS
18	Total Coliforms/ 100mL	ml	19	N/A	13	N/A	86	N/A	0/100 (MPN/100ml) NEQS
19	Fecal Coliforms/ 100mL	ml	0	N/A	0	N/A	0	N/A	0/100 ml NEQS

NGVS= Not Given Values set, PSQCA= Pakistan Standards & Quality Control Authority; WHO= World Health Organization, N/A = Not available

5.4.1 Ambient Air Quality

The sub-project areas of Qubba Qadir Bux in Khairpur district and Nagarparkar in Tharparkar district are located in a sparsely populated areas with no industrial or commercial activity. Vehicular traffic on the dirt roads causes some dust emissions whose effect is fairly localized. The main pollutants emitted by vehicle exhaust pipes are particulate matter, carbon monoxide, sulphur dioxide, and nitrogen oxides. These emissions generally affect the air quality in the vicinity of the roads. However, traffic on the roads in the project area is low compared to the national highways or other major roads. The ambient air quality tests were carried out in the month of Nov 2019 from 13-11-2019 to 15-11-2019 by SRP through HSE Consultants and Laboratories Karachi for Tungwari, Darigh and Jaganwari dam sites, whereas for other small dam sites like Samlee, Sehryoon, and Paro jo Wandhio secondary data of near by ongoing sites of SRP Project (Sankar, Sabusan) has been used. These ongoing sites are 2 to 3 Kms in radius away from new proposed dam sites. Table-17 Results reveals that all parameters are within permissible limits of SEQs ambient air quality. Detailed ambient air quality laboratory reports are attached as Annex 2.

Table 17: Ambient Air Quality Results

S. No	Parameters/ Analysis	SEQS A.A Limits	WHO Limits of A.A	Results					
				Samlee	Sehryoon	Paro Jo Wandhio	Jaganwari Nai	Darigh Nai	Tungwari Nai
1	Sulphur Dioxide (SO ₂)	120.0 µg/m ³	125.0 µg/m ³	37.6	36.5	37.6	BDL	BDL	BDL
2	Oxides of Nitrogen (NO ₂)	80.0 µg/m ³	200 mg/Nm ³	25.9	26.7	25.9	ND	ND	ND
3	Carbon Monoxide (CO)	10.0 mg/m ³	10.0 µg/Nm ³ 8 hrs	1.4	1.2	1.4	ND	ND	ND
4	Particulate Matter (PM ₁₀)	150.0 µg/m ³	150.0 µg/m ³	167.3	156.9	167.3	98.8	76.2	122.4

5.4.2 Noise

Proposed sub-projects are in sparsely populated areas where traffic is very less and no existence of other noise sources are in the reported areas. During the baseline survey ambient noise levels were recorded in the sub-project areas and found within permissible limits of SEQs and WHO standards. Details are present in Table-18.



Table 18 : Ambient Noise Levels in Sub-project Areas

S.No	Sub-Project	Location		Noise Levels 80 dBA (SEQS)	
		Northing	Easting	Min	Max
1	Samlee	N 24 30 01.9	E 70° 73" 19.4	41.0	47.0
2	Sehriyoon	N 24 31 06.9	E 70° 51" 19.2	41.0	48.0
3	Paro Jo Wandhio	N 24° 32" 46.10	E 70 66" 14.9	41.0	47.0
4	Jaganwari Nai	27°15'58.6"N	E 68°53' 21.9"	47	72.1
5	Darigh Nai	27°13'57.7"N	E 68°53' 34.1"	45	70.1
6	Tungwari Nai	27°08'49.0"N	E 68°52' 50.8"	44	74.6

5.4.3 Soil

The Soil texture in sub-project area are generally sandy loam, while soil cover of the Nagarparkar region sub-project areas is very thin due to severe wind erosion and soil erosion in the area. Soil samples of sub-project area were collected during the base line survey and has been analysed from PCRWR laboratories. The test results reveals that all the parameters are within the permissible limits of . The details are given in Table 19.

Table 19: Soil Analysis of Sub-project Area

S.No	Parameter	Units	Samlee	Sehriyoon	Paro Jo Wandhio	Jaganwari	Darigh	Tungwari
1	EC	(ds/m)	1.3	3.45	2.1	2.2	2.0	1.89
2	pH	-	8.2	7.6	8.0	7.4	6.8	7.1
3	Bicarbonate (HCO ₃)	Meq/l	4.5	7	6.5	6.3	5.7	3.87
4	Chloride	Meq/l	6.08	15	11.05	8.01	6.3	7.3
5	Sulfate	Meq/l	3	12.5	3.40	3.12	5.98	4.4
6	Calcium + Magnesium	Meq/l	5.5	15.5	9.00	8.5	7.54	6.7
7	Sodium	Meq/l	6.9	12.78	10.56	10.21	9.76	8.9
8	SAR	-	4.16	4.6	4.98	4.78	3.89	3.1
9	ESP	-	4.653	5.23	5.73	5.4	5.7	4.7
Soil Texture								
1	Sand %		75.8	73.8	69.8	66.7	71.2	64.9
2	Silt%		23.96	17.96	15.96	15.9	11.9	16.9



S.No	Parameter	Units	Samlee	Sehriyoon	Paro Jo Wandhio	Jaganwari	Darigh	Tungwari
3	Clay%		0.24	8.24	14.24	17.4	17.0	18.2
4	Texture Class		Loamy Sand	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam

5.5 Biological Environment

The SRP project area has a diverse habitat, which supports a large variety of animal from riverine forest to the desert ecosystem of Nagarparkar and Qubba Qadir Bux and Chatan Shah Hills. Common animal habitats are riverine plains, mountains, desert and deltaic region. These habitats support the peculiar species according to their requirements. The following broad categories have been identified for this report focusing on the sub-project areas.

5.5.1 Flora and Fauna of the Sub-projects Area

Fauna of Sub-projects of Qubba Qadir Bux and Chhatan Shah Hills (Nara Region)

During the field study of Jaganwari, Darigh and Tungwari dam area, Five (05) large mammal species were observed in which Asiatic Jackal is common and can be easily seen, while wild Cat specie rarely found in the field. Small mammal species from different micro habitats were also recorded, among those Khul's Bat and Persian Jird were found most common at all dam sites. Reptile and amphibians were recorded from different sites, among that Indian monitor Lizard, Indian Fringe Toad Sand Lizard and yellow Bellied Gecko were the common and can be seen easily. Some bird species mostly resident birds were observed in the study area. Common babbler has become very rare from the region, while House crow, Jungle Babbler, Common Myna, House Sparrow, Common Crow, Indian Roller and Collared dove population is quite satisfactory in Indus eco-region. Chestnut-bellied sand grouse, Red-vented bulbul and Red turtle dove population is declining in the region. Detail of mammals, Reptiles and bird found in Qubba Qadir Bux area is given in Table 20.

Table 20: Fauna in Qubba Qadir Bux Sub-project Areas (Nara Region)

S/N	English Name	Scientific Name	IUCN Status
Large Mammals			
1	Grey Mongoose	<i>Herpestes auropunctatus</i>	LC
2	Small Mongoose	<i>Herpestes juvinicus</i>	LC
3	Asiatic Jackal	<i>Canis aureus</i>	LC
4	Wild Cat	<i>Felis silvestris</i>	LC
5	Desert Fox	<i>Vulpus cena</i>	LC
Small Mammals			



S/N	English Name	Scientific Name	IUCN Status
1.	Palm Squirrel	Funambulus pennantii	LC
2.	Crested Porcupine	Hystrix indica	LC
3.	Common Bat	Pipistrellus kuhlii	LC
4.	Indian Field Mouse	Mus booduga	LC
5.	Indian Hedgehog	Paraechinus micropus	LC
6.	Persian Jird	Meriones persicus	LC
7.	Indian Gerbil	Tatera indica	LC
8.	House Shrew	Suncus murinus	LC
9	Khul's Bat		LC
Reptiles & Amphibians			
1	Skittering Frog	Euphlyctis cyanophlyctis	LC
2	Yellow-Bellied House Gecko	Hemidactylus flaviviridis	LC
3	Keeled Back Gacko	Hemidactylus brookii	LC
4	Bengal Monitor	Varanus bengalensis	LC
5	Ground Agama	Trapelus agilis	LC
6	Spotted Gecko	Hemidactylus maculatus	LC
7	Indian Fringe-Fingered Lizard	Acanthodactylus cantoris	LC
Birds			
1	Blue Rock Pigeon	Columba Livia Domestica	LC
2	White cheeked bulbul	Pycnonotus leucotis	LC
3	Collared Dove	Streptopelia decaocto	LC
4	Common Babbler	Turdoides caudate	LC
5	House Crow	Corvus splendens)	LC
6	Common/Barn Swallow	(Hirundo rustica	LC
7	Crested Lark	Galerida Cristata)	LC
8	Indian House Crow	Corvus Splendens	LC
9	Indian House Sparrow	Passer Domesticus	LC
10	Indian Roller	Coracias Benghalensis	LC
11	Grey Shrike	Colluricincla Harmonica	LC

Flora in the Sub-projects of Qubba Qadir Bux and Chhatan Shah Hills

Habitat of the study area consisted deciduous xerophytes trees and shrubs form open communities related to soil texture, depth and physiographic factors. The principal vegetation of the site comprises of Acacia nilotica, Prosopis cineraria, Saccharum griffithii, Zizyphus Nummularia, Tamarix Indica, Stocksiana, and Capparis Decidua. Details of the flora are provided in Table-21 below and photo gallery of fauna and their habitats in Figure-26.



Table 21: Flora in Qubba Qaddir Bux (Nara Regio)

S.#	Family	Plant species	Type
1.	Capparidaceae	<i>Capparis decidua</i>	Large Shrub
2.	Chenopodiaceae	<i>Salsola imbricata</i>	Shrub
3.	Chenopodiaceae	<i>Suaeda fruticosa</i>	Shrub
4.	Euphorbiaceae	<i>Euphorbia</i>	Herb
5.	Fabaceae	<i>Alhagi maurorum</i>	Subshrub
6.	Mimosaceae	<i>Acacia nilotica</i>	Tree
7.	Mimosaceae	<i>Prosopis cineraria</i>	Tree
8.	Mimosaceae	<i>Prosopis juliflora</i>	Large Shrub
9.	Poaceae	<i>Saccharum benghalense</i>	Large Grass
10.	Poaceae	<i>Saccharum griffithii</i>	Large Grass
11.	Poaceae	<i>Saccharum spontaneum</i>	Large Grass
12.	Poaceae	<i>Sporobolus sp. nov.</i>	Grass
13.	Poaceae	<i>Tetrapogon tenellus</i>	Grass
14.	Poaceae	<i>Tragus roxburgii</i>	Grass
15.	Rhamnaceae	<i>Ziziphus nummularia</i>	Shrub
16.	Salicaceae	<i>Populus euphratica</i>	Tree
17.	Salvadoraceae	<i>Salvadora oleoides</i>	Tree
18.	Tamaricaceae	<i>Tamarix alii</i>	Shrub
19.	Tamaricaceae	<i>Tamarix indica</i>	Shrub
20.	Tamaricaceae	<i>Tamarix sp</i>	Shrub



HABITAT OF THE STUDY AREA



Habitats in Jaganwari Dam Area



Habitat of Jaganwari Dam area



House Sparrow In Common In All Sites



Green Beater Sub-Project Area of Tungwari



Observed In Jaganwari Dam Area



Dove Is common in Study Area



Brilliant Agama Found In Project Area

House Gecko Found at All Dam Sites

Figure 27: Picture Gallery of Nara Study Area

Fauna of Sub-projects Nagarparkar Area

During the field study of Samlee, Sehryoon and Paro o Wandhio dams four (4) large mammal species were observed including Desert fox and Grey Mongoose, Indian wild boar and Asiatic Jackal recorded from different locations near the dame area. All mammalian species area common and listed as Least Concern (LC) in IUCN red list. 4 small mammals recorded from micro habitats of same site are common and Least concern in IUCN list, during field survey in Sehryoon dam site 7 reptiles and one frog species identified, among them Indian Star tortoise is Vulnerable (VU) and rare species found in the area, Star Tortoise is also protected by Sindh Wildlife department. 26 bird species were recorded from the dam site and its surrounding area, among them Indian Peafowl is one of the beautiful and important bird can be observed frequently near the human population, it is susceptible to infectious diseases and die by viral attack. Indian Peafowl is protected by protected by Sindh Wildlife Act 1972 and Indian wildlife law. Its status is Least Concern (LC) by IUCN red list 2018. Indian Peafowl is one of the beautiful and important bird can be observed frequently near the human population, it has susceptible to infectious diseases and die by viral attack. Detail of Fauna of Nagarparkar Sub Project Areas is given in below Table-22.

Table 22: Fauna in Nangarparkar Study Area

S/N	English Name	Scientific Name	Conservation by IUCN
Large mammals			
1	Grey Mongoose	Herpestes javanicus	LC
2	Asiatic Jackal	Canis aureus)	LC
3	Indian wild boar	Sus scrofa	LC
4	Desert fox	Vulpes bangalinces	LC
Small Mammals			
1	Palm squirrel	Funambulus pennantii	LC
2	Kuhls' bat	Pipistrellus kuhlii	LC
3	Hedgehog	Parachinus micropus	LC



S/N	English Name	Scientific Name	Conservation by IUCN
4	Indian desert Jird	Meriones hurrianae	LC
Reptiles and Amphibian			
1	Skittering frog	Euphlyctis cyanophlyctis	LC
2	Yellow-bellied house gecko	Hemidactylus flaviviridis	LC
3	Keeled Back Gacko	Hemidactylus brookii,	LC
4	Bengal monitor	Varanus bengalensis	LC
5	Indian fringe-fingered lizard	(Acanthodactylus cantoris	LC
6	Indian Star tortoise (reported ZSD)	Geochelone elegans	VU
7	Keeled Back Gacko	Hemidactylus brookii	LC
Birds			
1	Indian Peafowl	Pavo cristatus	LC
2	Indian Koel	Eudynamys scolopaceus	LC
3	Ashy crowned finch-lark	Eremopterix griseus	LC
4	Bank Myna	Acridotheres ginginianus	LC
5	Grey Shrike	(Lanius excubitor	LC
6	Black Drongo	Dicrurus macrocercus	LC
7	Desert Lark	Ammomanes deserti	LC
8	Black winged Stilt	Himantopus himantopus	LC
9	Green Bee-eater	Merops orientalis)	LC
10	Blue-throat	Luscinia svecica	LC
11	Cattle Egret	Bubulcus ibis	LC
12	Collared Dove	Streptopelia decaocto	LC
13	Common Babbler	Turdoides caudate	LC
14	Common Crow Pheasant	Centropus sinensis	LC
15	Pied Kingfisher	Ceryle rudis	LC
16	Common Myna	cridotheres tristis	LC
17	Common/Barn Swallow	(Hirundo rustica	LC
18	Eastern Pied Wheatear	Oenanthe pleschanka	LC
19	Eurasian sparrow hawk	Accipiter nisus	LC
20	Hoopoe	Upupa epops	LC
21	Indian house crow	Corvus splendens	LC
22	Indian House Sparrow	Passer domesticus)	LC
23	Indian Pond Heron	Ardeola grayil	LC
24	Little Egret	Egretta garzetta	LC
25	Indian peacock	Pavo cristatus	LC
26	Black Redstart	Phoenicurus ochruros	LC
VU = Vulnerable, LC = Least Concern			

Flora of Nagarparkar Sub-project Area

The common plants of Nagarparkar sub-project area are (Euphorbia Caducifolia), Phog (Calligonum polygonoides), and (Calotropis Gigantea). In irrigated tracts, Babul (or Babur), Acacica Nilotica), Talhi (Dalbergia Sissoo) Nim (Azadirachta Indica), Jar (Salvadora Oleoides), and Lai (Tamarix gallica) are found.



Sand dunes are represented by xerophytic plants because of their topographical features. They are all of deserted nature with the sandy soil makeup. The dominant and frequent species like Euphorbia Caducifolia, Calligonum Polygonoides, Aerva Javanica, Salvadora Oleoides, Indigofera Spp., Aristida Spp and Tribulus longipetalus were forming common vegetation on them. There is no previous report available on the vegetation of this area. Details of flora found in Nagarparkar Sub-projects areas are given in Table-23 and a photo gallery of fauna and their habitats are given in Figure 28.

Table 23: Flora of Nangarparkar Study Area

S.No	Local Name	Scientific Name	Plant type
1	Thuhar	Euphorbia caducifolia	Shrub
2	Phog	Calligonum polygonoides	Shrub
3	Ak	Calotropis	Shrub
4	Babur	Acacia nilotica),	Tree
5	Talhi	Dalbergia sissoo	Tree
6	Neem	Azadirachta indica	Tree
7	Jjar	Salvadora oleoides	Tree
8	Bare	Ziziphus nummularia	Tree
9	Devi	Prosopis juliflora	Tree
10	Kiri	Tamarix gallica	Tree
11	Khabar	Salvadora indica	Tree
12	Khip	Calligonum polygonoides	Shrub
12	Kapah Gul	Aerva javanica	Shrub
13	Gullabi Gul	Indigofera spp.	Shrub
14	Sanokano	Aristida spp.	Herb
15	Kandero	Alhagi maurorum	Herb
16	Dela	Capparis decidua	Shrub
17	Kano	Saccharum spontaneum	Grass
18	Drabh	Tetrapogon tenellus	Grass



Habitat of the Nagarparkar Area



Wild Habitat Of Site



Water Pond Near Dam Site



Indian Peafowl Near A Village



Blue Rock Pigeon Feeding In On Ground Near Sub-Project Area



Common Myna Found Near Sb-Project Area



Green Beeeater Recorded Near Sub-Project Area



Habitat of the Nagarparkar Area



House Crow Is Common In Nagarparker Area



House Sparrow Recorded Near Sub-Project Area



Tree Squirrel Observed Different Sites Near Sub-Project Area



Desert Jird Observed Near Sub-Project Area

Figure 28: Picture Gallery of Nagarparkar Study Area

5.5.2 Trees

Since the project area lies in the arid zone, there is general scarcity of water, vegetation is scarce and consists of stunted scrub and bushes. The main natural ground cover is provided by grasses which are nutritive and palatable fodder for the livestock.

There are many types of trees present around the proposed dam structures counted during field survey as shown in **Table-24**. A total of 115 mature and young trees including 15 trees are of Kandi (*Prosopis Cinereria*) varying from 10 to 15 years maturity and 30 young trees of 6 months to 1 year of age, 3 trees are of Kikar (*Acacia nilotica*) varying from 10-15 years of age (Mature) and 09 trees including young six months to 1 year of age. While, 29 trees of Bair (*Zizyphus nummularia*) 6 to 8 years maturity and 45 trees young varying from 2 to 3 years are found. 90 number of trees expected to be damaged/uprooted during construction phase. All species are common and wide spread in the vicinity of the subproject areas.



Table 24 : Trees Identified on the Sub-projects

S. No	Name of Dam	Name of Species		Mature (Girth more than 24")		Immature (Girth less than 24")	
		Common Name	Scientific Name	Existing	To be cut	Existing	To be cut
1	Samlee	Kandi	Prosopis Cinereria	0	0	3	3
2	Sehriyoon	Kandi	Prosopis Cinereria	0	0	2	2
		Sindhi Babur	Acacia nilotica	1	0	5	5
3	Paro Jo Wandhio	Kandi	Prosopis Cinereria	9	4	3	3
4	Jaganwari Nai	Bair	Zizyphus nummularia	9	7	11	11
5	Darigh Nai	Bair	Zizyphus nummularia	14	14	19	15
		Kandi	Prosopis Cinereria	2	2	7	3
6	Tungwari Nai	Kirir	Tamarix gallica	4	4		
		Kandi	Procopius Cineraria	2	2	3	3
		Bair	Zizyphus nummularia	6	5	15	7
Sub total				47	38	68	52
Total Number of Existing trees				116			
Total Number of cut down trees				90			

5.5.3 Characteristics of Runn of Kutch

Runn of Kutch lies in the Indo-Malayan ecoregion. It stretches for hundreds of square kilometers in the state of Gujarat in India, from the frontier with Pakistan's Sindh desert, southward to the little Runn and the Gulf of Kutch. It provides shelter to the last population of the endangered Asiatic wild ass (*Equus hemionus*) and supports one of the world's largest breeding colonies of the greater and lesser flamingos (*Phoenicopterus ruber* and *Phoenicopterus minor*).

Since the Mesozoic, the little and great Runns were expansion of the shallow Arabian Sea until geological uplift closed off the connection with the sea, creating a vast lake that was still navigable during the time of Alexander the Great (WII 1993). But over the centuries, silting has created a vast, saline mudflat. During the brief wet season, the mudflat becomes flooded. Then it becomes parched under the relentless, searing heat of the long dry season, the ecoregion has one of the highest annual evaporation rates in the region. Average summer temperatures hover around 44°C but can reach highs of 50°C, and the minimum winter temperatures approach or even drop below freezing.



6. SOCIO-ECONOMIC PROFILE OF THE SUB-PROJECT AREA

6.1 Methodology

This section describes the socio economic condition of the subproject area. The socio-economic survey and social impacts assessment was carried out during the months of October and November, 2019 under SRP preparatory study. The team used a Questionnaire and a checklist for Focus Group Discussions (FGDs) (Attached at Annex-3). In order to have comprehensive detailed information, consultation meetings were held with the stakeholders and general public. The main objectives of the consultations were to provide a platform to the stakeholders, to voice their concerns and suggestions to the project team and to develop a sense of collective ownership for the activities of sub project. The participants of the consultation meeting and Focus Group Discussion actively provided support in data collection and understanding the socio-economic fabric of the people living in the subproject area.

6.2 Social Aspect for Study

The social-economic survey was carried out to collect the following information's:

- a. Demographic data, (population and literacy levels)
- b. Occupations. Sources of Livelihood and income levels
- c. Socio-cultural fabric (Ethnicity, language, religion and vulnerability).
- d. Access to civic facilities (water, sanitation, health, education and communication).
- e. Assessment of the impact of the proposed sub-project on the subject population
- f. In case of negative impacts expected, suggest mitigation measures.

A survey and consultation was carried out in three villages Sawan Bhanbhro, Lal Bux Bhanbhro, and Sorah (Panah Nizamani) in Khairpur district, while four villages Kharrayoon, Serhyoon, Paro jo Wandhio and Sodhran in Tharparkar district. These are the only settlements located within the study area of two km.(Please see the maps for details in Annexure-VI)

All of these 07 villages were within the primary impact zone. This survey was conducted in the months of October and November , 2019 in order to establish a social baseline of the project area. A list of the location of villages visited is provided in Table-25.

The information gained will assist in the measurement and determination of the impacts (positive and negative) on social services, livelihood and cultural pattern of the population under study. To make the analysis more compelling, qualitative data through focus group discussions (FGDs) was also collected.



Table 25: Villages Visited for Socio-economic Baseline Data

S.No	Sub-project Name	Village	U.C	Taluka	District	Co ordinates	
						N	E
1	Samlee Dam	Kharryoon, Rarko and Lakarkhadio	Adhigam	Nagarparkar	Tharparkar	N 24 1756.88	E 70 4357.66
2	Paro Jo Wandhio	Sodhran /Paro Jo Wandhio	Adhigam	Nagarparkar	Tharparkar	N 24 1950.24	E 70 3912.92
3	Sehryoon Dam	Sehryoon	Virawah	Nagarparkar	Tharparkar	N 24 3059.13	E 70 5031.38
4	Jaganwari Nai Dam	Sawan Bhambhro	Chondko	Nara	Khairpur	N 27 1556.40	E 68 5316.50
5	Darigh Nai	Lal Bux Bhambhro	Chondko	Nara	Khairpur	N 27 1322.90	E 68 5315.84
6	Tungwari Nai	Sorah (Panah Nizamani) and Lalbux	Chondko	Nara	Khairpur	N 27 0720.90	E 68 5710.06

6.3 Population

According to the results of the survey, total number of households of sub-projects of Samlee, Sehryoon, Paro Jo Wandhio, Jaganwari Nai, Darig Nai and Tungwari dams are 1821 with a total population of 12890. Samlee, Sehryoon and Paro Jo Wandhio are in Tharparkar district, while Jaganwari Nai, Darig Nai and Tungwari are in Khairpur district. Population of the project area belongs to the Khaskheli, Kolhi, Rabari, Khunbhar, , Bhanbhra and Nizamani tribes. Kolhi Rabari and Khunbhar are found on Samlee dam, Khaskheli is in Sehryoon dam, Kolhi in Paro jo Wandhio, Bhanbhra are in Jaganwari Nai and Darig Nai dams while Nizamani in Tungwari dam. Sindhi is the main language in the Sub-Project area although most men can also speak Urdu. The sub-project wise details are given in the Table-26.

Table 26: Population and Tribes on Sub-Projects

Region	Dams	Villages	Tribes	HH	Pop	Average Family size	
Nangarparkar	Samlee	Kharrayoon	Kolhi, Thakur	300	2300	7.3	
		Rarkoo	Kolhi	500	3370	6.7	
		Lakarkhadyo	Kolhi, Thakur	150	1120	7.4	
		Serhyoon	Serhyoon	Khaskheli	55	500	9
		Paro Jo Wandhio	Sodhran	Kolhi	276	1675	7.3
			Paro jo Wandhio	Kolhi	50	365	7.3



Nara	Jaganwari	Sawan Bhanbhro	Bhanbhra	20	150	7.5
	DarganNai	Lal Bux bhambhro	Bhanbhara	70	510	7.2
	Tungwari	Sorah, Panah Nizamani	Nizamani	300	2250	7.5
		Lal bux Nizamani	Nizamani	100	650	6.5
				1821	12890	

6.4 Languages

Sindhi is spoken and understood by the 100% of the people in the sub project areas, as Sindhi is the dominant language. Besides, in Nara region 52% of the population also speaks Seraiki, while in Nangarparkar region 48% population also speaks Parkari language. National language Urdu is spoken and understood by the majority of the people in the project area.

6.5 Family System

The majority of population in the study area live together with their extended families (parents living with married children and their families). Families believe this is a more economical way of living as they often work together on the same land and are able to share their joint incomes to support the entire family, including elderly relatives, who are unable to work. It is also thought to be more efficient to share basic amenities such as water, electricity, housing and food rather than for each family to purchase immediately or from their own source. The sub-project wise details of population and average family size are given in Table-26

6.6 Religious Affiliation

During the socio-economic field survey, it was observed that in the Nagarparkar region the Muslim and Hindu population live together within the same villages. They participate in each other's religious and cultural festivals. There are Mosques and temple in most of the villages. While, in the Nara region, it was found that the majority of population was Muslim.



Mosque near Tungwari



Temple near Samlee dam

6.7 Occupations, Sources of Livelihood and income levels

Within the study area of subprojects (Tharparkar and Khairpur) districts, agriculture, and livestock are the main source of income for the people. Agriculture depends on rainfall, which is often erratic and falls between July and September only. After the rains, the desert subsoil aquifers are recharged and the pasture lands are regenerated. However, by February, the aquifers are often depleted and the pasturelands dry up. Generally, livestock depends on grazing in pastures and crop residues. Women are especially involved in livestock herding and play an important role in this occupation.

Due to the lack of an industrial base, the sources of income of households are less diversified, with their heavy dependence on livestock and casual labor. The deplorable social indicators such as large household size, poor literacy level, higher mortality rate, inadequate infrastructure with poor access to education and health facilities show a higher level of poverty and deprivation in the subproject areas.

Furthermore, during the survey, it was revealed that minimum monthly income level in surveyed villages of Nangarparkar region is Rs. 17000, while in Nara region Rs.15000. The maximum monthly income level in Nangarparkar region is Rs. 75,000, while in Nara region Rs. 50,000.



6.8 Village wise losses due to drought

The village wise losses due to drought were assessed during second round of focus group discussions (FGDs). It was revealed that due to drought in 2018-2019 significant livestock mortality, agriculture losses and reduction in ground water level was witnessed in the villages of sub project areas. The details are provided in below Table-27.

Table 27: Village wise losses due to drought in 2018-2019

<i>Region</i>	<i>Dams</i>	<i>Villages</i>	<i>Total Livestock Population</i>	<i>Livestock (Mortality)</i>	<i>Total Agriculture Area (Acre)</i>	<i>Reduction in ground water level</i>
Nangarparkar	Samlee	Kharrayoon	2900	230	2100	65%
		Rarkoo	900	110	2700	50%
		Lakarkhadyo	780	117	800	60%
	Serhyoon	serhyoon	900	83	1500	70%
		Sodhran	1559	141	1200	55%
	Paro Jo Wandhio	Paro jo Wandhio	430	51	300	55%
Nara	Jaganwari	Sawan Bhambhro	460	45	200	30%
	DarganNai	Lal Bux bhambhro	850	71	150	28%
	Tungwari	Sorah, Panah Nizamani	1500	181	700	35%
		Lal bux Nizamani	400	100	100	35%
Total			10679	1129	9750	

6.9 Livelihood improvements due to the small dams



The construction of small dams would lead to improvement in overall socioeconomic conditions in the sub project areas. The people inhabiting these areas are exposed to drought and food insecurity and will be directly benefitting from the construction of small dams for rain water harvesting and recharging of groundwater aquifers.

It is expected that small dams would bring significant livelihood improvement in sub project areas. Since the local communities are heavily dependent on livestock and rain fed agriculture and the small dams would recharge the groundwater level. This would have multiplier effect not only on the sustenance of livestock and agriculture but on human population and environment as well. It is expected that dams will raise water table depth, and contribute in reduction of livestock mortality (current mortality rate is 10.5%) through availability of water and fodder, while loss of agriculture would also be reduced through water availability.

Moreover, it is expected that farmers will have crop residue and variety of grasses to feed their livestock. The increased availability of water, fodder for livestock and improved agriculture will impact positively on the migration pattern as the population used to migrate from the sub project areas to canal areas.

6.10 Social Cohesion and Conflict

Social organization in all villages is strongly based on community (tribal) system, where each tribe has a tribal leader. In the Nara region, villages are mostly inhabited by members of a single tribe. There is minor interaction between villages of different tribes and therefore low chance of tribal conflict. While, in the Nagarparkar region, villages are multi tribal and multi religion and live within the same village. There is a single leader of the entire village, which is recognized by all tribes. The minor scale conflicts are resolved by the village leader.

The tribe leaders are mostly landlords and politically active. All families belonging to the same tribe have strong interactions with one another but mostly remain separate from other tribes. This extends to marriages, where it is the preference for young tribal members to marry a member of the same tribe. During the survey it was found that most communities had built their own mosques and maintenance of these mosques is the joint responsibility of community.

6.11 Social Vulnerability

Social vulnerability refers to inequality in social systems that discriminate against and marginalize certain groups of people from accessing resources and services. People who have been marginalized in social, economic or political terms are vulnerable. Disasters, poverty and vulnerability are interlinked as it has been observed that, during disasters, the most affected population are the poor of the community. In the surveyed villages, incidence of poverty has increased as droughts have reduced income level of the households by damaging



their assets and sources of income and thus have aggravated the household poverty. In many households there is just one earning person with many dependents.

During the survey it was found that most people in the sub project areas lack job opportunities, health and educational facilities, which escalate the social vulnerability to various hazards including drought.

6.12 Conflict Resolution within Tribes and Villages

According to the socio-economic survey, there is no major dispute among the people (inter or intra tribal conflicts) in the project area. The conflict resolution pattern in the project area is about the mutual conflicts, marriage settlements and other matters are usually resolved by the village head, while the head of a tribe shall resolve intra bradari (community) disputes. It was found during the survey that 95 per cent of the conflicts were resolved at village level. Those living within communities of the project area feel obliged to accept the decision of the village or tribal leaders.

In case of serious matters, local influential politicians (who are often also tribal leaders) intervene to settle the dispute. Occasionally, when parties do not agree on the decision of caste or tribal leaders, matters may go to the police and ultimately a court of law. The police and the court of law are the last options and these are rarely exercised.

6.13 Housing

The project area consists of rural population living comparatively in isolation. Majority of the population in Nagarparkar region live in small settlements of five to ten houses. Some of the houses usually have a boundary wall enclosing enough space for cattle and storage. In Nangarparkar region houses consists of huts called Chaunras with pointed thatched roofs of grasses which are built on mud plastered platforms. It was observed that all the people were living in self-owned houses.

While in Nara region twenty to seventy houses are normally settled together. All huts house consists of wooden beams of all shapes and sizes, cover of thick date-palm mats and a layer of mud with clay plaster at the top.



Houses near Paro Jo Wandhio



Houses near Tungwari Dam site

6.14 Literacy and Education Facilities

Literacy rate in Tharparkar district is low. According to the district education office Tharparkar the literacy rate in the district is 19.6%. (28.3% for male and 7.1% for female), while literacy rate in Khairpur district is 43%. (62% for male and 22% for female) Source: District Khairpur Hazard, Vulnerability and Development Profile RDPI/Plan.

During socio-economic field survey, it was noted that, there are 7 boys and 4 girls primary schools, in which 548 boys and 320 in girls Primary school are enrolled. While there are two Middle Schools for boys and girls. The enrolments in middle schools is reported 46 boys and 18 girls. Education facilities in the sub-project area are given in Table-28.

Table 28: Education Facilities in the Sub-Project Area

Name of Sub-project	Boys Primary School	Teachers	Enrolment	Girls Primary School	Teachers	Enrolment	Boys Middle School	Teachers	Enrolment	Girls Middle School	Teachers	Enrolment
Samlee	1	1	80	0	0	0	0	0	0	0	0	0
Serhyoon	1	2	55	1	0	35	0	0	0	0	0	0
Paro Jo Wandhio	1	1	100	0	0	45	0	0	0	0	0	0
Jaganwari	0	0	0	0	0	0	0	0	0	0	0	0
DarganNai	1	2	75	0	0	50	0	0	0	0	0	0
Tungwari	1	3	175	1	1	100	0	0	0	0	0	0
Total	5	9	485	2	1	230	0	0	0	0	0	0

6.15 Health Facilities

It was found that in sub project areas many people have suffered from hepatitis, typhoid, malaria, eye problems, diarrhoea and other hygiene related ailments . Sometime women die during delivery cases. Majority of the women were malnourished usually being the last ones to eat their meals in the family. In all the project study areas, there is no any health facility like Basic Health Units (BHU), dispensary, midwifery centres and medical stores in immediate vicinity. The seriously ill patients are taken for treatment to Khairpur and Mithi district hospitals and other may or cities including Sukkur, Hyderabad. However, in some project area quakes were operating as reported by the community.

6.16 Transport

Most of surveyed villages have an average 6.8 km village tracks or unsurfaced (Katcha) roads that are in bad condition except some of the villages. The construction and maintenance of village roads is the responsibility of local government. One Mehran highway Khairpur-Nawabshah passess along the sub-projects area of Nara region and a national highway Karachi to Via Thatta Nagarparkar passes along Tharparkar region.

The socio-economic baseline survey reveals that the major source of the human transport in the villages of the project area is public transport including buses, Van/Pickups, Jeeps, Quinqi Rickshaw a for the general public, while individual cars and motor bikes is another mode of transport in the project area The farm inputs and outputs are transported through trucks and tractor trolley. The animals from the sub-project areas transported to Hyderabad and Karachi by Trucks. The firewood is also transported through trucks and trolleys. Transport facilities of sub-project area is given in Table 29.

Table 29: Transport Facilities in the Project Area

Name of Sub-project	Van/Pickup	Bus/Truck	Car	Motor Bike	Distance from Village to Main Road (km)
Samlee	3	1	0	10	13
Serhyoon	2	0	0	7	4
Paro Jo Wandhio	5	3	0	15	1
Jaganwari	0	0	0	2	2
DarganNai	1	0	1	5	1
Tungwari	4	3	2	20	1



View of local transport in Sub project area



View of local transport in Sub project area



View of local transport in Sub project area



View of local transport in Sub project area

6.17 Telecommunication

During the field survey, the respondents reported that there is no landline facility available in the project area. Mobile phone communication is widely prevalent in all sub-project areas.

6.18 Energy Sources

Out of seven surveyed villages in sub project areas, four villages of Nangarparkar region are without electricity, while in Nara region one village is without electrify and two villages are connected with the grid. The area people collect firewood from the surrounding area and some people purchase firewood from nearby town. The fire wood per 40 kg cost is Rs.300. Moreover, use of solar system for irrigation purpose was also witnessed in some sub-project area.



6.19 Drinking Water and Sanitation

It was observed that women and children were responsible for fetching of water for drinking and domestic use. Groundwater results sheet Table: 16 reveals that, all ground water quality parameters are within SEQS & WHO permissible limits, except Nitrite and total coliforms, which were exceeding permissible limits in some sub project areas. The reason for exceeding coliform might be due to unavailability of sewerage system or open defecation in the area. The underground water was mostly sweet and good quality in the sub-project areas. While in Sehriyoon dam area there is no any drinking water source and the villagers use the rain water stored in earthen reservoir. Survey results showed that in all sub- project area the drinking water source was their irrigation tube wells, while in Tungwari, Darig Nai and Jaganwari Nai sub project area hand pumps were additional source of drinking water.

The water level was observed 25-30 feet deep in the Nagarparkar region and 100-150 feet deep in the Nara region.

Sanitation: During the survey, it was found that there was no proper sanitation in surveyed villages. In most of the villages open defecation is practiced, while small segment of population use direct pit latrines.

Within the sub-project areas, people drain out used water in open places and dump solid waste in the open. Sub-project wise details of sources of drinking water is provided in Table-30.

Table 30: Drinking Water Sources in the Sub-Project Areas

Sr. No	Name of the Dam	Hand Pumps	Dug wells	Number of Tube-Wells and Use			Piped Water
				Number	Drinking	Irrigation	
1	Samlee	2	7	2	✓	✓	0
2	Serhyoon	0	10	1	✓	✓	0
3	Paro Jo Wandhio	0	4	1	✓	✓	0
4	Jaganwari	1	0	0	0	0	0
5	DarganNai	1	1	0	0	0	0
6	Tungwari	7	1	0	0	0	0
Total							0



Tarai



Dug Well



Womens Collecting water



Water tank



Dug Well

6.20 NGOs

During the field survey it was observed that four major NGOs: were reported working in the project area namely Baanh Beli, Sindh Education Founfation and Thardeep Rural Development Program TRDP and Sindh Rural Support Organization (SRSO). The NGOs working in the area along with their area of interest are detailed in Table-31.

Table 31: NGOs Working in the Sub-project Areas

NGO working in the village								Currently, any major development projects under implementation	What are the Social Impacts of these projects
Name of Village	Name of Sub-Project	yes	no	Working Area of Interest.					
				Health	Educatio n	Micro credit	others		
Kharrayoon	Samlee	1	0	1	1	1	1	0	0
serhyoon	Serhyoon	1	0	1	1	1	0	0	0
Paro jo Wandio	Paro Jo Wandio	1	0	1	0	1	0	0	0
Sodhran		1	0	1	0	1	0	0	0
Sawan Bhanbhro	Jaganwari	0	1	0	0	0	0	0	0
Lal Bux bhambhro	DarganNai	1	0	0	1	0	0	0	0
Sorah	Tungwari	1	0	1	0	1	1	0	0

6.21 Priority Needs of Community

During consultation meeting with the male groups prioritized their needs. The ranking of prioritized needs is derived from the individual rankings of priorities generated from the discussion with the separate groups in each village. During the male consultation meetings in the target villages, different types of problems were identified and the priorities for each village are summarized as follows;

- Expressed need of male and female primary to middle level schools in the project area.
- Demanded for link roads construction.
- Demanded for the provision of health facilities in the project area.
- Demanded for the emplyment of local people. Demanded for the safe drinking water.

6.22 Archaeological and Cultural Heritage

Saints and shrines are highly respected by the local communities, during baseline survey no any archaeological sites observed in the impact zone of dam sites and no any graveyard is situated within the sub-projects impact area. But as far as districts level is concerned, the area has a rich cultural and historical background with various ancient buildings. However, these are not situated within the primry impact zone of the sub project area.

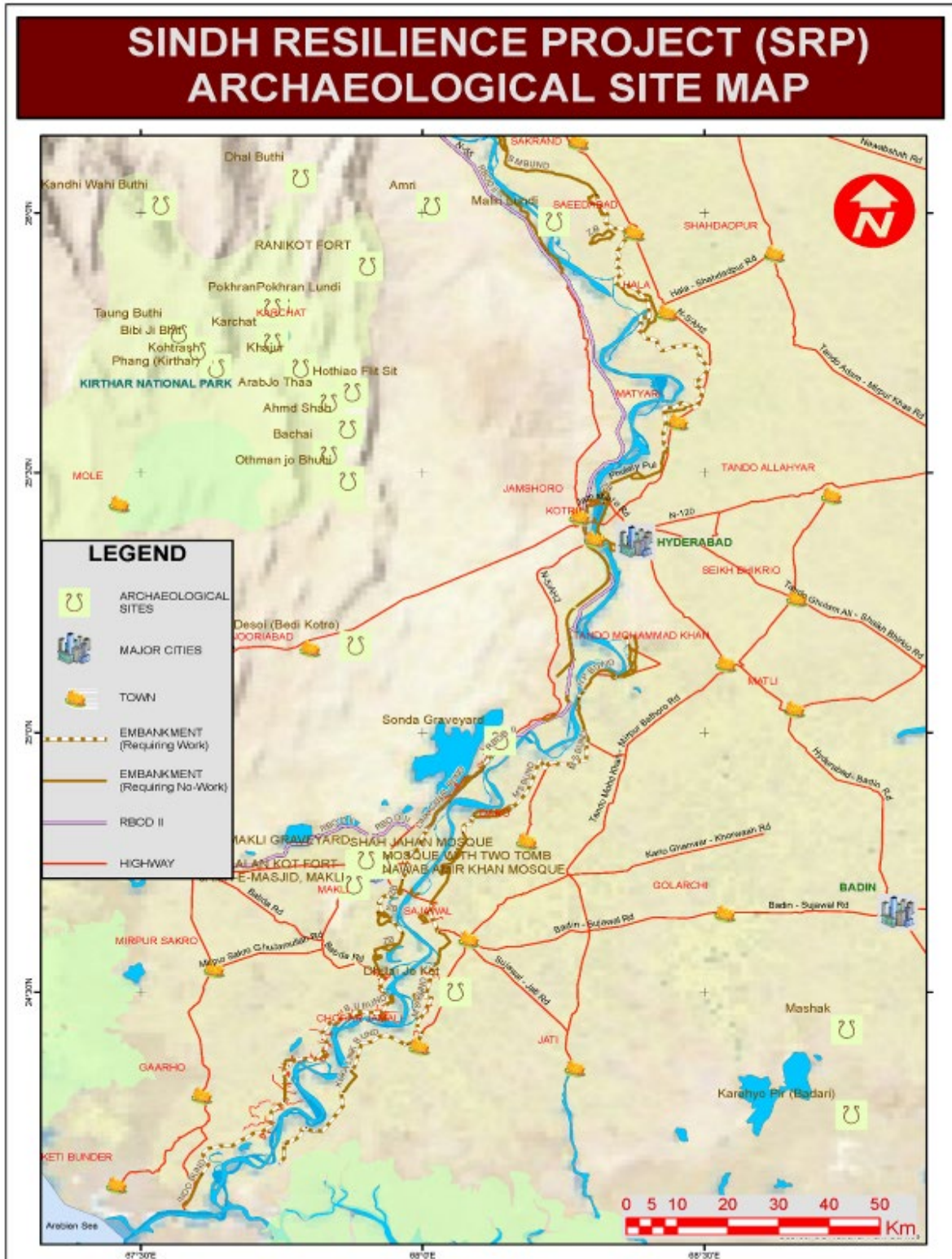


Figure 29: Archaeological Map of the Study Area

7. STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

Stakeholders are groups and individuals that are affected by or can affect the outcome of a project. Stakeholder engagement is a broad, inclusive and continuous process between a company and its stakeholders. It encompasses a range of coherent activities and approaches, spanning the entire life cycle of a project. The objective of conducting stakeholder consultations during the ESMP process was to inform all the stakeholders about the Project, record and take into account their opinions, suggestions and concerns and establish confidence amongst the project stakeholders that the project was developed in a responsible way. This was achieved by informing the stakeholders in a timely manner about the proposed project and its potential consequences on the environment and by encouraging their feedback.

7.1 Consultation

This section provides the objectives, process, and outcome of the stakeholder consultations conducted as part of the ESMF and ESMP. The primary objective of consultations was to disseminate the subproject information and to incorporate recommendations/ concerns of the stakeholder's particularly the local communities in the subproject design and implementation plan. Subproject stakeholders were identified through an initial social impact assessment of each subproject. Stakeholder consultation was carried out during the preparation of the subproject through community meetings focused group discussion and interviews of key informants.

7.2 Consultation Workshop for overall Project

The first round of consultation was held while preparing ESMF. It was ensured that no relevant groups would be excluded from the dialogue process. To ensure their presence, a stakeholder's workshop under Sindh Resilience Project (formerly DACREP) was organized in the irrigation office in Thatta on 30th December 2015. The executive summary of the draft ESMF was translated into the local language (Sindhi), uploaded on the Sindh irrigation Website and printed copies were distributed among the participants. Invitations were given by individual invitation cards and on the irrigation Department's SRP website.

The irrigation department also sent invitation letters to Sindh Wild Life and Forest Departments, WWF, IUCN, and Sindh EPA. More than sixty people were from the Irrigation department, Fisheries department, Consulting firm, SIDA, Education department, forest department, and NGOs participated in the dialogue.



7.3 Community Consultation for Sub-projects

The consultation was carried out during field visits conducted from 09th to 30th October, 2019. Field team comprising ESMU members of PMT- SRP, staff of PISSC along with staff of concerned sub-divisions of SID visited the nearby villages of Dams sub-projects to get the views of the people of the subproject, who are affected and beneficiaries. They appreciated the Sindh irrigation department for taking up initiatives for building dams to recharge groundwater,. The community was eager to have small dams in their area. According to the community, these small dams would serve water requirements for human population, agriculture and livestock. They further shared that dams would also protect their houses, agriculture lands and other livelihood assets from the damages of flash floods.

Table 32: List of villages visited during first round of consultations

<i>Dams</i>	<i>Villages</i>	<i>Date of Consultation</i>	<i>No of Participants</i>
Samlee	Kharrayoon	October 10, 2019	5
Serhyoon	Serhyoon	October 09, 2019	6
Paro Jo Wandio	Paro jo Wandio	October 10, 2019	6
	Sodhran	October 10, 2019	4
Jaganwari	Sawan Bhambhro	October 30, 2019	5
DarganNai	Lal Bux Bhambhro	October 30, 2019	6
Tungwari	Sorah, (Panah Nizamani)	October 29, 2019	7



Pictures During Consultation



Consultation with Residents of Village Lal Muhammad Bhambhro



A Group Photo with Residents of Village Sehryoon



Consultation with Residents of Village Paro jo Wandhio



A Group Photo with Residents of Village



During impact assessment survey, consultations with women were also conducted by female sociologists with women of all ages in a separate rooms where local males were discouraged from attending. Meetings were conducted in local language (Sindhi language). Seven sessions were conducted with women in all sub project areas, while total attendees were 41. The details of project were described and explained using simple language. During the meetings the gender related questions were asked in a formal way. Women were encouraged to ask questions and share their views and concerns related to the project, which were carefully noted.

They were informed that with the successful completion of these sub-projects, it will boost up living standard of the inhabitants through conservation of the flood flows and to utilize the same for irrigation and other purposes etc. They were happy and told that the subprojects are most important for their better livelihood and also will protect them from flash floods. They also told that these sub-projects will leave positive impacts on villagers and their livestock and they do not have any concerns with these sub-projects

During consultation process, they were briefed that the barren land/ excavated earth will be used for borrow material and contractor will be bound to take borrow material from nearby areas. They applauded the efforts of Sindh Irrigation Department. They were also informed that the continuous liaison with local community will be maintained to update them about status of subproject implementation. Their complaints will be redressed through Grievances Redress Mechanism. It will provide local community a chance to address their concerns during construction activities. During public consultation/ interviews, the people of the sub-project areas were fully involved and they came up with positive conclusion: Some comments/ observations with actions/ responses from the stakeholders (male and female) are as follows.

Comments / Observations	Actions / Responses
Employment should be given to local persons especially to those from villages within the study area. Participants from Sub-project villages, during consultation strongly demanded that unskilled labour should be hired from local area, as there is availability of unemployed young men.	Participants were told that local community people would be employed and workers activities would be strictly monitored.
Participants were of the views that proper dissemination of information about the subproject may be ensured.	Participants were briefed about the sub-project in detail during field focus group discussion, interviews, consultation while preparing ESMP. They have been intimated that all members are on board and are aware about the sub-projects that is to be strengthened.



Comments / Observations	Actions / Responses
Livestock is scared by the increase in traffic and noise from machinery during Project construction and operation, which may cause stress and disease. The community is dependent on the livestock for income.	Techniques to reduce the noise will be employed. Road and traffic route will be planned to avoid disturbance to community.
The privacy of women will be affected due to the project. Women currently collect fuel wood, tend to livestock etc. and the family is not concerned about their safety. However, with the increase of outsiders this freedom of movement for women will be reduced.	Cultural emersion and sensitization training will be a part of the induction program for new employees.

Keeping in view the comments and responses, it is very essential that the concerns of people may be addressed by applying good governance and management practices before and during the construction work.

7.4 Second round of consultations

Moreover, second round of consultation was undertaken in September 2020 in which validation of data and signing of community consent for construction of dam was carried out. Consultation was also undertaken with communities downstream of each dam location (Please see table 33 for list of villages). During the visit previous data was validated including village profile, household data, family size and land ownership. The community was eager to have small dams in their area. According to the community, these small dams would serve water requirements for human population, agriculture and livestock. They further shared that this year their areas received ample rains and if dams were constructed earlier, the area would have certainly benefited.

Table 33: List of villages visited during second round of consultations

<i>Dams</i>	<i>Villages</i>	<i>Date of Consultation</i>	<i>No of Participants</i>
	Kharrayoon	September 18, 2020	10
Samlee	Rarko	September 19, 2020	5
	Lakarkhadio	September 19, 2020	4
Serhyoon	Serhyoon	September 19, 2020	09
	Sodhran,	September 19, 2020	20
Paro Jo Wandhio	Paro Jo Wandio	September 19, 2020	7

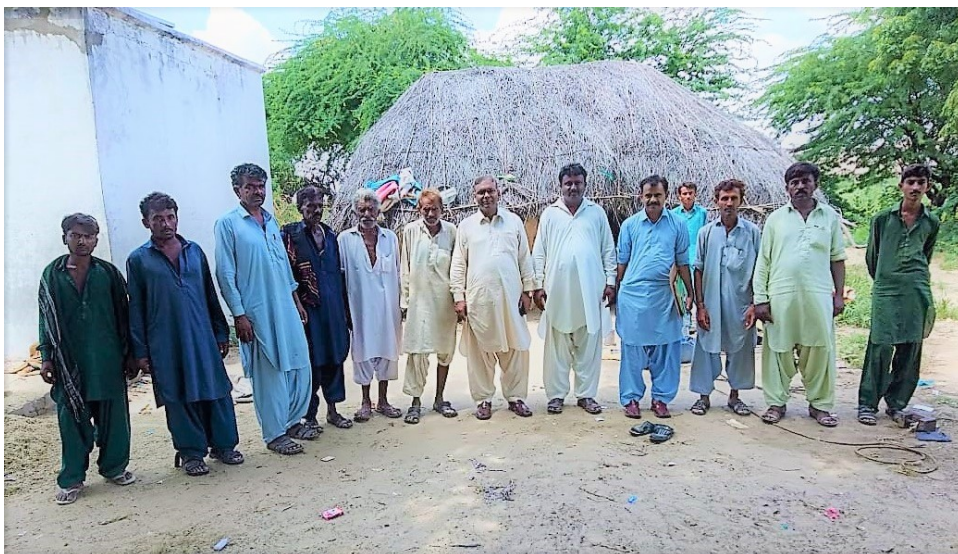


Jaganwari	Sawan Bhambhro	September 20, 2020	10
Dargan Nai	Lal Bux Bhambhro	September 20, 2020	07
Tungwari	Sorah, (Panah Nizamani)	September 20, 2020	15
	Lal Bux Nizamani	September 20, 2020	8

Pictures during the Second Round of the consultations



Consultation at village Paro jo Wandhio



Consultation at village Kharrayoon



Consultation at village Lalbux Bhanbhro



Consultation at village Panah Nzamani



Comments / Observations	Actions / Responses
The participants shared that this year their areas received ample rains and if dams were constructed earlier, the area would have certainly benefited.	The participants were informed that these sub projects goes through various stages of approval. However, efforts are being made to expedite the process.
The participants from Sub-project villages, during consultations again demanded that unskilled labour should be hired from their villages, as significant number of unemployed labour is available.	The participants were informed that local community people would be given preference, while hiring unskilled labour and this would be strictly monitored.
The participants were of the views that proper dissemination of information about the subproject may be ensured. Overall community is very happy about the poposed small dams and gave positive feedback about the project	The participants were briefed about the sub-project in detail during field focus group discussion, interviews, consultation while preparing ESMP. Whiel during the process, the community consent for construction of dams were also obtained.

7.5 Information Disclosure

As disclosure requirement, the Environmental and Social Management Framework (ESMF), has been uploaded on the SRP Sindh Irrigation Department website, while whole document of Environmental and Social Management Plan (ESMP) of the reported sub-projects will be translated into Sindhi after approval from the Wold Bank same will also be uploaded on the website of SRP Sindh Irrigation Department. The hard copy would also be made available at the camp sites.



8. ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATIONS

The reconnaissance field visit was carried out to assess social and environmental impacts of the activities to be undertaken for the Construction of Small Dams/ Weirs. A checklist showing rapid assessment of potential environmental and social impacts, mitigation measures and residual impacts after mitigation is given in Table-32. It reveals that the project activities will not cause significant disturbance and inconvenience to local community and natural environment of the area. All the impacts which have been identified during the reconnaissance, are associated with the construction phase, and minor to moderate in severity; and can easily be mitigated through planning or adopting appropriate management measures that are included in this ESMP. The minor impacts can be resolved through the best management practices. Social impacts such as getting borrow pit area, hiring of labourers and setting up of labour camp will be mitigated according to applicable policies and procedures. The subprojects will be highly beneficial for the inhabitants of water scarce areas of Qubba Qadir Bux & Chhatan Shah Hills and Nagarparkar. The nature and scope of the construction activities would bring a number of the associated potential social and environmental impacts. The social impacts associated with borrow pit area will be managed by proper guidance and strict monitoring of subprojects activities. The labourers are expected to be recruited largely from local areas which will enhance economic opportunity for them.

The environmental and social safeguards rapid screening depicts that: (i) the subproject will not require land acquisition; and (ii) the subproject will not involve any involuntary resettlement.

8.1 Impacts and Mitigations

8.1.1 Major Environmental Impacts and Mitigations

Many positive impacts like socio economic uplift of the area and creation of job opportunities for the local people are envisaged during the construction and operation stages of the Project. The ground water table around the command area will rise and will be utilized for drinking and irrigation purposes. In other conditions flooding of the downstream area will be less as compared to past condition. Increase in per capita income and other opportunities and general uplift of the area are expected.

The possible negative impacts of the construction of Dam on air, water, land and also on socio-economic matters, issues at the Dam-site as well as surroundings include resettlements, agriculture, water quality, aquatic life, watershed erosion and siltation, downstream erosion and water borne diseases.



It is evident from the checklist that the Project is environment friendly with respect to the reservoir area and the command area. As regards the command area, the people of this area will be the main beneficiaries. The following sections give in detail the possible environmental impacts and their mitigations.

8.1.2 Temporary Impacts during Construction Phase

During construction of dams the surrounding area will face some undesirable effects. A number of impacts are of temporary nature and may occur during project construction or early years of project operation. Some of them are described below:

8.1.3 Health and Safety of Community and Construction Staff/Workers

During construction stage of small dams there shall be impacts to the health, safety and hygienic conditions of both the workforce and the local community. The potential impacts to the local communities shall be direct, such as being struck by moving plant or vehicles within and outside the project area, and indirect through the decrease in air quality surrounding the project area. Air quality will reduce as a result of increased dust generated from construction and on transport routes, as well as due to emissions from plant and vehicles. The impact will continue for the duration of the works (12 months) and can be mitigated by using water bowsers to prevent the creation of dust and by keeping plant and vehicles to a high standard through regular servicing to ensure they meet the SEQs.

8.1.4 Health and Safety Related Mitigations

All works shall be excluded from within 20 m (65ft) of any residential area. The following steps are suggested for proper management of traffic on routes to be used for material transport within the project area:

- The contractor will have to prepare an Occupational Health and Safety Plan and will submit to the PISSC and PMT for review and approval. When approved, the contractor will implement the OHS plan during construction period. This plan will need to describe all jobs, their risks, and the controls that will reduce risks; these controls may include PPE, restrictions on activities or locations, and other measures. The plan also needs to describe what type of training will be given to the workers. Those who work near water, at heights, with heavy equipment will need special training so those hazards can be managed and minimized.
- The contractor will ensure the use of Personal Protective Equipment (PPE) for his labours during construction period;
- The contractor will train his crews on the aspects covered in the above described OHS Plan;



- The contractor shall fence the working area and unauthorized shall not be allowed to enter in the area;
- The contractor will hire an HSE officer with an adequate experience to address above impacts.
- The Contractor will display sign boards and banners about traffic diversion at places on detour routes;
- Provision of speed breakers at appropriate places in consultation with/approval of the Engineer which should be removed after completion of the project;
- Establish and obey speed limits;
- The Contractor will maintain workers hygienic conditions in labour camps
- The Contractor shall make available the First aid kit with adequate medicines and bandages at all the times and all the sites. The location of these kits shall be clearly marked and shall be easy to access by all.
- No private property without permission of the owner will be used for transportation;
- Drivers will fix net on containers while transporting stones and soil etc.
- Community liaison will be maintained during construction stage and GRM will be established to address complaints related to safety hazards.

Contractor will prepare an emergency response plan to address events such as fire, floods, earthquakes, injury/death, and accidents.

8.1.5 Health and Safety of Community and Construction Staff/Workers related to COVID-19

During construction stage of small dams there shall be impacts of Corona Virus on the health conditions of local community through work force. Coronaviruses are a family of viruses that cause illness such as respiratory diseases or gastrointestinal diseases. Respiratory diseases can range from the common cold to more severe diseases, such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV).

8.1.6 COVID -19 Related Mitigations

Addressing COVID-19 at a project site goes beyond occupational health and safety, and is a broader project issue which requires the involvement of different members of a project management team. Given the project context, a designated team would be established to address COVID-19 issues, at PMT level, PISSC level, and at the contractor level. Detailed SOPs are prepared as per World Bank SOPs of COVID-19. Detailed Mitigation measures are given in SOPs attached in Annexure- VIII



8.1.7 Noise Pollution

During the Construction stage, Noise will be created as a result of the works. The main impact will be from traffic along haulage routes and the operation of construction machinery like (Batch Plant, Excavators, Dozers, Compactors and Graders). All machinery shall only be permitted to operate six days a week between the hours of 8 am and 6pm, unless authorized by the Engineer. The most significant impact shall be to the settlements within or close to the dam site.

Due to the limited number of settlements present within the vicinity of work areas where noise levels shall be elevated, the magnitude of this impact is judged to be minor adverse.

8.1.8 Noise related mitigation.

The mitigations shall be to limit working hours to between 6 am and 6 pm, six days a week. The camp sites shall be situated at least 500 m from any settlement. On-demand noise monitoring will be carried out in case of any complaint or request by the affected communities. Noise level of machines to be used during the construction will be controlled as far as possible and the workers will be provided earmuffs, where necessary.

Additional mitigation measures will be identified and implemented in case the noise levels exceed the permissible limits. Community liaison will be maintained to ensure that complaints and grievances are addressed as soon as possible.

8.1.9 Air Pollution

Keeping in view the distance of dam site and population there would be no major impact of air and noise pollution. During the course of construction following minor issues may arise and are as under,

i) Air Quality

Air quality would be disturbed during construction stage due to cuttings, vehicular movement and release of particulate matter PM2.5 from vehicular emission. As the Dam site is far away from the population so, cutting noises would not affect the local population and only vehicular movement would cause minor noise and would disturb the air quality.



ii) Dust

Impact of dust is restricted only to the few villages, which is very closely located on the route to the dam sites. The dust problem is expected to be minimal. During operational stage, the area would be dust free as there would be no construction activities and heavy vehicular movement.

iii) Smoke and Vehicular Emission

Smoke emission from the vehicular movement and heavy machinery would slightly cause smoke problem in the nearby villages, which are located on the way of dam site. While no noise issue is anticipated during operational stage as there would be no heavy machinery movement and other noise related activities.

8.1.10 Air Pollution Mitigation Measures

The air related mitigation is discussed as follows,

During the construction phase of the proposed sub-projects, some adverse impacts on the environment by suspended dust and noise are foreseen. These will be effectively mitigated by adopting the following preventive measures;

- Contractor sprinkling of water on the service roads and dirt tracks;
- Controlling the vehicle speed by imposing speed limits;
- Native species tree shall be planted, no rapidly growing trees, shrubs and grasses in the project area shall be allowed.
- Control on emissions of exhaust gases of vehicles to be used for construction;
- The speed of the vehicle used for transportation of construction machinery and material will be limited;

8.1.11 Water Related Impacts

i) Water Quality

The water samples were collected from the dug wells and ponds near the dam site and were analysed from the PCSIR, the results have already been summarized earlier.

In addition further quality of water parameters is to be carried out by the ESMEC and PISSC during and after the completion of physical works. It was found that the turbidity level was beyond the SEQS/NEQS and WHO standards.

The rivers are basically non perennial and flow only few hours during rain months. During the construction stage different types of activities such as cutting, earth work and concrete work would alternately result in deteriorating the surface water quality.

A secondary adverse impact is potential spillage of chemicals, hydro-carbons and other pollutants as part of the construction process as well as contamination arising from the improper disposal of wastes (organic and inorganic) at the camp and work sites. Such wastes are detailed in Table-34.

Table 34: Site Wastes

Type of Waste	Description
Campsite or domestic waste	Biodegradable: Foodstuffs, fruits and vegetables, wood, Campsite or domestic waste bones, grass etc.
	Non-Biodegradable: Paper, metals, glass, plastic bottles, scrap metal, textile and shoes, bottles and jars, fluorescent tubes.
Sewage and grey water	Kitchen and washing areas sewage
Workshop waste including solid and Fluid	Used oil, ferrous /nonferrous materials, batteries etc.
Medical waste	Syringes, glass bottles, Bandages, blood sampling tubes, expired drugs, dressing etc.
Packing waste material	Paper, plastic, textiles, cardboard, rubber, wood, glass, tin cans etc.
Excavated and Demolition waste	Rocks, sand, silt/clay, concrete, bricks and other building materials
Excess construction material	Sand, aggregate, stones and other construction materials

The groundwater which is a source of drinking in some areas may be potentially contaminated by the release of untreated sewage from construction camps and office.

ii) Anticipated Aquatic and Terrestrial Life

Impacts on aquatic and terrestrial life during the construction stage are given below.

- **Impact on Reservoir Area**

Reservoir area houses the population of plants, animal habitats, and reptile animals except fish fauna due to non-perennial system in the reservoir. After the construction of the dams, a positive impact on plants, animal habitats and reptile animals in the reservoir area are anticipated. It is expected that reservoirs would retain water for ten to twelve weeks.



- Impact on Command/Lower Riparian**

The six dams can be categorized into two groups. Out of three dams in Nangarparkar region one dam namely Sehryoon is storage dam while two are groundwater recharge dams. In Nara region two dam sites namely Jaganwari and Tangwari are storage dams and one is ground water recharge dam. The combined water diversion is only 0.86 % which is negligible.

Table 35: Quantification of water diverted to dams

S.No	Dam	Type of dam	Water to be Diverted by the Dams (Ac-ft)	Water Availability in Region (Ac-ft)	The ratio of Water to be Diverted by the dams against Water Availability in of Runn of Kutch / Nara
Dams in Nara Region					
1	Jaganwari	Storage	20		
2	Darigh	Recharge	102		
3	Tungwari	Recharge	205		
	Sub-total		327	60,722	0.53%
Dams in Nangarpakar Region					
4	Sehriyoon	Storage	54		
5	Samlee	Recharge	56		
6	Paro Jo Wandhio	Recharge	100		
	Sub-total	-	210	1,900	11.05%
	Total combined storage capacity	-	537	62,622	0.86%

Further, the parts of Runn of Kutch in Nagarparkar area receive their freshwater contribution of rains through some well-defined nais such as Kharoro, Mudro, Mulji, Sudran, Adigam, Jinjoo, Kasbo, Surachand, Ghartiari, Gordhro Bhitiani and Chitrasar and through natural drainage of surrounding area towards low lying marshy lands. The total catchment area of Runn of Kutch is spread on 1810 sq.-miles and the total catchment areas of three dams Sehriyoon, Samlee and Paro Jo Wandhio Dams sub-project of Nagarparkar are 3.47 sq. Miles.



It may be noted that Sehriyoon, Samlee and Paro Jo Wandhio dams will be storing almost 11.05% of flows along the runoff area. These dams will store the rainwater before it is released into salty marshes of Runn of Kutch.

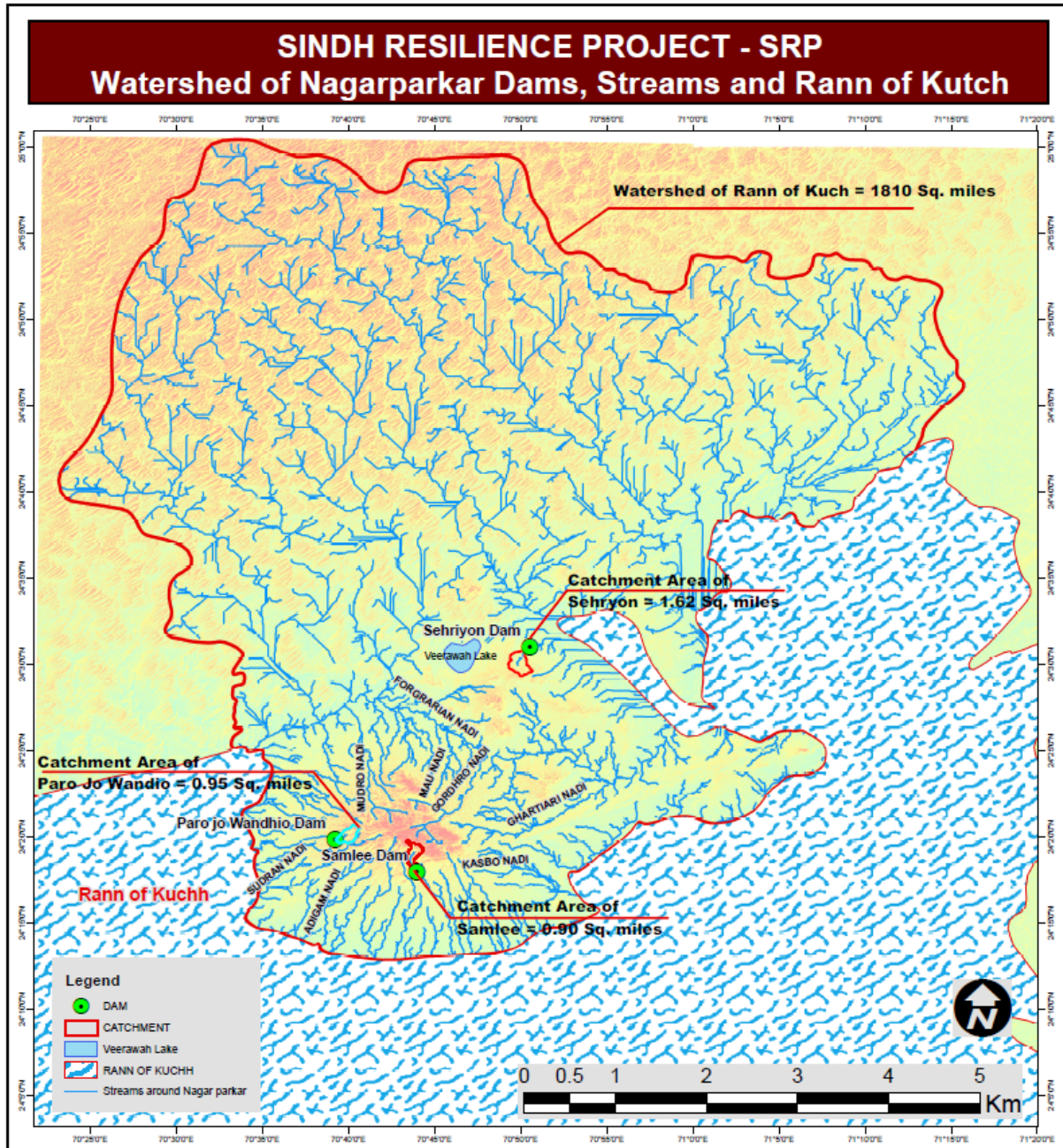


Figure 30: Watershed of Nagarparkar Dam, streams and Runn of Kutch



It may further be noted that in sub-projects area, local population is already collecting rain water for their use by constructing earthen embankments near proposed dam locations. The sub-project will replace those poor structures with properly designed safe structures with spillways. In fact practically there will be no additional intervention to the rainwater runoff towards salty marshes due to construction of these dams. Thus there will be negligible impact of the sub-projects on eco-system of marshy lands.

Since all the dams are of small reservoir capacity there will be very small retention as compared to total flows in streams. Thus there will be negligible impact on the downstream flows. On the other hand the groundwater recharge will percolate towards downstream areas, hence, the downstream communities would be major beneficiaries of these dams.

The bio-diversity including plants and animals in the command / downstream area during the construction period would experience little or no adverse impacts. After construction of the dams, the command area and lower riparian will directly benefit by getting perennial ground water supplies for drinking and domestic purposes. It will bring revolutionary improvement of the ecosystem in the area and livestock of the area would benefit since there would be enough water and food availability.

Impacts of Dam Breach

The study of dam break was conducted as a part of detailed design by PISSC. In their report titled “Detailed Design” August 2020, the results of the dam break study are given in Table 36 below.

Table 36: Summary of Dam Break Study

S.NO	Parameters	Samlee	Sehryoon	Paro Jo Wandhio,	Jaganwari	Darigh	Tungwari
1	Flood Volumes:						
1.1	Reservoir Volume at Normal Reservoir Level or Dam Breach Volume (Acre-ft)	186	160	100	118	260.0	1,186
1.2	Design (100-year) Flood Hydrograph Volume (Acre-ft)	335	443	211	5,819	3,211	5,819
1.3	Combined volume: Dam Breach+100-year Flood (Acre-ft)	521	603	311	5,937	3,471	7,005
2	Discharge Peaks:						
2.1	Case 1: Breach Hydrograph Peak (cfs)	9,944	7,960	4,264	5,511	8,238	7,477



S.NO	Parameters	Samlee	Sehryoon	Paro Jo Wandhio,	Jaganwari	Darigh	Tungwari
2.2	Case 2: Design (100 year) Flood Peak (cfs)	5,492	2,099	1,871	1,152	2,610	2,930
2.3	Case 3: Combined : Dam Breach + 100 year Flood (cfs)	15,436	10,059	6,135	6,663	10,849	10,406
3	Inundated Area (Sq.Miles):						
3.1	Case 1: Dam Breach only	1.71	1.38	1.34	1.25	1.59	3.88
3.2	Case 2: Design (100-year) Flood only	3.83	1.99	3.04	2.43	5.21	11.77
3.3	Case 3: Combined : Dam Breach + 100 year Flood	4.88	2.66	3.71	3.00	5.91	13.55
4	Estimated population affected according to Land Scan Population Grid:						
4.1	Case 1: Dam Breach only	287	61	584	18	25	873
4.2	Case 2: Design (100-year) Flood only	325	100	767	29	341	3,649
4.3	Case 3: Combined : Dam Breach + 100 year Flood	369	120	808	31	349	4,229

It has been concluded from the dam break study, the reservoir area of all six (06) dams is small, and not exceeding 0.131 sq.miles or 0.34 sq.kilometers. Thus the area inundated in worst case scenario (Combined dam breach + 100 year flood) 13.55 sq.miles or 35.09 sq.kilometers at Tungwari Dam, and number of person affected in the worst case scenario is 4,229 person. Overall the areas inundated by breach of dams are small and consequently the population affected in case of dam breach is small only. Therefore, the incremental impact of dam breach on 100-year design flood is not appreciable. The number of population affected depends on the human settlements downstream of the dam. In case of Tungwari Dam appreciable population may be affected in event of high flood. An emergency preparedness plan will be prepared for all dams.

8.1.12 Water Related Mitigations

A contractor will make his own arrangement and would not rely on existing community resources and would not extract from sources currently used by the community.



Moreover, the Contractor must provide the following facilities at each campsite: Latrines; lined washing areas; septic tanks and soaking pits for toilet waste.

Key mitigation measures are listed below.

- All hydro-carbons and other potential pollutants should be properly confined, there should be proper septic tanks and soaking pits for sewage treatment and disposal, sewage/sanitation at work camps and proper wastewater collection facilities.
- Proper collection and disposal of water used for construction (to be the contractor's responsibility).
- Collection drains and oil interceptors.
- Regular monitoring of water quality shall be carried out by the PISSC and ESMU of PMT.
- Contractor / PISSC will purchase water from nearby available resources as well as dig his own well. The contractor will ensure that if a well is dug, it does not overdraw from a reservoir being used by the community
- Water consumption will be monitored during construction stage and record will be maintained to avoid any wastages.
- Sewage treatment facilities to be provided to treat the wastewater from construction camps and other sanitary appliances (to be the contractor's responsibility).
- Diesel, oil and lubricants should be properly stored in accordance with the petroleum regulations. This will be the responsibility of the contractor.
- Appropriate arrangements will be made to stop stones and soil to slip in the river water.
- Community liaison will be maintained and GRM will be established to address complaints related to waste disposal.

8.2 Potential Positive Impacts and Benefits

The planned sub-project is expected to provide required water quantity, improve water quality and stabilize the current water supply losses. It will also be contributing to the reduction of water pollution and water-borne diseases. The area and the local communities will gain many directly related positive impacts and benefits as briefed.

8.2.1 Income and Employment

The employment opportunities generated by the growth in the local agricultural sector and some other sectors, the economy that stem from the agriculture improvement and livestock will increase significantly.



8.2.2 Land and Property Value

Due to improvement in the environmental quality some increase in land and property value is also expected.

8.2.3 Development of Borrow Land

The proposed raising of the dams involves concreting and earthworks. Borrow areas for bunds are proposed in existing bunds to increase their capacities. Therefore no major effects on the borrow areas is anticipated.

8.2.4 Reclamation of Land

During operational stage no water logging, salinity and erosion properties are anticipated, so, no reclamation of the land would be required at later stages.

8.2.5 Development of Roads

For the transportation of construction material, equipment and heavy machinery the existing National Highway N5 Karachi to Nagarparkar via Thatta and Badin and from Nagarparkar to dam site is 30 Km link road will be used. Further, three sites of Khairpur area i.e Jaganwari, Darigh and Tungwari Nai will be accessed through Karachi to Khairpur National Highway N-5 upto Ranipur then Ranipur to Choundko main road will be used. No permanent or temporary roads therefore required to be constructed for accessibility of the dam-site.

8.2.6 Land Use Changes

During the construction of the dams and associated works some technical staff, workers and officials would be staying near the dam-site and would require land for their residence such as contractor's camp, staff residences, dam and reservoir access roads, electric power etc. These temporary residential areas would be used by the contractor's staff and labours once the construction is completed. During the construction stage, necessary localized arrangements for electric power and telephone exchange is needed as the area is lacking these two facilities. No adverse impacts are foreseen during the construction and operation of the Dam.

8.2.7 Biodiversity

A detailed baseline of the main habitats and mammals, reptiles, amphibians and birds present in the project area is given in Section 5.



Temporary impacts during the construction of the dams on wildlife (small reptiles and some birds losing their nests etc.) are envisaged. During expedition of Samlee, Sehriyoon and Paro Jo Wandhio dam site, it is observed that, Indian Star tortoise is Vulnerable (VU) and rare species found in the area. Indian Star tortoise is reported by IUCN list in Run of Kutch area, which is located at 3.5 kilometres, project activities will be kept limited to project area.

Moreover, as the total catchment area of Samlee, Sehriyoon and Paro Jo Wandhio proposed Dams in Nagarparkar is only 4.8 sq/Miles of the total watershed area of the marshy lands of Runn of Kutch in project vicinity. The total catchment area of Runn of Kutch is spread on 1810 sq.-miles and the total catchment areas of the Sehriyoon, Samlee and Paro Jo Wandhio Dams sub-project of Nagarparkar are 4.8 sq. Miles. Hence there will be no impact on Indian tortoise or any other species due to project activities. After the creation of reservoirs diverse wildlife including migratory birds may be attracted.

In addition to this no-poaching or hunting will be allowed to project staff, also SWLD is vigilant for the protection of wildlife in the area.

8.2.8 Watershed Erosion and Sedimentation

As there would be no intervention in the watershed area, therefore no erosion is expected due to the construction activities of the dams. However, during operation stage watershed erosion may result in the accumulation of silt in the reservoir resulting the effective life of the dams. Proper watershed management is, therefore, required in the catchment area.

8.2.9 Downstream Erosion and Siltation

The water quality may be temporarily disturbed at dam-sites due to construction activities and temporary residential areas for the workers/staff which is one of the causes for water borne diseases. Water utilization would be minimal as the distance of the dams to the nearest settlements is significant that would prevent use of water on the daily basis.

8.2.10 Wastewater Discharge

Domestic wastewater from the contractor's camp will be collected in the septic tanks, before reaching top level treated water will be collected in the water tanker then after same water will be used for sprinkling purpose on the haul routes to settle down the dust. Therefore, no adverse impact is foreseen in the area.

However the design of septic tanks will be done during construction stage by contractor on the basis of occupancy in the camp and same will be ensured in Contractors' ESMP.



8.2.11 Socio Economic Impacts

The sub-projects will be instrumental in considerably improving the socio economic conditions of the local population, both during the construction and operation stages, through provision of considerable job opportunities. Employment, health, life style and cultural uplift are the direct benefits during these stages.

i) Population and Settlement Pattern

During the construction stage considerable job opportunities will be created. The standard ratio will be applied by the contractor while hiring labour i.e. 70% local and 30% non-local. For skilled jobs people from other parts of the country would be employed. There would be some temporary increase in the visitor population who would however leave the area after the completion of the construction activities. During the operation stage no adverse impact is envisaged.

ii) Human Resource Development

During the construction stage local population would get jobs in the form semi and unskilled labor. The wages for unskilled labour would be Rs.600/day, semi-skilled labour Rs.800/day, while skilled labour Rs.1200 to 1500/day. Due to their interaction with skilled labor, their skills would be developed for future development activities of this kind.

iii) Impacts of Labor Employed from Outside

Some social impacts could arise due to labour influx. There shall also be a risk to community health from HIV/AIDS or other transmitted infections as a result of the presence of a migrant construction labour. There could be risk of gender based violence from the migrant labour, who often remain away from home on the site. This may lead to inappropriate behaviour including sexual harassment of women girls and boys of the local community. This could especially be relevant in case the nearby population is from any marginalized group e.g. Hindu community. Cultural sensitization is necessary as a mitigation. Problem of child labour could also arise due to increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

Besides this, some adverse environmental impacts could also arise due to labour influx. Impacts like, inadequate waste disposal and illegal waste disposal sites due to large populations of workers, wastewater discharges from camp could also emerge. Major health risks can occur if latrine pits spill over into local streams that are used for drinking water by the host community. The provision of clean drinking water and water for hygiene purposes can result in increased pressure on freshwater resources. Impacts in ecologically sensitive areas, workers' camps can have impacts on the local wildlife. This may include disturbance of species, as well as illegal hunting. In the same context, new access routes for workers' camps may have impacts on natural habitats.



As part of the mitigation process, the contractors shall locate/ construct camps for their staff at least 500 meters away from communities in order to avoid social conflict as well to avoid the possible adverse impacts of the construction camps on the surrounding communities. Fencing will be provided around the camp site and security will be provided by the Contractor. Camp layout plan and workers code of conduct will be prepared by contractor and will be submitted for review and approval of the Engineer.

Preference will be given to local labour for work, most of the labour will go back to their homes on daily basis. Limited number of labours (35 – 40) labour would be resident in the camp. The contractor shall include information about HIV/AIDS and the spread of sexually transmitted diseases within the workers code of conduct. The contractor shall also include proposals for awareness on HIV/AIDS and the spread of sexually transmitted diseases in the CESMP and in training plan. The contractor will train the workers regarding (Gender Based Violence GBV) and also train workers about sexual harassment, child abuse, child labour, human trafficking for reducing the risk of GBV. First aid and medical facilities will also be provided by Contractor on site and camp areas.

Moreover, Contractor will purchase water from nearby available resources, as well as dig his own well, for the consumption of water in camps for domestic purpose. In ecological sensitive areas, construction activities will be confined in the designated areas. No new access routes will be developed for borrow areas or for the movement of supply vehicles. Existing routes will be used for such activities.

iv) Socio Economic Uplift

During the construction stage of the sub-project socio economic condition of the population of the area may improve as a result of increase in per capita income through creation of direct and indirect opportunities of jobs. During operation stage of small dams, the communities of targeted command area would get perennial groundwater.

v) Impact of Dams on Lower Riparian

The traditional water rights in respect of the rivers are not well defined in the command area and are total different from the flood irrigation practice in other parts of the province. The communities of both regions have never used the flood water for irrigation purpose, the main reason being that the command areas have used either direct rain or wells. The natural drainage pattern of surrounding areas is towards Runn of Kutch. After completion, dams will store the rainwater before it is released into salty marshes of Runn of Kutch. The catchment area of all three dams in Nangarparkar area is only 3.49 sq. miles, out of 1810 sq.miles which is only 0.19 sq.miles of total marshy lands of run of Kutch. Thus a negligible amount of water will be harvested and it will not make significant impact on marshy lands of runn of Kutch and its ecology.



Further, four recharge dams of Nara & Nagarparkar region and two storage dams will be constructed on well-defined nais (rivers). The natural drainage pattern of surrounding areas is towards Runn of Kutch and after the overspill the remaining water also Run of Kutch area.

Thus, construction of these dams will not have any significant impact on lower riparian, however, the command area and lower riparian will directly benefit by getting perennial ground water supplies for drinking and domestic purposes. It will bring revolutionary improvement of the ecosystem in the area and livestock of the area would benefit since there would be enough water and food.

Out of total 10 villages visited 8 are located in downstream, 5 villages were visited in first round and 3 were visited in second round, which is mentioned in Table 37.

Table 37: Consulted villages located in downstream of the dam sites

	Name of Dam site	Name of Village
First round of consultations	Serhyoon	1. Serhyoon
	Paro Jo Wandio	2. Paro jo Wandio
	Jaganwari	3. Sawan Bhambhro
	DarganNai	4. Lal Bux Bhambhro
	Tungwari	5. Sorah
Second round of consultations	Samlee	6. Lakar Khadio
		7. Rarko
		8. Lal Bux Nizamani

8.2.12 Commulative Impacts of the Project

The proposed project will have positive impacts in the area. The socio-economic conditions of the area shall improve considerably both during construction and operation stages in terms of job opportunities and social uplift. After construction of these dams land and property value shall also appreciated due to availability of groundwater and surface water. Further, during the construction stage of the sub-projects socio economic conditions of the population of the area may improve as a result of increase in per capita income through creation of direct and indirect job opportunities.

Some social impacts could arise due to labor influx, people can migrate to the project area in addition to the labor force, thereby exacerbating the problems of labor influx. There shall also be a risk to community health from HIV/AIDS or other transmitted infections as a result of the presence of a migrant construction labor. There could be risk of gender based violence from



the migrant labor, who often remain away from home on the site. Problem of child labor could also arise due to increased opportunities for the host community to sale goods and services to the incoming workers can lead to child labor.

Besides this, some adverse environmental impacts could also arise due to labour influx. Impacts like, inadequate waste disposal and illegal waste disposal sites due to large populations of workers, wastewater discharges from camp could also emerge. Major health risks can occur if latrine pits spill over into local streams that are used for drinking water by the host community. The provision of clean drinking water and water for hygiene purposes can result in increased pressure on freshwater resources. Impacts in ecologically sensitive areas, workers' camps can have impacts on the local wildlife. This may include disturbance of species, as well as illegal hunting. In the same context, new access routes for workers' camps may have impacts on natural habitats.

In case of dam breach area may be inundated, and population living in downstream may be affected total 90 trees will be cut down. No relocation is expected due to construction activities.

Mitigation Measures

As a part of the mitigation process, the contractors shall locate/ construct camps for their staff at least 500 meters away from communities in order to avoid social conflict as well to avoid the possible adverse impacts of the construction camps on the surrounding communities. Fencing will be provided around the camp site and security will be provided by the Contractor. Camp layout plan and workers code of conduct will be prepared by contractor and will be submitted for review and approval of the Engineer.

Preference will be given to local labour for work, most of the labour will go back to their homes on daily basis. Limited number of labours (35 – 40) labour would be resident in the camp. The contractor shall include information about HIV/AIDS and the spread of sexually transmitted diseases within the workers code of conduct. The contractor shall also include proposals for awareness on HIV/AIDS and the spread of sexually transmitted diseases in the CESMP and in training plan. The orientation sessions will be conducted for contractor workers regarding (Gender Based Violence GBV) and also sensitized workers about sexual harassment, child abuse, child labour, human trafficking for reducing the risk of GBV. First aid and medical facilities will also be provided by Contractor on site and camp areas.

Moreover, Contractor will purchase water from nearby available resources, as well as dig his own well, for the consumption of water in camps for domestic purpose. In ecological sensitive areas, construction activities will be confined in the designated areas. No new access routes will be developed for borrow areas or for the movement of supply vehicles. Existing routes will



be used for such activities. An emergency response plan will be prepared for the all dam site which will be triggered in case of dam break.

9. GRIEVANCE REDRESS MECHANISM (GRM)

It is proposed to establish the following GRM mechanism prior to commencing project implementation activities including pre-construction activities:

- A Public Complaints Centre (PCC), which will be responsible to receive, log, and resolve complaints;
- A Grievance Redress Committee (GRC), responsible to oversee the functioning of the PCC
- A non-judicial decision-making authority e.g. Project Management Team or Secretary Irrigation Government of Sindh for resolving grievances that cannot be resolved by PCC;
- Grievance Focal Points (GFPs), which will be educated people from each community on each sub-project site. The GFPs should be community members who easily approached by the community. The GFPs will be provided training by the Environment and Social Section of the PISSC and PMT, SRP.

9.1 Public Complaints Centre (PCC)

In its capacity as the Project Implementation Body, the PMT, in consultation with the Secretary Irrigation, Government of Sindh will establish a Public Complaints Centre (PCC) in the PMT, SRP office. The PMT and the local government bodies will issues public notices to inform the public within the project area of the Grievance Redress Mechanism. The PCC's phone number, fax, address, the email address will be disseminated to the people through displays at the respective offices of the Deputy Commissioner Khairpur and Tharparkar.

The PCC will be staffed by a full-time officer from the PMT and will be independent of the PISSC and contractor/operator. The officer should have experience and/or training in dealing with complaints and mediation of disputes. The PCC officer will have resources and facilities to maintain a complaints database and communicate with contractor, Site Engineers, PISSC and DC Khairpur and Tharparkar also with complainants.

The PCC will be responsible to receive, log, and resolve grievances. Given that the female community members have restricted mobility outside of their villages and homes, the female PMT staff will be required to undertake visits to the local communities. The frequency of visits will depend on the nature and magnitude of activity in an area and the frequency of grievances.



9.2 Grievance Redress Committee (GRC)

The GRC will function as an independent body that will regulate the grievance redress process. It will comprise of, Environmental and Social Specialists of PMT, Senior Engineer from PMT, Representative of DC office of Khairpur and Tharparkar, also senior members from civil society from sub-project areas. Decisions or findings taken in the Grievance Redress Committee would be binding upon the contractor.

9.3 Grievance Focal Points (GFPs)

The GFPs will be literate people from each community that will assist and facilitate the community members in reporting grievances resulting from project activities. The GFPs will be provided training by the PMT/PISSC in facilitating grievance redress. The GFP will be selected by the E&SS team of the contractor in consultation with the community. While selecting, preference would be given to literate person with willingness to perform the role.

Two GFPs (a female and male) will be selected for each sub-project.

9.4 Role and Responsibilities of PCC

The responsibilities of the PCC are:

- The PCC will log the complaint and date of receipt onto the complaint database and inform the PISSC and the Contractor;
- The PCC will instruct Contractors and PISSC to refer any complaints that they have received directly to the PCC. Similarly, the PCC will coordinate with local government to “capture” complaints made directly to them;
- The PCC, with the PISSC and the Contractor, will investigate the complaint to determine its validity, and to assess whether the source of the problem is due to project activities, and identify appropriate corrective measures. If corrective measures are necessary, PCC, through the PCI, will instruct the Contractor to take necessary action;
- The PCC will inform the Complainant of investigation results and the action taken;
- If the complaint is transferred from local government agencies, the PCC will submit interim report to local government agencies on status of the complaint investigation and follow-up action within the time frame assigned by the above agencies;
- The PCC will review the Contractors response on the identified mitigation measures, and the updated situation;
- The PCC will undertake additional monitoring, as necessary, to verify as well as review that any valid reason for complaint does not recur.



During the complaint investigation, the PCC should work together with the Contractor and the PISSC. If mitigation measures are identified in the investigation, the Contractor will promptly carry out the mitigation. PISSC will ensure that the measures are carried out by the Contractor.

9.5 GRM Steps and Timeframe

Procedures and timeframes for the grievance redress process are as follows:

- Stage 1: In this stage services of Community Liaison Officer (CLO) of Contractor will be utilized at site to register the complaints and grievances in the community. When a grievance arises, the affected person may contact directly with the contractor/operator and the project manager to resolve the issue of concern. If the issue is successfully resolved, no further follow-up is required;

The contractor will also formally maintain a record of all complaints and issues raised, through CLO assigned for each sub-project. The contractor will also display prominent signage containing the contact details of PCC in Sindhi language.

- Stage 2: If no ad hoc solution can be found at stage-1 at site level, the affected person/s will submit an oral or written complaint to the PCC by themselves or through GRM entry points (the CFP, PMT, PISSC, and Contractor/Operator). For an oral complaint, the PCC must make a written record. For each complaint, the PCC must investigate the complaint, assess its eligibility, and identify an appropriate solution. It will provide a clear response within five (5) working days to the complainant, PMT, and Contractor. The PCC will, as necessary, through PISSC; instruct the Contractor to take corrective actions. The PCC will review the Contractor's response and undertake additional monitoring. During the complaint investigation, the PCC will work in close consultation with the Contractors, and the Supervising Engineer (during construction) and with the SID (during operation). The contractors during construction and the PMT during operation should implement the redress solution and convey the outcome to the PCC within seven (7) working days;

In addition, the E&SS team of PISSC and PMT will also encourage oral and written feedback from the community during monitoring visits.

- Stage 3: If no solution can be identified by the PCC or if the complainant is not satisfied with the suggested solution under Stage 2, the PCC will organize, within two (2) weeks, a multi-stakeholder meeting under the auspices of the SID, where all relevant stakeholders (i.e., the complainant, PMT, contractor/operator, relevant local government offices) will be invited. The meeting should result in a solution acceptable to all, and identify responsibilities and an action plan. The contractors during construction and the



PMT during operation should implement the agreed-upon redress solution and convey the outcome to the PCC within seven (7) working days;

- Stage 4: If the multi-stakeholder hearing process is not successful, the PCC will inform Project Steering Committee (PSC) or Secretary Irrigation Department Government of Sindh accordingly, and the PSC or Secretary SID will organize a special meeting to address the problem and identify a solution; and
- Stage 5: If the affected people are still not satisfied with the reply in Stage 4, he or she can go through to local judicial proceedings.

9.6 Reporting

The PCC will record the complaint, investigation, and subsequent actions and results in the monthly Environmental Management and Monitoring reports. In the construction period and the initial operational period covered by loan covenants, the PMT will periodically report progress to the World Bank, and this will include reporting of complaints and their resolution. The tracking and documenting of grievance resolutions within the PCC and/or PMT will include the following elements: (i) tracking forms and procedures for gathering information from project personnel and complainant(s); (ii) dedicated staff to update the database routinely; (iii) systems with the capacity to analyse information so as to recognize grievance patterns, identify any systemic causes of grievances, promote transparency, publicize how complaints are being handled, and periodically evaluate the overall functioning of the mechanism; (iv) processes for informing stakeholders about the status of a case; and (v) procedures to retrieve data for reporting purposes, including the periodic reports to the PMT and including PCC reports into the monthly ESMP Compliance monitoring report to the World Bank.

9.7 Conclusion

The sub-projects will not harm the environment. The anticipated adverse impacts on the regional environment can be avoided or minimized by taking necessary mitigation measures and properly implementing environmental and social monitoring plan. There are number of positive effects of the proposed sub-project which in general will improve the environment and social aspects of the sub-project area. These may include the following.

- Increased water supply through wells due to the recharging of the aquifer
- Good quality water for drinking thereby eliminating water-borne diseases and good health.
- Extra supplies to grow more food crops like bajra, moong dal, and vegetables.
- More anticipated income means a rise in the standard of living.



10. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

10.1 Objectives

The purpose of Environmental and Social Management and Monitoring Plan (ESMMP) for the construction of small dam works is to ensure that all necessary identified measures have been adopted in order to protect the environment and social situations and to comply with country environmental and social legislation and applicable World Bank operational Policies. After the preparation of ESMF, PISSC have outlined site-specific ESMMP for the Contractors and executing agency.

10.2 Institutional Arrangement

10.2.1 Project Management Responsibilities

Implementation of the ESMP will be a contractual obligation between the Contractor and PMT, SRP. The Contractor shall engage full time technical staff capable of carrying out the monitoring activities as proposed in the ESMP as contractual obligations under the contract agreement.

PISSC in coordination with ESMU-PMT will carry out monitoring activities related to the project during the construction phase by using checklists and notify the Contractor of any violations of the ESMP, check the progress reports, advise the client and contractor regarding any violations which require further action and maintain a record of events and surveys for reference.

In addition, ESMEC as independent consultants will regularly monitor the environmental and social aspects of ESMP implementation including those associated with the Contractor's activities as and when required.

The overall responsibility for SRP project as well as Environmental and Social Management and Monitoring will rest with the Project Management Team (PMT), Irrigation Department Government of Sindh to be headed by a Project Director. The PD is supported by Additional Director Dams, Additional Director Bunds/Flood Levees, Additional Director Coordination and Technical Assistant. In addition, the PMT will be supported during the Environmental and Social Management Plan (ESMP) implementation by the Environmental and Social Management Unit (ESMU) to be established within PMT and Project Implementation Support and Supervision Consultants (PISSC) respectively.

The specific responsibilities of the institutions involved in the ESMP implementation is shown in the Figure-31 and described below.

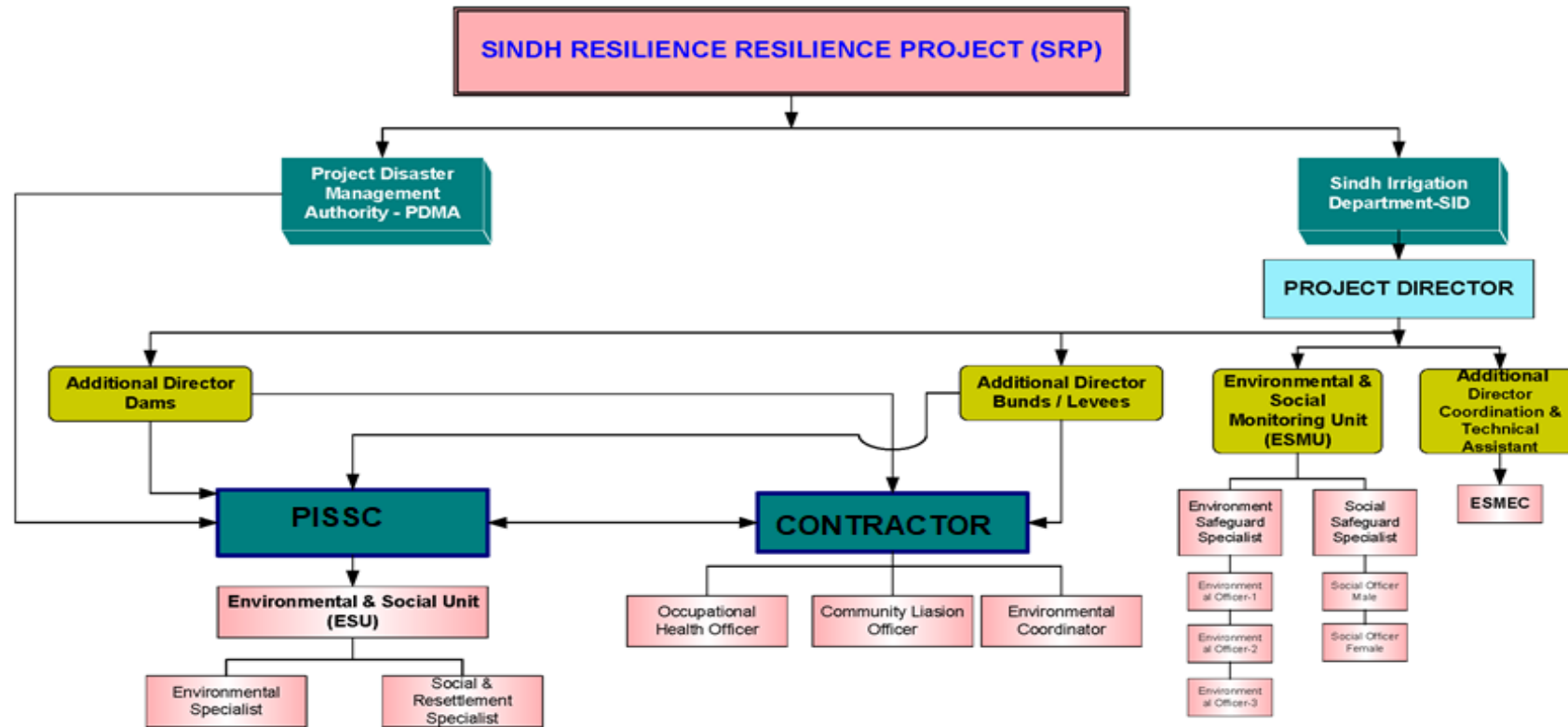


Figure 31: Organizational Chart of Sindh Resilience Project



10.2.2 Project management Team (PMT)

The overall responsibility for the supervision of ESMMP will rest with the Project Management Team (PMT) under the Sindh Irrigation Department and PDMA that will act as apex body of the project to take care of Social/Gender and Environmental issues and to take policy decisions at project level. An Environmental and Social Management Unit (ESMU) has been established within PMT under the supervision of Additional Director Coordination and Technical Assistant. Key positions within the ESMU include: Environment Specialist; Social and Resettlement Specialist.

The ESMU shall be responsible for the supervision of implementing and monitoring the ESMMP. The Staff of ESMU shall be answerable to the Project Director (PD) SRP. The ESMU shall be responsible for the monitoring defined in the ESMMP as part of their overall monitoring of the social and environmental management.

10.2.3 Project Implementation Support and Supervision Consultants (PISSC)

The Project Implementation Support and Supervision Consultant (PISSC) have been engaged by the project proponent and is responsible for day to day monitoring of the ESMMP on behalf of the Client/ PMT during execution of the Civil Works for sub-projects under the SRP and shall submit periodic reports to the PMT regarding the ESMMP and implementation status. The ESMPs prepared or to be prepared shall be part of the Contract documents. In general the PISSC has the following responsibilities pertaining to the environmental aspects of the project:

- Prepare the required documents, review and update the available documents relevant to the Project (including ESIA, ESMPs and RAP) and those to be prepared by the Contractor.
- Monitor the implementation of ESMPs and RAP on a regular basis during execution of civil works by the Contractor. An Environmental and Social Unit (ESU) within PISSC has been established which include the following key positions:
 - a) Environmental Specialist
 - b) Ecologist
 - c) Assistant Environmental Specialist
 - d) Social and Resettlement Specialist
 - e) Assistant Sociologist (s)

The ESU of PISSC shall be responsible for monitoring the contractor's compliance with the ESMPs. The role of the ESU-PISSC shall be day to day monitoring of the supervision of the ESMP with the assistance of social and environmental staff of the Contractor and reporting



any non-compliances to the PISSC Chief Resident Engineer, Resident Engineers as well as PMT.

10.2.4 Environmental/Social Monitoring and Evaluation (ESMEC) Consultant

The ESMEC is an independent body responsible for regular environmental and social monitoring for the SRP Project on behalf of PMT. The ESMEC has environmental and social experts and shall carry out intermittent third-party monitoring of the project.

10.2.5 Contractor

The Contractor will be responsible for the on-field implementation of the ESMP as well as maintaining responsibility for environmental protection liabilities under Sindh Environmental Protection Act (SEPA), 2014, World Bank safeguard policies, ESMF, sub-project specific ESMPs and other applicable national as well as provincial policies and regulations.

The Contractor will also be responsible for training his crews on all aspects and implementation of the ESMP. The bid should include an environmental and social mitigation budget as part of the engineering costs of the respective works. The key positions to be filled within the contractor's staff for implementation of the ESMP include:

Environmental Coordinator(s); Occupational Health and Safety (OHS) Officers; and Community Liaison Officers.

10.3 Environmental Code of Practices (E.CoP)

The objective of preparation of the Environmental Code of Practices (E.CoP) is to address less significant environmental impacts and all general construction-related impacts for the proposed SRP project implementation. The E.CoPs will provide guidelines for best-operating practices and environmental management guidelines to be followed by the contractors for sustainable management of all environmental issues. This E.CoP will be annexed in the general conditions of all the contracts to be carried out under the SRP project. Detailed E.CoPs are attached as Annexure VII.

10.4 Contractor's Plans

This ESMP has been prepared prior to Contract award, and therefore, certain mitigations which are dependent upon the methodology chosen by any Contractor to deliver the project, could not be specified in it. For example, haulage routes are dependent upon the exact campsite locations chosen by the Contractor. Therefore, it is required that the Contractor shall prepare plans within 30 days of the signing of the contract or before mobilization and implement the plans described below with the help of mitigation measures discussed in



Section 6. Once approved by the Engineer and Environment Specialist of PISSC, these documents will become part of the ESMP for the Contract.

10.4.1 Corona Virus Management Plan (COVID-19)

The contractor shall provide the details of prevention measures, arrangements planned for the Management of COVID. The Plan shall include the details of the designated quarantine area, disinfection facilities for Vehicles, and inventory arriving on site. The plan shall also include necessary supplies, such as face mask, soap, hand sanitizers, temperature monitoring infrared guns, etc. Disposal of COVID related waste plan shall also be prepared.

10.4.2 Pollution (Air, land, and water) Control Plan

The Contractor shall provide details of the principal pollution control facilities proposed and of contingency plans in the event of failure of these facilities. The plan shall include the details of the designated and licensed tip, oil treatment facilities, and hazardous waste disposal sites which shall be used to dispose of waste. The plan shall also include Environmental effects monitoring. Contractor shall develop the plan as per SOP developed by PMT-SRP team which is attached as Annexure-VIII.

10.4.3 Waste Management Plan

The Contractor shall include details of the procedures for the collection and disposal of wastes. The Plan shall deal with each waste stream separately.

10.4.4 Traffic Management Plan

The basis of the Contractor's Traffic Management Plan and further information is to be provided. The Contractor is required to provide further details once camp/work site locations and material sources are finalized. The Traffic Management Plan must include details of the proposed access routes to the project area as well as haulage and access routes throughout the project area (including access to and from borrow pits).

10.4.5 Plan for Handling of Hazardous Materials

The Contractor shall identify control measures to ensure no environmental or health impacts from the handling of hazardous materials and the collection and safe disposal of hazardous materials (this may be including within the Pollution Control Plan).



10.4.6 Occupational Health and Safety

Upon mobilisation, and within 15 days of commencement, the Contractor shall prepare an Occupational Health and Safety Plan which shall be relevant to his chosen methodology. This plan shall detail the following:

- Health and safety management structure, responsibilities, supervision and reporting scheme
- Health and safety goals for the project
- Identification of potential hazards (health risks, safety risks)
- Proposed measures to reduce the risk of identified hazards
- Arrangements to implement such measures
- A system for reporting and investigating accidents, incidents and near misses
- A plan for emergency transfer of staff or public from site to medical facilities
- Fire and emergency procedures
- Site security.
- Management and Monitoring of COVID-19

10.4.7 Environmental and Social Awareness Training Plan

This shall include details of the Contractor’s environmental and social awareness training program proposed for the workforce. Details are given in Table-38 given below.

Table 38: Environmental and Social Awareness Training Plan

Areas of Training	Key Aspects to be Covered	Target Group	Frequency	Budget.
Environment, Social and Resettlement	<p>a. Environmental and social awareness;</p> <p>b. Key environmental and social issues associated with the project and subprojects ESIA's and ESMP's findings;</p> <p>c. Subproject monitoring and reporting;</p> <p>d. Occupational Health and Safety Issues associated with Construction.</p> <p>e. Grievance Redress Mechanism implementation</p> <p>f. Gender Based Violence (GBV)</p> <p>g. Child Labor</p> <p>h. COVID -19 Management and Monitoring</p> <p>i. Safety measure for COVID-19</p>	PMU, PIC and Contractor staff as well as relevant communities.	Before project/physical works commencement , during construction and after construction.	Total nine types of trainings for six dams are to be conducted throughout the life of sub-projects. Each training will cost about 150,000 rupees. Total Budget is Rs.900,000 for Six Dams.



10.4.8 Emergency Response Plan

The contractor will prepare an emergency plan to address emergencies/events such as fire, floods, earthquake, accidents, and death/injury. The Plan will include the following details:

- Contacting the relevant agency (e.g., Fire Brigade)
- Procedure for shutdown of site;
- Indicators on site that shall prompt the shutdown of areas of work (linked to natural events)
Emergency evacuation procedure of staff and members of the public within range of likely impact.)

10.4.9 Tree Plantation and Maintenance Plan

Most of the trees to be felled are *Acacia nilotica* and *Prosopis Cinereria*. These trees are common in the project area. The Contractor is required to prepare an inventory of the trees to be cut/uprooted before the commencement of the physical works in presence of PISSC and PMT staff, submit a detailed tree plantation plan, defining the proposed plantation methodology, species and plantation locations. The plantation location shall be approved by the PISSC Engineer and PMT approval. All trees to be planted shall be of native species as they have more chances of survival and plantation of invasive species shall be prohibited. The Contractor shall be responsible for the aftercare of the saplings/plantation for one year.

10.4.10 Emergency Preparedness Plan in case of Dam Break

A consolidated emergency preparedness plan will address emergencies in case of Dam break; this plan will be prepared for all dams covered under SRP by (Supervision & Design Consultants) before the completion of all dams and the same will be submitted to the World Bank.

10.5 Mitigation and Monitoring

Mitigation measures for reduction of environmental degradation and social impacts especially relating to air quality, soil contamination, pollution of water resources, loss of habitat and disruption to wildlife will need to be implemented and monitored. Monitoring tasks will vary over the construction and operation stages of the sub-projects. Physical, biological and socio-cultural parameters will be measured/monitored to determine compliance with national and international standards and compliance with the ESMP itself. Monitoring during the construction phase will largely consist of compliance with mitigations identified in Section 8.

Table 39 presents the mitigation and monitoring plan.



10.6 Compliance and Effects Monitoring

PISSC shall carry out monitoring within the subproject area using the monitoring checklists to be prepared based on this mitigation and monitoring plan.

To aid the monitoring process, the Contractor will complete the following:

- Submit the plans detailed earlier in Section 8.
- Train construction staff for the implementation of the ESMP and safety measures.
- Submit various progress reports to the Environmental and Social Specialists of PISSC and ESMEC.
- Explain the implementation of various environmental aspects to visiting national and international agencies and representatives of the donor.
- Receive monitoring reports/notes issued by ESMU and PISSC and take action to mitigate various violations to ESMP.
- Regularly submit Reports to PISSC Engineer and Environment Specialists about the compliance to the ESMP and various issues related to the HSE including but not limited to the following:
 - OHS Measures adopted (OHS statistics)
 - Fuel and hazardous material consumption
 - Workforce statistics (employment/deployment etc.)
 - Compliance monitoring to check whether the actions proposed in the ESMP is being carried out.
 - Effects monitoring to record the impacts of mitigation measures adopted on the biophysical and social environment; as applicable, these effects are repeatedly measured.

Compliance monitoring will be completed by PISSC and ESMU-PMT with independent monitoring by ESMEC. The effects monitoring shall be the responsibility of PISSC.

Examples of compliance and effects monitoring parameters are included in Box 10.1. Both approaches will be conducted using the monitoring parameters given in Table 40 by visual observation, photographic documentation, and measurement where necessary. A record of events and surveys will be maintained.

Compliance monitoring will also be facilitated using checklists included to be prepared by PISSC and ESMU of PMT during the project implementation.



Box 10.1

(i) Compliance Monitoring:

- Frequency of anti-dust water sprays during construction period;
- Installation of signage regarding community health and safety
- Safety at workplaces and working hours during construction;
- Incidence of liquid/solid waste in the vicinity of work camps (type and amount of waste, amount, interference with local residents, fauna, flora and crops);
- Plantation of saplings of new trees against trees cut
- Survival rate of saplings of new trees
- Arrangements made at construction sites for protection of floral and faunal resources
- Assurance of installation of signage regarding community health and safety

(ii) Environmental Effects Monitoring

- Ambient air quality (Particulate matter) during construction phase;
- Surface water quality during construction phase especially at diversion sites
- Ground water quality at camp sites;
- Ground water table at construction sites;
- Number of patients suffering from malaria, cholera, diarrhoea, respiratory ailments during construction phase
- Noise levels (in dBA), monitored at fixed locations and planned schedule during construction
- Extent and degree of functionality of diversion channels to ensure un-interrupted water supply;
- (iii) Social Effects Monitoring
- Number of local people recruited on project works.
- Incidence of child labour and disproportionate wages
- Conflict at community level
- Chance find archaeological site
- Grievance redressal mechanism is in place
- Health screening of labour at site



10.7 Environmental Non-compliances and Corrective Measures

The Contractor will be notified of any violations of the ESMP, as well as any corrective actions required.

Outlined below are some steps, relating to the increasing severity of environmental problems, which will be implemented. The principle is to keep as many issues within the first few steps as possible.

Step 1. PISSC discusses the problem with PMT and Contractor to work out mitigations together and record the facts and the decision implemented.

Step 2. A more serious infringement is observed and PISSC notifies the Contractor of the issues in writing, with a deadline by which the problem must be rectified. All costs will be borne by the Contractor.

Step 3. PISSC/PMT shall order the Contractor to suspend part, or all, of the works. The suspension will be enforced until the offending parties, procedure, or equipment is corrected and/or remedial measures put in place if required. No extension of time will be granted for such delays and all costs will be borne by the Contractor.

Step 4. Breach of contract - One of the possible consequences of this is the removal of a Contractor and/or equipment and/or the termination of the contract. Such measures will not replace any legal proceedings that PMT may institute against the Contractor.

10.8 Communication Reporting and Documentation

The following environmental meetings are proposed:

- Primary meetings between ESMU-PMT, PISSC, and Contractor for setting out the format for the regular meetings shall be held before the commencement of the project.
- Scheduled Environmental and Social Progress Review Meeting (ESRPM) meetings between ESMU-PMT, PISSC, and Contractor shall be done every month.

The purpose of the meetings is to discuss the conduct of the operation, non-compliances noted by the PISSC and ESMU environmental and social teams and measures recommended for their remedy.

The Contractor and PISSC's environmental and social teams will produce monthly, quarterly, and works completion reports of the sub-projects based on the social and environmental issues. The distribution of the reports shall be to PMT, ESMEC, and World Bank.



A photographic record of the project area shall be kept. Photographs will be taken at key locations using a digital camera of the project area in a walkthrough survey by contractor, PISSC, and ESMU-PMT. The following data shall be recorded for each photograph:

- Shot number
- All the photographs will be referenced with GPS Coordinates
- Title of photograph
- Date and Time, and
- Photographic features.

The photographic record shall be incorporated into the monthly reports. Completed monitoring checklists to be prepared separately during the implementation of the project by PISSC, ESMU of PMT, and ESMEC shall be appended to the monthly reports.

Complaints Register. The Contractor will maintain a complaint register at the campsite and workplaces to document all complaints received from the local communities. The register will also record the measures taken to mitigate the reported concerns. The final report will be communicated to the ESMU of PMT. All complaints/issues of the community will be reported in the monthly progress report of the following month along with the status of the last month's complaints and will be reviewed by PISSC, ESMEC, and ESMU of PMT.

Moreover, telephone numbers and addresses of all concerned tiers within the GRM would be displayed in Sindhi and Urdu at all sites, and the same would also be distributed in community training/meetings.

Change Record Register. There are two scenarios in which a review of this ESMP will be triggered:

- A change to the designs which deviate from the parameters which are safeguarded in this ESMP.
- A discovery in the baseline socio-environmental conditions which is not recognized or covered by this ESMP.

In the event of either scenario, the ESMP shall be updated and reissued accordingly. The design change record shall be maintained by the Contractor and PISSC to document any change in the project design/operation. The ESMU and ESMEC would supervise the number of design change applications and suggestions received from the local people and its implementation by PISSC and Contractor.



10.9 Environmental and Social Management and Monitoring Cost

It is estimated that 90 trees will be felled for the construction of the above mentioned 6 (Six) dams. The replanting of 5 times trees to this number would cost Rs 450,000 rupees @ the rate of Rs 1000 per tree. Adding the cost of Rs. **98,609,600/-** budget for the implementation of the ESMP has been allocated. Details are given in Table-39 below.

Table 39: Cost of Environmental / Social Management and Monitoring

Items	Unit Cost	No of Units	Estimated
A. Samlee Dam			
Training (Different training for 50 persons)	3,000	50	150,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	7000	26	2,184,000
Drinking-Water Quality Monitoring (During Const) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	7000	50	350,000
COVID-19 Test for staff and worker for two rounds	6,000	100	600,000
Personal Protective Equipment(for 50 persons approx)	3,500	50	175,000
Fire Fighting Equipment purchase and refilling	3,000	15	45,000
Health, Hygiene and COVID-19 Management and Monitoirng as per SOPs	Lumpsum	--	150,000
Ambient Air Monitoring(Pre-Const, During Const,) at one construction location	27,000	12	324000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8,400
Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300,000	12	3,600,000
General Community support needs (if any)	Lumpsum	--	10,000,000
Subtotal			17,706,400
Contingency Cost 10%			1,770,640
Total			19,477,040
B. Sehryoon Dam			
Training (Different trainings for 50 persons)	3,000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring (12 months)	7,000	26	2,184,000
Drinking-Water Quality Monitoring (During Const)	10,000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	7,000	50	350,000
COVID-19 Test for staff and worker for two rounds	6,000	100	600,000
Personal Protective Equipment(for 50 persons approx)	3,500	50	375,000
Fire Fighting Equipment purchase and refilling	3,000	15	45,000
Health, Hygiene and COVID-19 Management and Monitoirng as per SOPs	Lumpsum		150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27,000	12	324,000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8,400



Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300,000	12	3,600,000
General Community support needs (if any)	Lumpsum	--	10,000,000
Subtotal			17,906,400
Contingency Cost 10%			1,790,640
Total			19,697,040
C. Paro Jo Wandhio Dam			
Training (Different training for 50 persons)	3000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring (12 months)	7,000	28	2,352,000
Drinking-Water Quality Monitoring (During Const)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	7000	50	350,000
COVID-19 Test for staff and worker for two rounds	6000	100	600,000
Personal Protective Equipment(for 50 persons approx)	3,500	50	175,000
Fire Fighting Equipment purchase and refilling	3,000	15	45,000
Health, Hygiene and COVID-19 Management and Monitoirng as per SOPs	Lumpsum	--	150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8,400
Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300,000	12	3,600,000
General Community support needs (if any)	Lumpsum	--	10,000,000
Subtotal			17,874,400
Contingency Cost 10%			1,787,440
Total			19,661,840
D. Jaganwari Dam			
Training (Different trainings for 50 persons)	3,000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring (12 months)	7,000	28	2,352,000
Drinking Water Quality Monitoring (During Const)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	7000	50	350,000
COVID-19 Test for staff and worker for two rounds	6000	100	600,000
Personal Protective Equipment(for 50 persons approx)	3,500	50	175,000
Fire Fighting Equipment purchase and refilling	3,000	15	45,000
Health, Hygiene and COVID-19 Management and Monitoirng as per SOPs	Lumpsum	--	150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27,000	12	324,000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8,400
Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300,000	12	3,600,000
General Community support needs (if any)	Lumpsum	--	10,000,000
Subtotal			17,874,400
Contingency Cost 10%			1,787,440
Total			19,661,840
E. Darigh Dam			



Training(Different trainings for 50 persons)	3,000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring (12 months)	7,000	28	2,352,000
Drinking Water Quality Monitoring (During Const)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	7000	50	350,000
COVID-19 Test for staff and worker for two rounds	6000	100	600,000
Personal Protective Equipment(for 50 persons approx)	3,500	50	175,000
Fire Fighting Equipment purchase and refilling	3,000	15	45,000
Health, Hygiene and COVID-19 Management and Monitoirng as per SOPs	Lumpsum	--	150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27,000	12	324,000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8,400
Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300,000	12	3,600,000
General Community support needs (if any)	Lumpsum	--	10,000,000
Subtotal			17,874,400
Contingency Cost 10%			1,787,440
Total			19,661,840
F. Tungwari Dam			
Training (Different trainings for 50 persons)	3000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring (12 months)	7,000	28	2,352,000
Drinking Water Quality Monitoring (During Const)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	7000	50	350,000
COVID-19 Test for staff and worker for two rounds	6000	100	600,000
Personal Protective Equipment(for 50 persons approx)	3,500	50	175,000
Fire Fighting Equipment purchase and refilling	3,000	15	45,000
Health, Hygiene and COVID-19 Management and Monitoirng as per SOPs	Lumpsum	--	150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8,400
Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300,000	12	3,600,000
General Community support needs (if any)	Lumpsum	--	10,000,000
Subtotal			17,874,400
Contingency Cost 10%			1,787,440
Total			19,661,840
Total of A+B+C+D+E+F			117,821,440
Compensatory tree Plantation			450,000
Grand Total Cost			118,271,440

Table 40: Environmental, Social and COVID Management and Monitoring Plan

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
Design and Pre-construction Phase					
Site Selection	No Impacts has been envisaged during site selection which require mitigation measures	Not required	Nil	Nil	Nil
Construction Phase					
Establishment of camp and machinery/equipment/ stone stacking yard/workshop etc.	Conflict due to use of privately owned agriculture land for camp construction	Establishment of camp on designated sites or at alternative suitable site within state owned land/ Irrigation Department. Community consultations will be carried out and liaison will be maintained Approval of camp site from the Engineer will be obtained.	Approval obtained from the Engineer; Photographic record maintained; Camp established on designated government land.	At time of camp establishment	Execution by contractor Monitoring by PISSC/PMT
	Social conflicts due to influx of external workforce	Establishment of camp on designated sites or at alternative suitable site within Right of Way of the bund belong to irrigation department. Contractor to obtain approval from the Engineer.	Camp shall be established at least 500m away from the nearest community; Local hired workforce; Any complaint from the local community.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	Child labor	Hiring of work force from local communities; Awareness raising of residents for safety protection. Awareness raising of labor to ensure respect for local customs. No child labor will be used.	Presence of National Identity card or relevant document.		
	Conflicts arising due to mixing of local and migratory job seekers.	Preference to provide jobs to local job seekers; Motivation to the workers for a good workmanship.	Jobs will be given to locals; Any complaint will be registered in complaint box.	Fortnightly	Monitoring by PISSC/PMT
Workers safety and hygienic conditions	Health risks due to unsafe and unhygienic living environment	Preparation and implementation of OHS Plan. Safety measures taken by the contractor such as installation of firefighting equipment, safe storage of hazardous material, fencing, provision of first aid facilities etc.; Contingency measures in case of accidents; Obligatory insurance of contractor's staff and laborers against accidents; Provision of adequate sanitation, washing, lighting, cooking and dormitory facilities. OHS trainings to construction and camp staff.	Approved OHS Plan. Evidence of OHS trainings conducted. Accident/Incident reported.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Camp site security	Security hazards. Security related conflicts with local community.	Proper fencing of the camp site; Deployment of guards for security; Friendly relations with the local community.	Any security issue emerged.	Monthly	Execution by contractor Monitoring by PISSC/PMT
Parking/repair of machinery and equipment	Soil and water contamination due to spillage of liquid wastes (Lubricants, fuel, chemicals from the machinery yard).	Proper maintenance of machinery and equipment; Ensuring proper storage and disposal of used oil etc.; Ensuring good housekeeping practices at workshop areas; Avoiding waste oil spill into soil and	Any spill observed; Availability of sealed containers for used oils and lubricants;	Fortnightly	Execution by contractor Monitoring by CSC/PIU/SEMU



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		adjoining area; Appropriate arrangements such as usage of concrete base drip pans to avoid spills during fuelling/oil change.			
Operation of diesel operated generators	Deterioration of air quality; Noise exceeding 75 dB is harmful for receptors.	Proper tuning and maintenance of generators.	Low smoke emissions; Noise levels within permissible limits (75dB at day time and 65dB at night time).	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Use of water for construction and consumption	Conflict with local water demand.	The contractor to make his own arrangements for water required for construction ensuring that water availability and supply to nearby communities remain unaffected.	Any conflict on the water availability.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Water supply to labour camp	Water related health risks (Gastroenteritis, Diarrhoea etc.)	Provision of safe drinking water supply at the camp as well as at working places by the contractor. Ensuring water quality as per SEQs from a SEPA certified laboratory.	Any water borne disease observed; Water quality analysis reports.	Quarterly	Execution by contractor Monitoring by PISSC/PMT
Sanitation and wastewater disposal	Soil and water contamination	No disposal of sewage into adjoining area; Construction of sewage treatment arrangement such as lined septic tank and collection chamber/soaking pit;	Inspection to ensure that sewage system is actually operating; Photographic record;	Monthly	Execution by contractor Monitoring by PISSC/PMT
Solid waste generation	Land pollution	Ensure proper collection and disposal of waste generated from camp at designated disposal pit (away from the camp site) approved by the Engineer; Prohibition on burning of waste; Good	Covered disposal containers placed at camp; Designated disposal pit available; Visual inspections.	Fortnightly	Execution by Contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		housekeeping practices to minimize waste generation.			
Storage, handling, and transport of hazardous materials	Work safety and human health risks	Provision of double containment for storage of hazardous material (if any).	Record of harmful incident occurred.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Restoration of camp area	Low aesthetic value if campsite is not restored to its original landscape	Remove all types of waste, debris, and discarded construction materials and machinery from the camp site and other site facilities..	Camp area restored. Photographic record;	At time of demobilization of the contractor	Execution by Contractor Monitoring by PISSC/PMT.
Work Places					
Manpower at work	Occupational Health and Safety (OHS) issues	<p>During activity of steel formation, concreting work, entry of unauthorised persons will be restricted. Without PPEs no any person will be allowed to enter in work area.</p> <p>Job specific PPEs will be provided. Prior to activity TBTs will be provided.</p> <p>Training on the benefits of use of PPEs, and work at height will be provided on periodically basis.</p> <p>Housekeeping will be maintained on site and in Camp areas to avoid any trip hazard.</p> <p>Provision of first aid facilities and standby emergency vehicle (ambulance).</p> <p>Occupational Health and Safety officers will be deputed on site to supervise the OHH related issues.</p>	<p>Approved OHS Plan.</p> <p>Evidence of OHS trainings conducted.</p> <p>PPE provided and used; First aid facilities provided; Record of injuries/ illness and near misses.</p>	Preparation at the start of execution of civil works and monitoring of its implementation on daily basis.	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		Orientation of project will be provided to all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working.			
	Workers code of conduct.	The contractor will prepare workers code of conduct plans and Camp layout plan and get it approved from the Resident Engineer and PMT for implementation at site. Especially working in Khirthar National Park.	The approved code of conduct is implemented.	During the life of contract.	Execution by contractor Monitoring by PISSC/PMT
	Child Labor	The contractor should maintain the labor registry for workers at site, and age verification should be conducted upon employment to make sure that children are not employed in the project	Labor register is made available at site containing complete data of all employees hired by the contractor	During the life of contract.	Execution by contractor Monitoring by PISSC/PMT
	Prohibition of gender-based violence.	Awareness will be raised regarding prohibition of gender-based violence through trainings.	Evidence of training	During the life of contract.	Execution by contractor Monitoring by PISSC/PMT
	Employment opportunities for local community	The contractor would hire employees from the local community (skilled and unskilled) and this would be part of the contract with the contractor.	Employment data from the contractor On site verification of the data provided by the contractor	During the all phases of contract.	Execution by contractor Monitoring by PISSC/PMT
Operation and movement of machinery and equipment	Deterioration of air quality due to exhaust gases and dust emissions	Proper engine tuning of machinery/equipment; Water sprinkling at dust prone areas.	Gas emissions minimized; Dust emissions controlled.	Monthly	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		<p>Prior to entry into the park, heavy equipment will be cleaned to prevent importation of non-native plant species, hydraulic fittings will be tightened, and it will be ensured that hydraulic hoses are in good condition and shall be replaced and repaired if petroleum leaks are observed.</p> <p>Proper and timely maintenance will be provided for vehicles and equipment used during construction to reduce the potential for mechanical breakdowns</p>	Check the fitness of the heavy machinery / equipment.		Execution by contractor Monitoring by PISSC/PMT
	Noise from vehicles, compaction rollers, concrete mixers and construction equipment exceeding 75 dB is harmful for receptors.	Proper engine tuning of machinery/equipment; Avoid night time traffic particularly near communities.	Levels within permissible limits (75dB at day time and 65dB at night time).		Execution by contractor Monitoring by PISSC/PMT
Transportation of construction material	Smoke and dust generation; Fall of transported material; Chance of accidents; damage to access roads.	Use earth material with the approval of the Engineer; Prepare traffic Management Plan to procure shingle from approved quarry and get approved by the Engineer; Regular inspection, tuning, and maintenance of transport vehicles; Material transport in closed containers or covered with canvas (Tarpal) sheets. Avoid night time activity;	Vehicles properly maintained; Designated borrow and quarry areas used; No fall of transported material; Damaged road repaired. Evidence of implementation of Traffic Management Plan.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		Maintain liaison with communities; Repair of damaged roads.			
		Truck and related construction equipment speeds will be limit in active construction areas to a maximum of 15 KM/hr and strictly adhering to park regulations and posted speed limits in other areas while inside park boundaries.			
	Soil erosion and contamination	Vehicle speeds to 30km/h.; Restriction on repair of vehicles and equipment in the field.	Monitoring compliance; Log of vehicle and equipment repairs; Soil erosion observed		Execution by contractor Monitoring by PISSC/PMT
	Air pollution	Use of machinery and vehicles with properly tuned to avoid the exhaust emissions. Sprinkling of water on site and on routes near communities. Water bowsers will be used to control excess airborne particulates at staging areas, active construction zones, and unpaved roads leading to/from active construction areas It will be ensured and implemented that the project remains within the parameters of Sindh Environmental Quality Standards.	Route maps of vehicle movement; Log of vehicle maintenance.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Water pollution	Avoiding washing of vehicles along the pond area. It will be ensured and implemented that the project remains within the	Monitoring compliance; Water quality testing.	Monthly	Implementation by Contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		parameters of Sindh Environmental Quality Standards.			
	Noise pollution	Use of muffles (silencers) in vehicles to minimize noise; Avoiding movement of vehicles at night near communities.	No construction activities at night; Log of vehicle movement; Visual inspections of the vehicles.	Fortnightly	Execution by construction contractor Monitoring by PISSC/PMT
	Occupational, Health and Safety issues	Preparation and implementation of OHS Plan. Fixing of sign board at detours; Use of PPE; Awareness raising of drivers; Avoiding speedy movement of vehicles near communities; Training of construction workers and others; Regular liaison with communities.	Approved OHS Plan. Evidence of OHS trainings conducted. PPEs used by workers; Reflectorized road signs; Visual inspections.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Construction works	Soil erosion and contamination	Proper compaction to minimize wind and water erosion; strengthening of bunds with earth filling and stone pitching according to design specifications will minimize erosion; The top and slope of the dam bunds will not be left un-compacted during construction works; Machinery and equipment will not be repaired and maintained at the site; No waste effluents will be released in to the ponds.	Erosion observed; Photographic record; contamination signs observed.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	Accident risks	Preparation and implementation of OHS Plan. Preparation of emergency response procedures (ERPs); Usage of PPEs; Provision of first aid kits and emergency vehicle. Trained drivers will be hired to operate machinery safely; Availability of trained operator to operate machinery.	PPEs provided and used; Record of any accident. Availability of ERPs	Fortnightly	Execution by contractor Monitoring by PISSC
	Loss of natural vegetation and associated fauna	59 Trees including young and mature expected to removed/relocated from site. On place of cut down/uprooted trees 295 new trees will be planted. Cost has been allocated for tree plantation for better environment in ESMP Implementation Cost. Tree plantation plan for indigenous species will be prepared including the type of species, location for plantation and other necessary information. No invasive species will be planted.	Record of tree cutting; Photographic record;	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Damage to infrastructure	Restoration/ rehabilitation of damaged infrastructure with entire satisfaction of the affected persons. Construction activities will be confined in the designated areas.	Visual inspections; Photographic records; Consultations/Interviews, Infrastructure restoration records.	Monthly	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	Breaking up of Land for Cultivation or mining purpose	It will ensured that, project acvities will remain isolated as per design excavations, no other activities will be permitted.	Review the designs and layout	Monthly	Execution by contractor Monitoring by PISSC/PMT
	Noise pollution	Noisy work shall be performed (such as the operation of heavy equipment) between the hours of 6:30 a.m. and 5:00 p.m. to minimize disruption to nearby community. Use of noise reduction devices; Regular inspection, maintenance and lubrication of the construction vehicle and equipment; Use of PPEs such as earplugs and earmuffs by the workers; Avoid night time activity. Construction activities will be confined in the designated areas	Noise levels measured.	Fortnightly	Execution by construction contractor Monitoring by PISSC/PMT
	Air pollution	Proper engine tuning of machinery/ equipment; Water sprinkling particularly at work sites near the communities.	Dust emission controlled; Monitoring on stack of machinery and equipment; Evidence of measurement records;	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Land degradation; soil erosion; pooling of water and drainage problem	Excavation of borrow sites as per specifications from river bed.	Visual inspections; Photographic records.	Fortnightly	Executing agency and contractor Monitoring by PISSC/PMT
	Residual wastes; construction material waste	Remove any left-over construction material/wastes from the construction sites. Trash will be properly secured during the workday and all trash	Waste material removed.	End of the rehabilitation works	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		shall be removed from site at the end of each workday.			
Safety/health measures for local population	Accident risks, particularly for local population living within/near the subproject especially women, children and elderly people; Public awareness campaigns through displaying sign board at site and haulage routes; Vulnerability to accidents; Deterioration of health due to dust	Restriction on movement of machinery on the designated haulage routes for transportation of materials; Public awareness campaigns through displaying sign board at site and haulage routes; Interaction with community; Setting up speed limits (not more than 30 Km in work areas); Availability of first aid box for locals; Strict enforcement keeping non-working persons, particularly children, away from work sites; Adequate signage to manage traffic at sites, haulage and access roads; Ensure water sprinkling.	Visual observations; Record of accident; any complaint from the community.	All activities on daily basis except public consultation that will be carried out on monthly basis	Executing agency and contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
Working near Wildlife Habitats	Damage to Wildlife, Hunting ,poaching to wildlife in National Park	<p>Effects of light and noise on adjacent habitat shall be limited through controls on construction equipment.</p> <p>Orientation of project will be provided to all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working.</p> <p>Construction activities will be confined in the designated areas</p> <p>Adequate education will be provided and enforcement to limit construction worker activities that are destructive to wildlife and habitats.</p> <p>Firing any gun or doing any other act which may disturb any animal or bird shall be prohibited which interferes with the breeding places.</p>	Ensure that all workers have signed the code of conduct.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Operation Phase					
Animal burrowing	Damage to the structure	Regular inspection of structures against burrowing by animals. (Rodents, porcupines, reptiles etc.). Removal of the animals from burrow and filling/ compaction of pit.	Visual observation.	Fortnightly	Executing agency Monitoring by PISSC/PMT
Care of newly planted trees	Mortality of newly planted saplings	The Contractor shall be responsible for after care of the newly planted	Survival of trees	Fortnightly	Executing agency Contractor and SID





Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		trees for the first year, after which trees will be handed over to the client.			Monitoring by PISSC/PMT
Impacts on lower riparian	Strom water will be blocked for lower riparian / downstream users.	With the construction of dams aquifer will recharge. It is expected that groundwater level will be raised. Solar operated tube well will be installed for closely monitoring of groundwater level.	Make sure that groundwater level is recharged	Monthly basis	Contractor, PMT, SID
Impacts on existing community tracks	Two kacha tracks of villages are expected to affect	All the pedestrian and vehicular tracks, which could be blocked by dam reservoirs or affected by construction activities will be realigned by providing unmetalled vehicle tracks. Cost estimation has been made	Make sure that works is undertaken as per Bill of Quantities.	Start of execution of civil works	Contractor, PISSC, PMT



ANNEX I: SCREENING CRITERIA TO DETERMINE ENVIRONMENTAL CATEGORY OF SUB PROJECTS

Title of Sub-project: Samlee Dam			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration: 12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
<ul style="list-style-type: none"> • There are 3-4 number of trees located within reservoir area of Samlee Dam. • There are no settlement near the proposed dam site • There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area. • During construction some natural habitats might be disturbed. • There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities. • No any forests observed near the dam site. • Ambient Air quality is clear and noise level is under SEPA standard. 			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.13 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.12 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies	Triggered (Yes/No)	Explanation	
Environmental Assessment OP/BP/GP 4.01	Yes		
Natural Habitats OP/BP 4.04	Yes		
Forest OP/BP 4.36	No		



Title of Sub-project: Samlee Dam		
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	
Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Waterways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	



Title of Sub-project: Sehriyoon Dam			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration: 12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
<ul style="list-style-type: none"> • There are 8-10 number of trees located within reservoir area of Sehriyoon Dam. • There are no settlement near the proposed dam site • There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area. • During construction some natural habitats might be disturbed. • There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities. • No any forests observed near the dam site. • Ambient Air quality is clear and noise level is under SEPA standard. 			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.32 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.18 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies	Triggered (Yes/No)	Explanation	
Environmental Assessment OP/BP/GP 4.01	Yes		
Natural Habitats OP/BP 4.04	Yes		
Forest OP/BP 4.36	No		
Pest Management OP/BP/4.09	No		
Physical Cultural Resources OP/BP 4.09	No		
Involuntary resettlement	No		



Title of Sub-project: Sehriyoon Dam		
OP/BP 4.12		
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	



Title of Sub-project: Paro Jo Wandhio Dam			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration: 12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
<ul style="list-style-type: none"> • There are 12-15 number of trees located within reservoir area of Paro Jo Wandhio Dam. • There are no settlement near the proposed dam site • There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area. • During construction some natural habitats might be disturbed. • There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities. • No any forests observed near the dam site. • Ambient Air quality is clear and noise level is under SEPA standard. 			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.13 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.23 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies	Triggered (Yes/No)	Explanation	
Environmental Assessment OP/BP/GP 4.01	Yes		
Natural Habitats OP/BP 4.04	Yes		
Forest OP/BP 4.36	No		
Pest Management OP/BP/4.09	No		
Physical Cultural Resources OP/BP 4.09	No		
Involuntary resettlement OP/BP 4.12	No		



Title of Sub-project: Paro Jo Wandhio Dam		
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	



Title of Sub-project: Jaganwari Dam			
Section:A Basic Information			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration: 12 Months			
Client Project: Irrigation Department Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
<ul style="list-style-type: none"> • There are only 20-25 trees located within reservoir area of Jaganwari Dam. • There are no settlement near the proposed dam site • There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area. • There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities. • No any forests observed near the dam site. • Ambient Air quality is clear and noise level is under SEPA standard. 			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume of 0.10 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.08 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies	Triggered (Yes/No)		Explanation
Environmental Assessment OP/BP/GP 4.01	Yes		
Natural Habitats OP/BP 4.04	Yes		
Forest OP/BP 4.36	No		
Pest Management OP/BP/4.09	No		
Physical Cultural Resources OP/BP 4.09	No		



Title of Sub-project: Jaganwari Dam		
Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	



Title of Sub-project: Darig Dam			
Section A : Basic information			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration: 12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
<ul style="list-style-type: none"> • There are 40-45 number of trees located within reservoir area of Darigh Dam. • There are no settlement near the proposed dam site • There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area. • There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities. • No any forests observed near the dam site. • Ambient Air quality is clear and noise level is under SEPA standard. 			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.15 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.12 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies	Triggered (Yes/No)		Explanation
Environmental Assessment OP/BP/GP 4.01	Yes		
Natural Habitats OP/BP 4.04	Yes		
Forest OP/BP 4.36	No		
Pest Management OP/BP/4.09	No		
Physical Cultural Resources OP/BP 4.09	No		



Title of Sub-project: Darig Dam		
Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	



Title of Sub-project: Tungwari Dam			
Section A : Basic Information			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration: 12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
<ul style="list-style-type: none"> • There are 20-25 number of trees located within reservoir area of Tungwari Dam. • There are no settlement near the proposed dam site • There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area. • There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities. • No any forests observed near the dam site. • Ambient Air quality is clear and noise level is under SEPA standard. 			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.14 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.08 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies	Triggered (Yes/No)		Explanation
Environmental Assessment OP/BP/GP 4.01	Yes		
Natural Habitats OP/BP 4.04	Yes		
Forest OP/BP 4.36	No		
Pest Management OP/BP/4.09	No		
Physical Cultural Resources OP/BP 4.09	No		



Title of Sub-project: Tungwari Dam		
Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	



ANNEX II: GROUND WATER AND AMBIENT AIR QUALITY RESULTS

Government of Pakistan
Ministry of Science & Technology
Pakistan Council of Research in Water Resources (PCRWR)

WATER QUALITY TEST REPORT

Report No.	682	Total No. of Pages	01
Client Name & Address	M/s Associated Consulting Engineers Limited (ACE)		
Project Title	Sindh Resilience Project (SRP)		
Client Code	S-01 G.W Samlee, Nagarparkar, Tharparkar		
Co-ordinates	N 24 30 01.9	E 70 73 19.45	Temp of Sample @ Receipt °C 27.4
WQL Sample code	PCRWR/KHI/682/11/19	Sample Receipt Date	13.11.2019
Date (s) of analysis	13-11-2019 To 20-11-2019	Reporting Date	21-11-2019

PHYSICAL & AESTHETIC PARAMETERS

Sr. No.	W.Q Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Color	--	--	Sensory evaluation	Colorless	Colorless
2	Odor	--	--	Sensory evaluation	Unobjectionable	Unobjectionable
3	Taste	--	--	Sensory evaluation	Unobjectionable	Unobjectionable
4	pH	--	0.03	APHA, 22 nd Edition	6.5-8.5	6.76

MAJOR CHEMICAL PARAMETERS:

Sr. #	Water Quality Parameter	Units	Det. Limit	Reference Method	Permissible Limits*	Results
1	Bicarbonate	ppm	5.0	APHA, 22 nd Edition	NGVS	220
2	Calcium	ppm	2.0	APHA, 22 nd Edition	NGVS	40
3	Carbonate	ppm	5.0	APHA, 22 nd Edition	NGVS	Nil
4	Hardness as Ca CO ₃	ppm	5.0	APHA, 22 nd Edition	500	180
5	Potassium	ppm	0.02	APHA, 22 nd Edition	30	1.6
6	Nitrate -N	ppm	0.03	APHA, 22 nd Edition	10	5.434
7	Nitrite -N	ppm	0.002	USEPA, 2000	3	0.012
8	Orthophosphate (PO ₄)	ppm	0.02	APHA, 22 nd Edition	NGVS	0.19
9	Fluoride	ppm	0.02	APHA, 22 nd Edition	1.5	0.83
10	Arsenic	ppb	0	Merck 1.17927	50 PSQCA	0
11	TDS	ppm	--	APHA, 22 nd Edition	<1000	379

WASTE WATER QUALITY PARAMETERS

Sr.#	Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Total Suspended Solids	ppm	--	APHA, 22 nd Edition	200 (NEQS, 1999)	22
2	Chemical Oxygen Demand	ppm	6.0	APHA, 22 nd Edition	150 (NEQS, 1999)	11

MICROBIOLOCAL PARAMETERS

Sr. No.	Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Total Coliform	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	19
2	Fecal Coliform	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	0
3	E.Coli	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	0

APHA = American Public Health Association, E.C = European Commission, NGVS = No Guideline Value Set, NSDWQ = National Standard for Drinking Water Quality, PSQCA = Pakistan Standards Quality Control Authority, G.W Ground water
*PSQCA/NSDWQ 2010

Note: The sample is provided by the client and this report is valid only for the sample provided.

Prepared by		Tech. Manager (Micro.)		Tech. Manager (Chem./QC)
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ES → Pb-incorporate & keep reports in file for future reference.



Government of Pakistan
Ministry of Science & Technology
Pakistan Council of Research in Water Resources (PCRWR)



WATER QUALITY TEST REPORT

Report No.	684	Total No. of Pages	01
Client Name & Address	M/s Associated Consulting Engineers Limited (ACE)		
Project Title	Sindh Resilience Project (SRP)		
Client Code	S-03 G.W Paro Jo Wandhyo, Nagarparkar, Tharparkar		
Co-ordinates	N 24 32 46.10	E 70 66 14.9	Temp of Sample @ Receipt °C
WQL Sample code	PCRWR/KHI/684/11/19	Sample Receipt Date	13.11.2019
Date (s) of analysis	13-11-2019 To 20-11-2019	Reporting Date	21-11-2019

PHYSICAL & AESTHETIC PARAMETERS

Sr. No.	W.Q Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Color	--	--	Sensory evaluation	Colorless	Colorless
2	Odor	--	--	Sensory evaluation	Unobjectionable	Unobjectionable
3	Taste	--	--	Sensory evaluation	Unobjectionable	Unobjectionable
4	pH	--	0.03	APHA, 22 nd Edition	6.5-8.5	6.87

MAJOR CHEMICAL PARAMETERS:

Sr. #	Water Quality Parameter	Units	Det. Limit	Reference Method	Permissible Limits*	Results
1	Bicarbonate	ppm	5.0	APHA, 22 nd Edition	NGVS	250
2	Calcium	ppm	2.0	APHA, 22 nd Edition	NGVS	32
3	Carbonate	ppm	5.0	APHA, 22 nd Edition	NGVS	Nil
4	Hardness as Ca CO ₃	ppm	5.0	APHA, 22 nd Edition	500	190
5	Potassium	ppm	0.02	APHA, 22 nd Edition	30	2.9
6	Nitrate -N	ppm	0.03	APHA, 22 nd Edition	10	2.748
7	Nitrite -N	ppm	0.002	USEPA, 2000	3	0.588
8	Orthophosphate (PO ₄)	ppm	0.02	APHA, 22 nd Edition	NGVS	0.14
9	Fluoride	ppm	0.02	APHA, 22 nd Edition	1.5	1.02
10	Arsenic	ppb	0	Merck 1.17927	50 PSQCA	0
11	TDS	ppm	--	APHA, 22 nd Edition	<1000	433

WASTE WATER QUALITY PARAMETERS

Sr.#	Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Total Suspended Solids	ppm	--	APHA, 22 nd Edition	200 (NEQS, 1999)	27
2	Chemical Oxygen Demand	ppm	6.0	APHA, 22 nd Edition	150 (NEQS, 1999)	31

MICROBIOLOCAL PARAMETERS

Sr. No.	Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Total Coliform	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	13
2	Fecal Coliform	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	0
3	E.Coli	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	0

APHA American Public Health Association, E.C= European Commission, NGVS No Guideline Value Set, NSDWQ= National Standard for Drinking Water Quality, PSQCA = Pakistan Standards Quality Control Authority, G.W Ground water

*PSQCA/NSDWQ 2010

Note: The sample is provided by the client and this report is valid only for the sample provided.

Prepared by		Tech. Manager (Micro.)		Tech. Manager (Chem./QC)
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Government of Pakistan
Ministry of Science & Technology
Pakistan Council of Research in Water Resources (PCRWR)

WATER QUALITY TEST REPORT

Report No.	691	Total No. of Pages	01
Client Name & Address	M/s Associated Consulting Engineers Limited (ACE)		
Project Title	Sindh Resilience Project (SRP)		
Client Code	S-10 G.W Darigh Nai, Nara, Khairpur		
Co-ordinates	N 27 26 28.76 E 68 89 33.92	Temp of Sample @ Receipt °C	26.1
WQL Sample code	PCRWR/KHI/691/11/19	Sample Receipt Date	13.11.2019
Date (s) of analysis	13-11-2019 To 20-11-2019	Reporting Date	21-11-2019

PHYSICAL & AESTHETIC PARAMETERS

Sr. No.	W.Q Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Color	--	--	Sensory evaluation	Colorless	Colorless
2	Odor	--	--	Sensory evaluation	Unobjectionable	Unobjectionable
3	Taste	--	--	Sensory evaluation	Unobjectionable	Unobjectionable
4	pH	--	0.03	APHA, 22 nd Edition	6.5-8.5	7.67

MAJOR CHEMICAL PARAMETERS:

Sr. #	Water Quality Parameter	Units	Det. Limit	Reference Method	Permissible Limits*	Results
1	Bicarbonate	ppm	5.0	APHA, 22 nd Edition	NGVS	140
2	Calcium	ppm	2.0	APHA, 22 nd Edition	NGVS	40
3	Carbonate	ppm	5.0	APHA, 22 nd Edition	NGVS	Nil
4	Hardness as Ca CO ₃	ppm	5.0	APHA, 22 nd Edition	500	150
5	Potassium	ppm	0.02	APHA, 22 nd Edition	30	4.5
6	Nitrate -N	ppm	0.03	APHA, 22 nd Edition	10	2.418
7	Nitrite -N	ppm	0.002	USEPA, 2000	3	0.009
8	Orthophosphate (PO ₄)	ppm	0.02	APHA, 22 nd Edition	NGVS	0.30
9	Fluoride	ppm	0.02	APHA, 22 nd Edition	1.5	0.25
10	Arsenic	ppb	0	Merck 1.17927	50 PSQCA	5
11	TDS	ppm	--	APHA, 22 nd Edition	<1000	257

WASTE WATER QUALITY PARAMETERS

Sr.#	Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Total Suspended Solids	ppm	--	APHA, 22 nd Edition	200 (NEQS, 1999)	34
2	Chemical Oxygen Demand	ppm	6.0	APHA, 22 nd Edition	150 (NEQS, 1999)	17

MICROBIOLOCAL PARAMETERS

Sr. No.	Parameters	Unit	Det. Limit	Ref. Method	Permissible limits*	Results
1	Total Coliform	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	86
2	Fecal Coliform	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	0
3	E.Coli	CFU/100ml	<1.0	APHA, 22 nd Edition	0/100ml	0

APHA American Public Health Association, E.C^o European Commission, NGVS No Guideline Value Set, NSDWQ= National Standard for Drinking Water Quality, PSQCA = Pakistan Standards Quality Control Authority, G.W Ground water
*PSQCA/NSDWQ 2010

Note: The sample is provided by the client and this report is valid only for the sample provided.

Prepared by		Tech. Manager (Micro.)		Tech. Manager (Chem./QC)
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HSE Services

Health, Safety & Environment Consultants, Laboratories,
Lawyers & Engineering Services



Ambient Air Test Report

Report No.	HSE/ENV/19/Nov/AM/0222 -1	Date	Friday, November 15-2019
Client Name	M/s Associate Consulting Engineering Limited (ACE)		
Client Address	D-288,KDA Scheme No-1-AStadium Road Karachi Pakistan		
Date of Sampling	Thursday, Nov- 14, 2019	Sampling Duration	Real Time
Location of Sampling	Construction Area	Location	JAGANWARI NAI
Project Title	Sindh Resilience Project (SRP) Project Implementation and Supervision Consultant (PISSC)		

S.No	Measuring Parameter	Units	Testing Method	SEQS Limits	Test Results	Remarks
1	Carbon Monoxide	CO (mg/m ³)	ASTM D3162 - 12	10	ND	OK
2	Sulphur Dioxide	SO ₂ (µg/m ³)	ASTM D-2914	120	BDL	OK
3	Particulate Matter (10Microns)	PM ₁₀ (µg/m ³)	RFPS-0706-162	150	98.8	OK
4	Oxides of Nitrogen as NO ₂	NO ₂ (µg/m ³)	ASTM-D-3824	ND

NOTE:

ND=Not detectable.

BDL=Below Detectable limit

SEQS=Sindh Environmental Quality Standards The instruments used were duly calibrated.

The measurements were carried out on client's request.

The client is responsible for lawful usage of reported data in future.

This report is not valid for Court evidence/ Judicial knowledge

The measurement results are based on the reading taken at the time of monitoring

Job Performed By

Mr. Basit

Report Prepared By

Issued By



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Deals in: TPI (Third Party Inspections), Environmental Monitoring, Environmental Assessment (PEE/ELA/EMP/EMR/ECR),

Treatment Plant Designing, Environmental Legal Assistance Equipment Calibration/Repairing



HSE Services

Health, Safety & Environment Consultants, Laboratories,
Lawyers & Engineering Services



Ambient Air Test Report

Report No.	HSE/ENV/19/Nov/AM/0222 -2	Date	Friday, November 15-2019
Client Name	M/s Associate Consulting Engineering Limited (ACE)		
Client Address	D-288,KDA Scheme No-1-AStadium Road Karachi Pakistan		
Date of Sampling	Thursday, Nov- 14, 2019	Sampling Duration	Real Time
Location of Sampling	Construction Area	Location	DARGANWARI NAI
Project Title	Sindh Resilience Project (SRP) Project Implementation and Supervision Consultant (PISSC)		

S.No	Measuring Parameter	Units	Testing Method	SEQS Limits	Test Results	Remarks
1	Carbon Monoxide	CO (mg/m ³)	ASTM D3162 - 12	10	ND	OK
2	Sulphur Dioxide	SO ₂ (µg/m ³)	ASTM D-2914	120	BDL	OK
3	Particulate Matter (10Microns)	PM ₁₀ (µg/m ³)	RFPS-0706-162	150	76.2	OK
4	Oxides of Nitrogen as NO2	NO2 (µg/m ³)	ASTM-D-3824	ND

NOTE:

ND=Not detectable.

BDL=Below Detectable limit

SEQS=Sindh Environmental Quality Standards The instruments used were duly calibrated.

The measurements were carried out on client's request.

The client is responsible for lawful usage of reported data in future.

This report is not valid for Court evidences/Judicial knowledge

The measurement results are based on the reading taken at the time of monitoring

Job Performed By

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Tel: 0317-4000 347

Deals in: TPI (Third Party Inspections), Environmental Monitoring, Environmental Assessment (EE/EUA/EMP/EMR/ECR), Treatment Plant Designing, Environmental Legal Assistance Equipment Calibration/Repairing



HSE Services

Health, Safety & Environment Consultants, Laboratories,
Lawyers & Engineering Services



Ambient Air Test Report

Report No.	HSE/ENV/19/Nov/AM/0222 -3	Date	Friday, November 15-2019
Client Name	M/s Associate Consulting Engineering Limited (ACE)		
Client Address	D-288,KDA Scheme No-1-AStadium Road Karachi Pakistan		
Date of Sampling	Thursday, Nov- 14, 2019	Sampling Duration	Real Time
Location of Sampling	Construction Area	Location	TANGWARI NAI
Project Title	Sindh Resilience Project (SRP) Project Implementation and Supervision Consultant (PISSC)		

S.No	Measuring Parameter	Units	Testing Method	SEQS Limits	Test Results	Remarks
1	Carbon Monoxide	CO (mg/m ³)	ASTM D3162 - 12	10	ND	OK
2	Sulphur Dioxide	SO ₂ (µg/m ³)	ASTM D-2914	120	BDL	OK
3	Particulate Matter (10Microns)	PM ₁₀ (µg/m ³)	RFPS-0706-162	150	122.4	OK
4	Oxides of Nitrogen as NO2	NO2 (µg/m ³)	ASTM-D-3824	ND

NOTE:

ND=Not detectable

BDL=Below Detectable limit

SEQS=Sindh Environmental Quality Standards The instruments used were duly calibrated.

The measurements were carried out on client's request.

The client is responsible for lawful usage of reported data in future.

This report is not valid for Court evidence/ Judicial knowledge

The measurement results are based on the reading taken at the time of monitoring

Job Performed By

Mr. Basit

Report Prepared By

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Islamabad: 1st Floor, 1507- Kiyani House, Street 79,

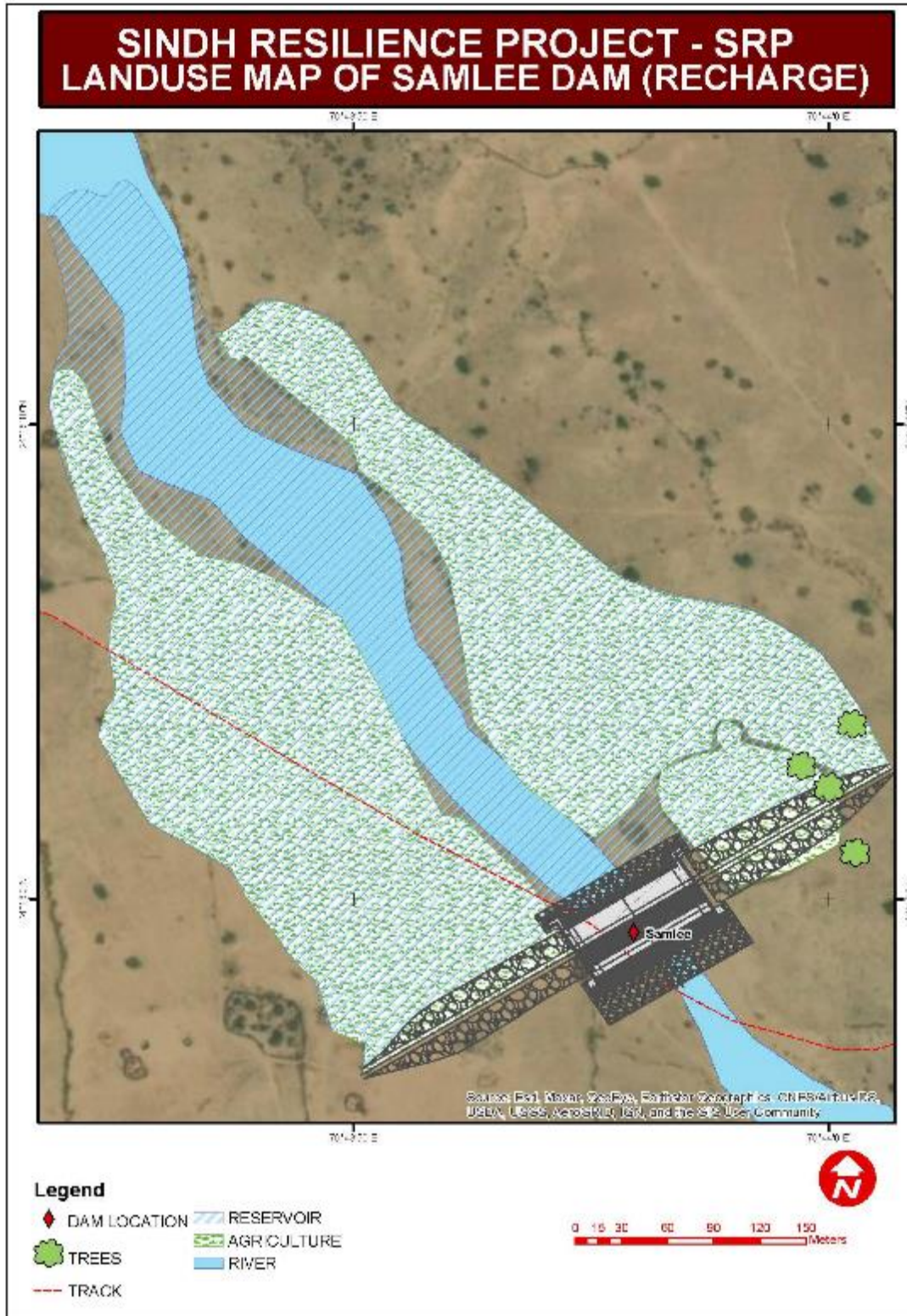
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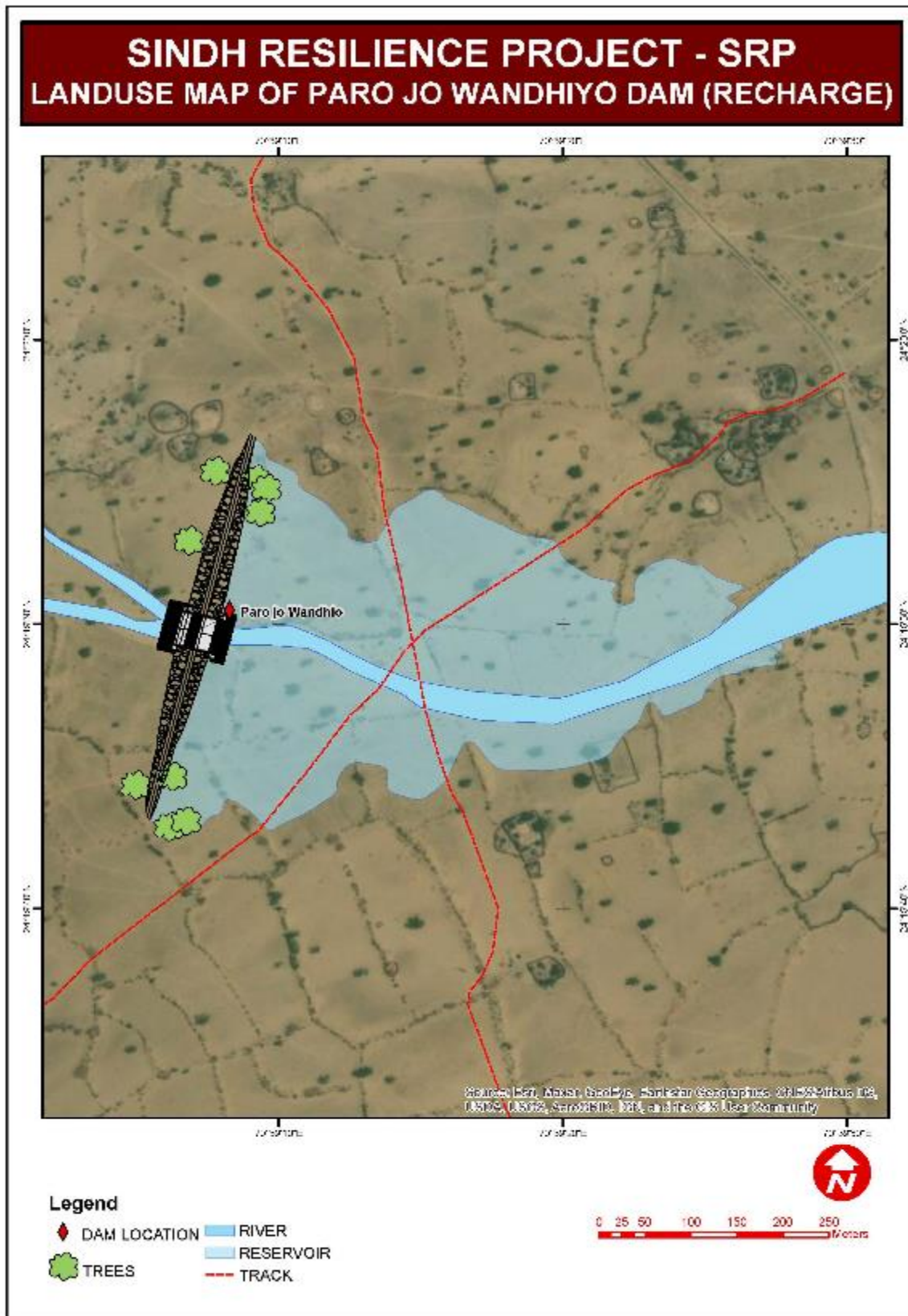
Tel: 0317-4000 347

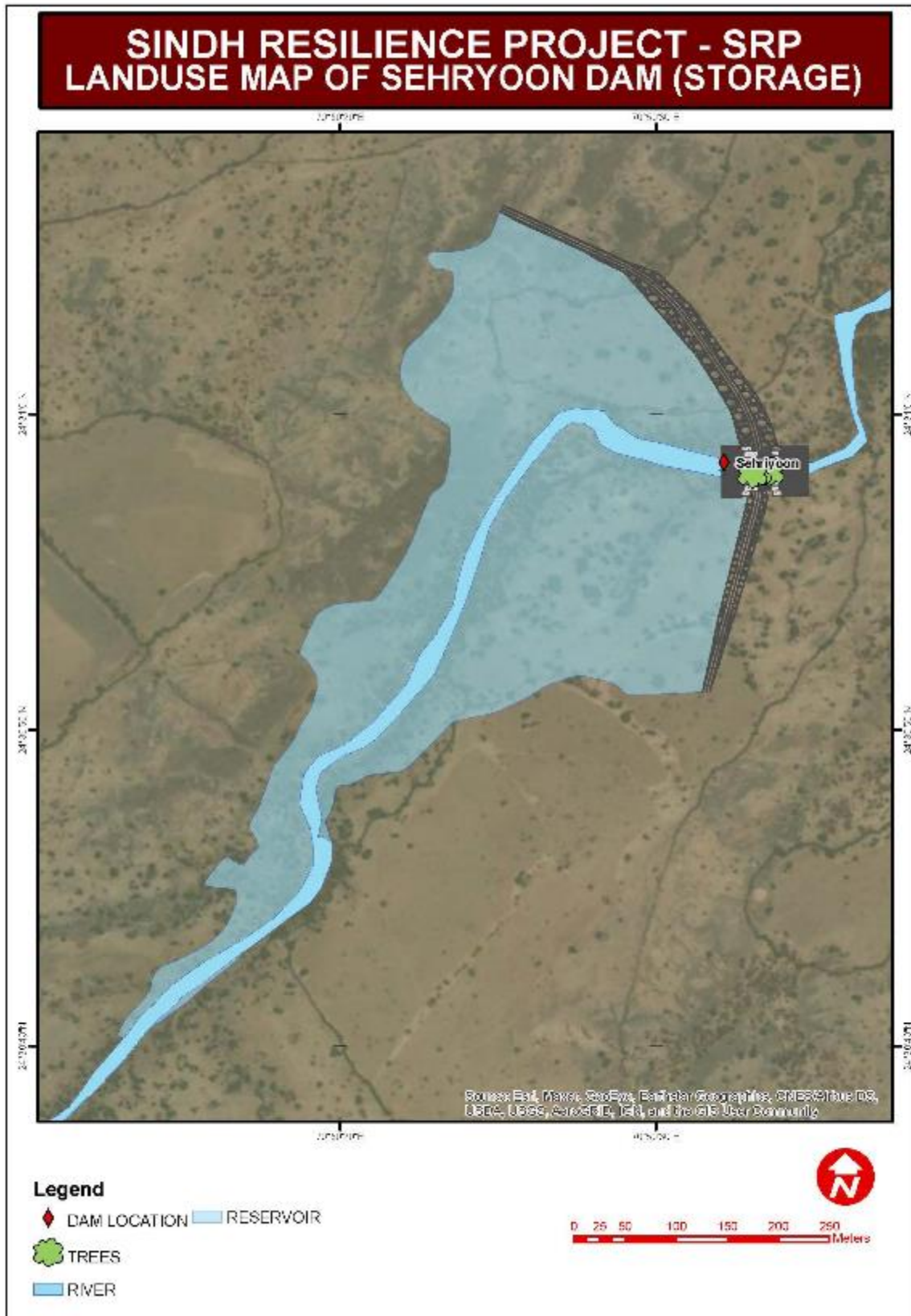
Deals in: TPI (Third Party Inspections), Environmental Monitoring, Environmental Assessment (FEE/EUA/EMP/EMR/ECR),
Treatment Plant Designing, Environmental Legal Assistance Equipment Calibration/Repairing

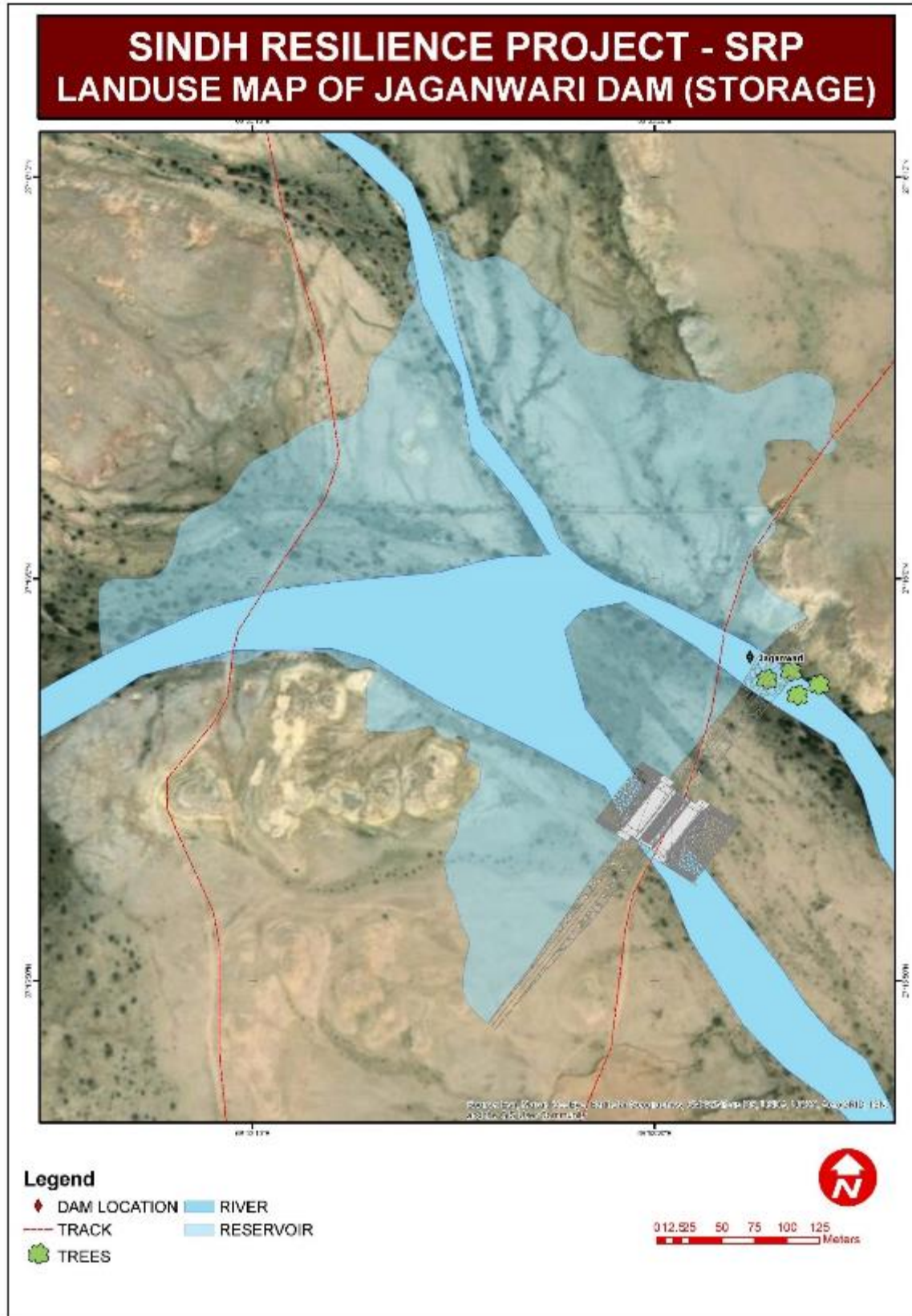


ANNEX III: LAND USE MAPS OF PROPOSED DAM SITES

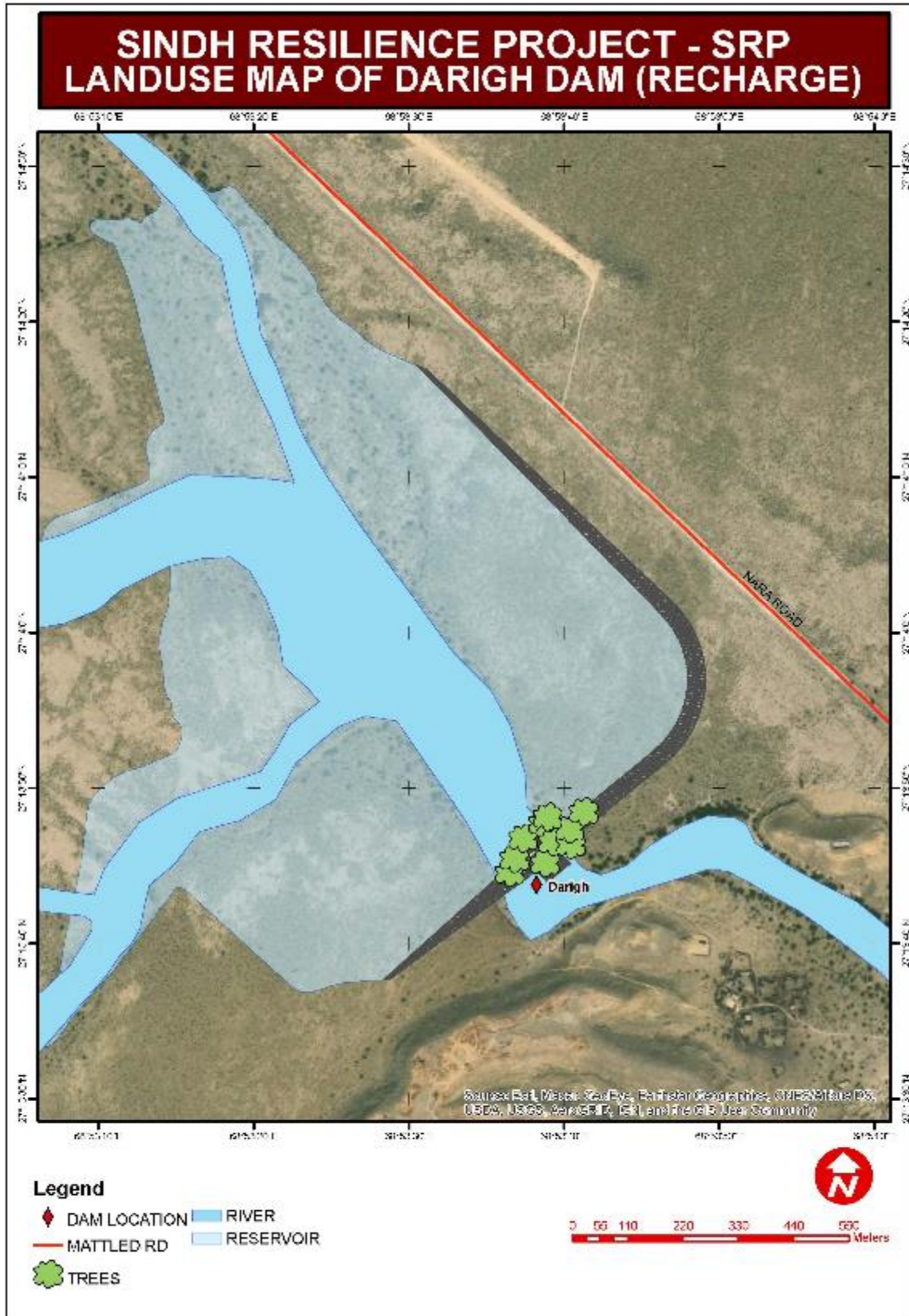
















ANNEX IV: ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT QUESTIONNAIRES/ Checklist

Rapid Environmental Assessment (REA) Checklist for Environmental Studies (Reconnaissance Surveys)		
Social Impacts	Yes / No / Likely/Not applicable	Where possible, provide details (Expected number of households, area of land, types of structures likely to be affected)
Is land acquisition necessary"		
Presence of squatters		
Loss of structures resulting in displacement		
Displacement of people due to loss of productive assets		
People losing means of livelihood and incomes (Temp. / Permanent)		
Is there any risk of economic marginalization of farmers and smallholders		
Basic facilities / services will be Inaccessible (Temp. / Permanent)		
Impact on crops, trees and other fixed assets in terms of loss of production or drop in yields		
Tenants/Lessees losing any fixed assets		
Loss of community assets		
Loss of existing social and community ties		
Impacts on Vulnerable Groups, if any: Impacts on Vulnerable Groups, if any:		
Poverty group affected		
Women headed households affected		
Ethnic Minority Affected		
Other vulnerable groups" affected		
Is there any risk to smallholders in terms of loss of livelihoods		

Section- A: Basic Information



ANNEX V: PHOTOGRAPHS

Samlee Dam



Proposed location of Samlee Dam



Proposed location of Samlee Dam



Proposed location of Samlee Dam



Proposed location of Samlee Dam

Paro Jo Wandhio Dam



Proposed location of Paro Jo Wandhio Dam



Proposed location of Paro Jo Wandhio Dam

Jaganwari Dam



Proposed Dam location of Jaganwari Dam



Proposed Dam location of Jaganwari Dam

Darigh Dam



Proposed Dam location of Darigh Dam



Proposed Dam location of Darigh Dam

Tungwari Dam



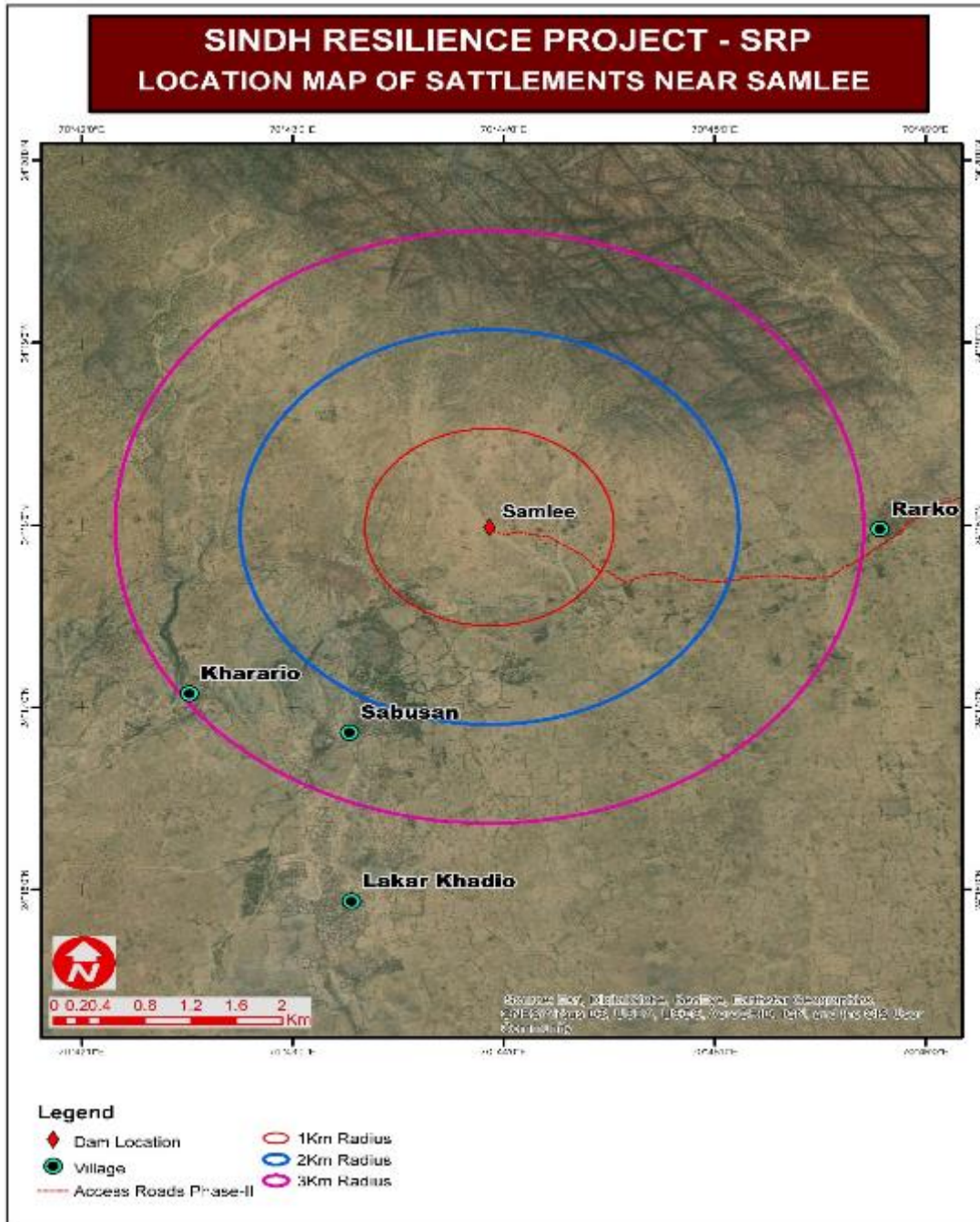
Proposed Dam location of Tungwari Dam

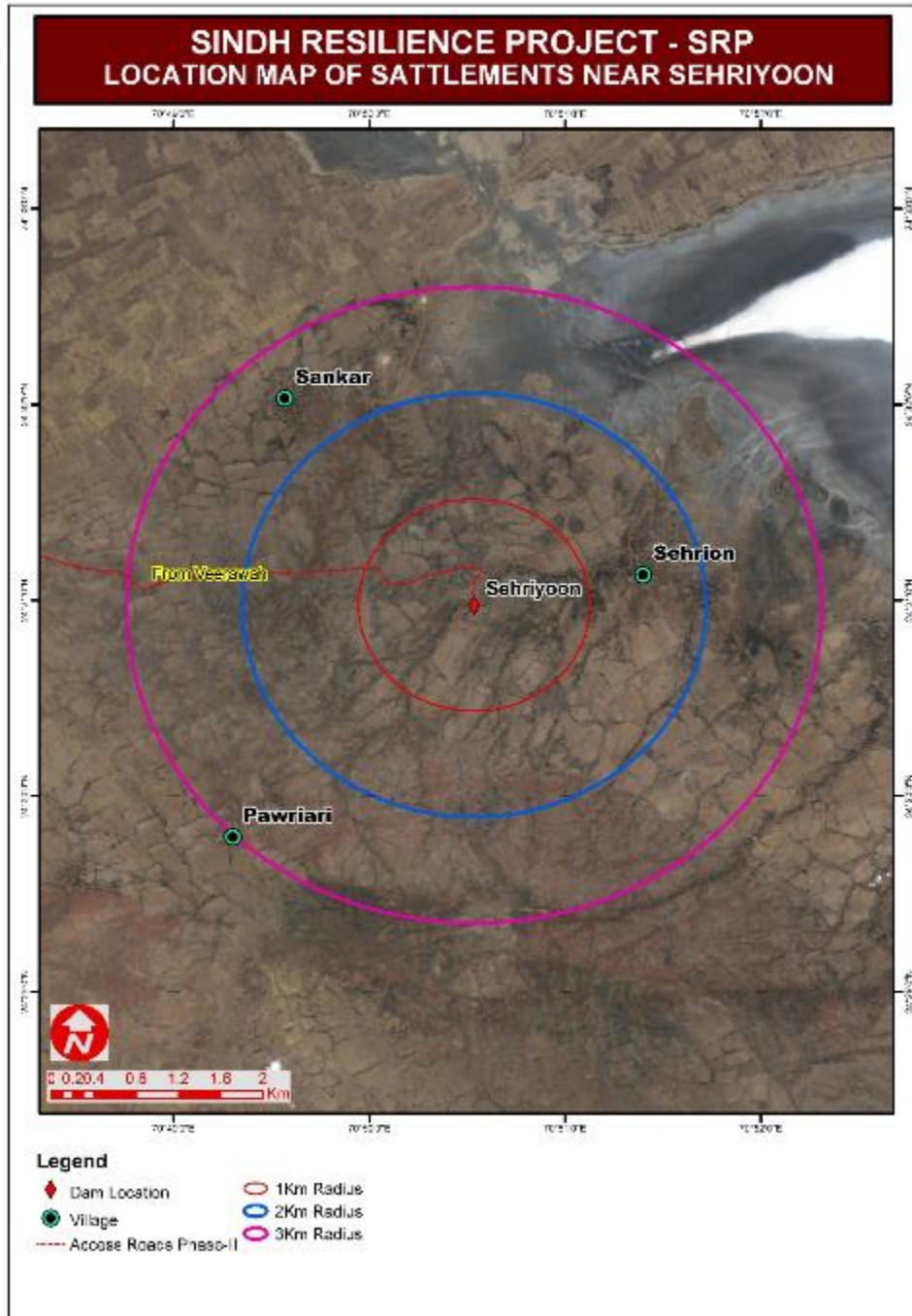


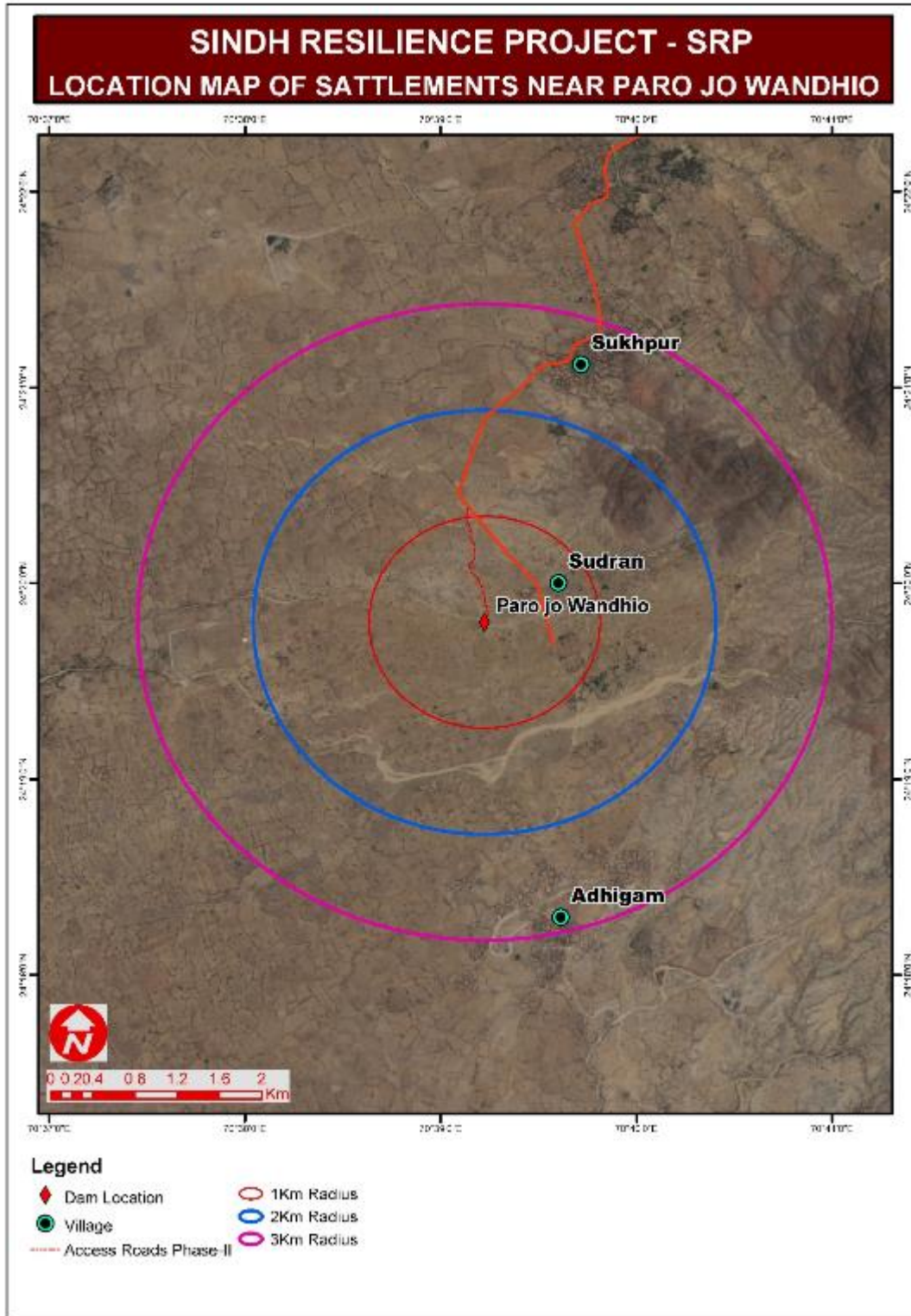
Proposed Dam location of Tungwari Dam

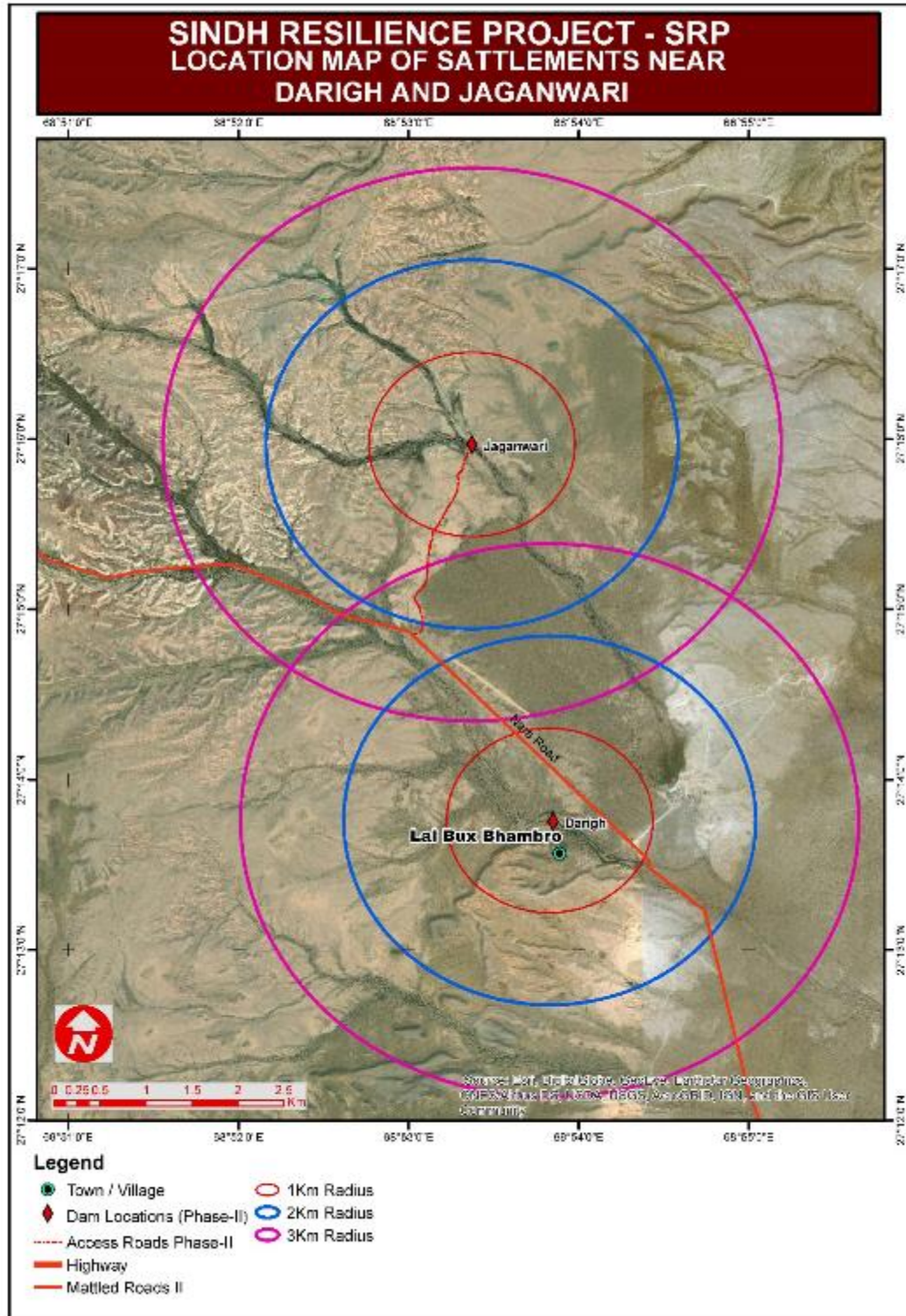


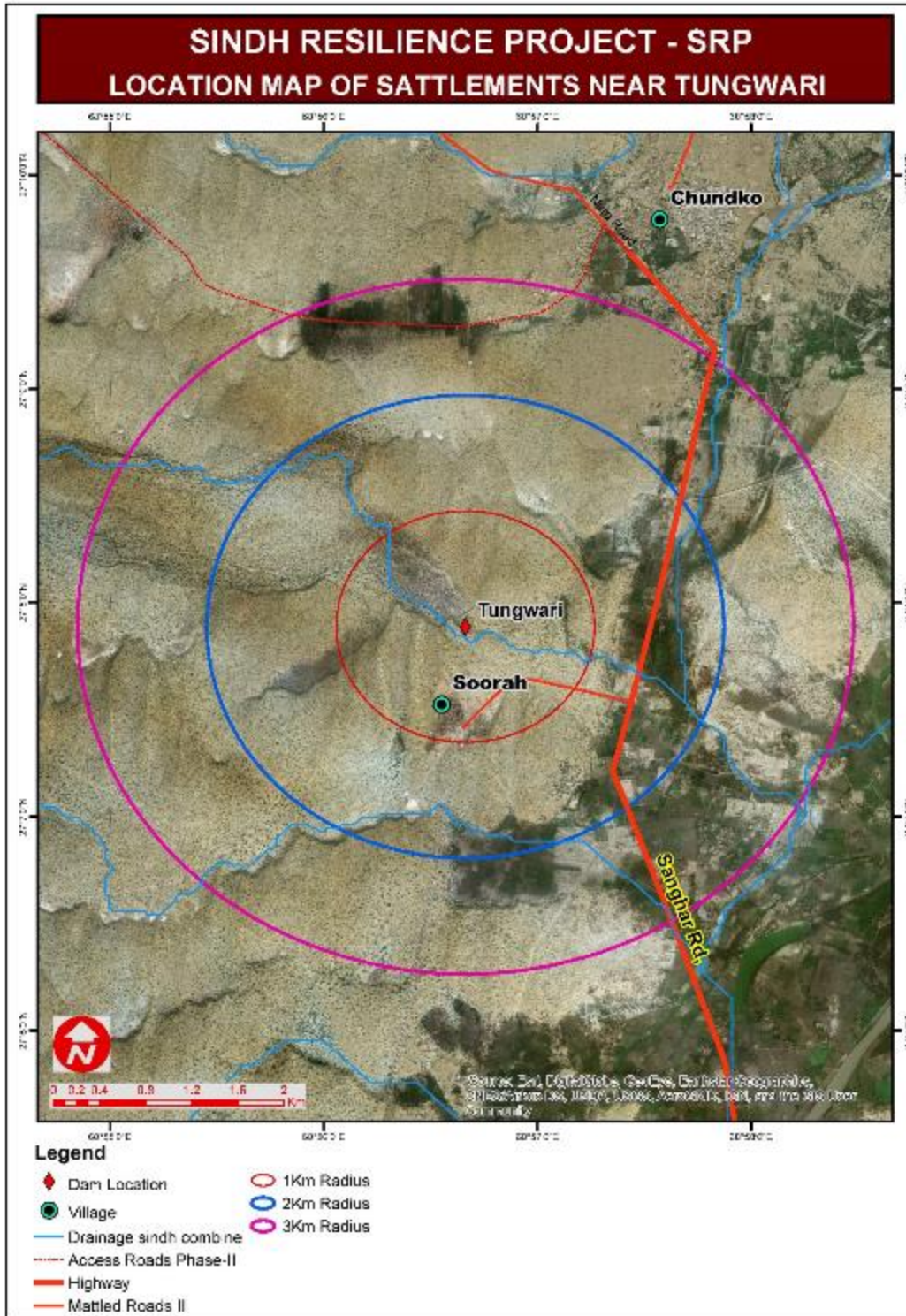
ANNEX VI: LOCATION MAPS OF SETTLEMENTS NEAR DAM SITES















ANNEX VII: ENVIRONMENTAL CODE OF PRACTICES (ECoPs)

Introduction

The objective of preparation of the Environmental Code of Practices (ECoPs) is to address less significant environmental impacts and all general construction related impacts for the proposed SRP project implementation. The ECoPs will provide guidelines for best operating practices and environmental management guidelines to be followed by the contractors for sustainable management of all environmental issues. This ECoPs will be annexed in the general conditions of all the contracts to be carried out under the SRP project. The list of ECoPs prepared for the SRP is given below:

ECoP 1: Waste Management

ECoP 2: Fuels and Hazardous Substances Management

ECoP 3: Water Resources Management

ECoP 4: Borrow Areas Development and Operation

ECoP 5: Air Quality Management

ECoP 6: Noise and Vibration Management

ECoP 7: Protection of Flora

ECoP 8: Protection of Fauna

ECoP 9: Road Transport and Road Traffic Management

ECoP 10: Construction Camp Management

ECoP 11: Cultural and Religious Issues

ECoP 12: Workers Health and Safety

The Contractor shall prepare a 'Contractor's Environmental and Social Management Plan' (CESMP) demonstrating the manner in which the Contractor will comply with the requirements of ECoPs and the mitigation measures proposed in the ESMP of the ESIA Report. The CESMP shall be submitted to the ESU of PISSC and ESMU of PMT for review and finally shall be approved by the ESU of PISSC. The CESMP will form the part of the contract documents and will be used as monitoring tool for compliance. Violation of the compliance requirements will be treated as non-compliance leading to the corrections or otherwise imposing penalty on the contractors.

VII.1 ECOP 1: WASTE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste.) prior to commencing of construction and submit to ESMU PMT and PISSC for approval. ○ Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. ○ Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. ○ Segregate and reuse or recycle all the wastes, wherever practical. ○ Collect and transport non-hazardous wastes to all the approved disposal sites. ○ Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. ○ Provide refuse containers at each worksite. ○ Request suppliers to minimize packaging where practicable. ○ Place a high emphasis on good housekeeping practices. ○ Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Collect chemical wastes in 200 litre drums (or similar sealed container), appropriately labelled for safe transport to an approved chemical waste depot. ○ Store, transport and handle all chemicals avoiding potential environmental pollution. ○ Store all hazardous wastes appropriately in banded areas away from water courses. ○ Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. ○ Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. ○ Construct concrete or other impermeable flooring to prevent seepage in case of spills

VII.2 ECOP 2: FUELS AND HAZARDOUS SUBSTANCE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels, oil, lubricants, paints and other hazardous substance.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous substance on-site, and potential spills from these goods may harm the environment or health of construction workers.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Prepare spill control procedures and submit the plan for PISSC and SID for approval. ○ Train the relevant construction personnel in handling of fuels and spill control procedures. ○ Store dangerous goods in bunded areas on a top of a sealed plastic sheet away from water course. Refuelling should occur only within bunded areas. ○ Make available MSDS for chemicals and dangerous goods on-site. ○ Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by Sindh EPA. ○ Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. ○ Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. ○ Make sure all containers, drums, and tanks that are used for storage are in good condition and are labelled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. ○ Store hazardous materials above flood plain level. ○ Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area should preferably slope or drain to a safe collection area in the event of a spill. ○ Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of a spill or leak. ○ Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. ○ Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.

VII.3 ECOP 3: WATER RESOURCES MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Follow the management guidelines proposed in ECoPs 1 and 2. ○ Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns, including infiltration and storage of storm water. The change in hydrological regime leads to increased rate of runoff and in sediment and contaminant loading, increased flooding and groundwater contamination.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Divert runoff from undisturbed areas around the construction site ○ Stockpile materials away from drainage lines ○ Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot ○ Wash out transit mixture and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each construction vehicle to ensure the local roads are kept clean.
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion ○ Ensure that roads used by construction vehicles are swept regularly to remove sediment. ○ Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary • Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers • Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. • Reduce infiltration of contaminated drainage through storm water management design • Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.
Drinking water	Groundwater at shallow depths might be contaminated and hence not suitable for drinking purposes.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Control the quality of groundwater to be used for drinking water on the bases of NEQS and World Bank standards for drinking water. Safe and sustainable discharges are to be ascertained prior to selection of pumps. • Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination
	Depletion and pollution of groundwater resources	<ul style="list-style-type: none"> • Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor and report on the water quality and water levels. • Protect groundwater supplies of adjacent lands

VII.4 ECOP 4: SOIL QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of fuel and toxic chemicals	Spillage of fuel and toxic chemicals will contaminate the soils	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Strictly manage the wastes management plans proposed in ECoP1 and storage of materials in ECoP2 • Construct appropriate spill contaminant facilities for all fuel storage areas. • Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals • Train personnel and implement safe work practices for minimizing the risk of spillage • Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site • Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results.
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

VII.5 ECOP 5: BORROW AREAS DEVELOPMENT AND OPERATION/RESTORATION

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of borrow areas	In case, the borrow pits developed by the Contractor, there will be impacts on local topography, landscaping and natural drainage.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Reuse excavated or disposed material available in the project area to the maximum extent possible • Identify borrow pits in consultation with the local governments and PISSC as well as PMT. • Obtain the borrow material from: <ul style="list-style-type: none"> • barren land or land without tree cover outside the road reserve; • Do not dig the borrow pits within 5m of the toe of the final section of the road embankment. • Dig the borrow pits continuously. Ridges of not less than 8 m widths shall be left at intervals not exceeding 300 m and small drains should be cut through the ridges to facilitate drainage • Borrow areas should not exceed 0.6 m (2ft.) in depth. • Slope the bed level of the borrow pits, as far as possible, down progressively towards the nearest cross drain, if any, and do not lower it than the bed of the cross-drain, to ensure efficient drainage. <p>Follow the below for restoration of borrow areas are:</p> <ul style="list-style-type: none"> • Return stockpiled topsoil to the borrow pit if is used for agriculture; • Return stockpiled topsoil to the borrow pit and all worked areas to be stabilized through re-vegetation using local plants. • Control at each site by ensuring that base of the borrow pit drains into a sediment trap prior to discharging from the site.

VII.6 ECOP 6: AIR QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Operate the vehicles in a fuel efficient manner • Cover haul vehicles carrying dusty materials moving outside the construction site • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions • Control the movement of construction traffic • Water construction materials prior to loading and transport • Service all vehicles regularly to minimize emissions • Limit the idling time of vehicles not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Focus special attention on containing the emissions from generators • Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites • Carryout effects monitoring on monthly basis to control the emissions from construction machinery. • Service all equipment regularly to minimize emissions • Engage all vehicles that are physical fit for the work. • Obtain fitness certificate of vehicles/equipment from third party certification.
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	<ul style="list-style-type: none"> • Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds) • Minimize the extent and period of exposure of the bare surfaces • Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site • Restore disturbed areas as soon as practicable by vegetation/grass-turfing • Store the cement in silos and minimize the emissions from silos by equipping them with filters.

VII.7 ECoP 7: Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours. • Make sure that all operator are trained and are having third party operator certificates.
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Appropriately site all noise generating activities to avoid noise pollution to local residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures • Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment.
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Notify adjacent residents prior to any Typical noise event outside of daylight hours • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate • Notify affected people if noisy activities will be undertaken, e.g. blasting • Plan activities on site and deliveries to and from site to minimize impact • Monitor and analyse noise and vibration results and adjust construction practices as required. • Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas and in National Park.

VII.8 ECOP 8: PROTECTION OF FLORA

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Reduce disturbance to surrounding vegetation of Khirthar National Park. • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. • Get approval from supervision consultant for clearance of vegetation especially in case of working in Khithar National Park. • Make selective and careful pruning of trees where possible to reduce need of tree removal. • Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads. • Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. • Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. • Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible. • Ensure excavation works occur progressively and re-vegetation done at the earliest • Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction • Supply appropriate fuel in the work caps to prevent fuel wood collection

VII.9 ECOP 9: PROTECTION OF FAUNA

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,	The Contractor shall: <ul style="list-style-type: none"> • Limit the construction works within the designated sites allocated to the contractors especially working in Khirthar National Park • check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal
	Impact on migratory birds, its habitat and its active nests	The Contractor shall: <ul style="list-style-type: none"> • Not be permitted to destruct active nests or eggs of migratory birds • Minimize the tree removal during the bird breeding season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests • Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds.
Vegetation Clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	The Contractor shall: <ul style="list-style-type: none"> • Restrict the tree removal to the minimum required. • Retain tree hollows on site, or relocate hollows, where appropriate • Leave dead trees where possible as habitat for fauna • Fell the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition.
Construction Camps	Illegal poaching	<ul style="list-style-type: none"> • Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

VII.10 ECOP 10: CONSTRUCTION CAMP MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of Construction Camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. • Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Submit to the PMT for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. • Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters. • Code of Conduct to be prepared by the Contractor, signed by his workers and approved by the PMT of SRP.
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>Contractor shall provide the following facilities in the campsites:</p> <ul style="list-style-type: none"> • Adequate housing for all workers • Safe and reliable water supply. Water supply from tube wells that meets the national standards • Drinking water should be checked on monthly basis through monthly effects monitoring. • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. Female toilets should be clearly marked in language understood by the persons using them to avoid miscommunication. The minimum number of toilet facilities required is one toilet for every ten persons. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment's/vehicles needed. • Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition. Cover the bed of the pit with impervious layer of materials (clayey, thin concrete) to protect groundwater from contamination. • Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odour likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites. • Contractor should made an agreement / got a NOC from near union council for disposal of solid waste in municipal facility.
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. • Make available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protecting of biodiversity in the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	There will be a potential for diseases to be transmitted including malaria,	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Provide adequate health care facilities within construction sites.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	<ul style="list-style-type: none"> • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide anti-venom injection at site dispensary to cope any emergency in case of snake bite. • Provide ambulance facility for the labourers during emergency to be transported to nearest hospitals. • Initial health screening of the labourers coming from outside areas • Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work • Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis • Complement educational interventions with easy access to condoms at campsites as well as voluntary counselling and testing • Provide adequate drainage facilities throughout camps to ensure that disease vectors habitats (stagnant water bodies, puddles) do not form. Regular mosquito repellent sprays in monsoon. • Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	<ul style="list-style-type: none"> • The Contractor shall: • Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. • Maintain register to keep track on a head count of persons present in the camp at any given time. • Encourage use of flameproof material for the construction of labour housing/site office. Ensure that these houses/rooms are of sound construction and capable of withstanding storms/cyclones. • Provide appropriate type of fire fighting equipment suitable for the construction camps • Display emergency contact numbers clearly and prominently at strategic places in camps. • Communicate the roles and responsibilities of labourers in case of emergency in the monthly meetings with contractors.
Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. • Dismantle camps in phases as the work decreases (do not wait for completion of the entire work. • Give prior notice to the labourers before demolishing their camps/units



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none">• Maintain the noise levels within the national standards during demolition activities• Different contractors should be hired to demolish different structures to promote recycling or reuse of demolished material.• Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site by PMT.• Handover the construction camps with all built facilities as it is if agreement between both parties (contractor and land-owner) has been made so.• Restore the site to its original condition or to an agreed condition with the landowner defined prior to the commencement of the works (in writing).• Not make false promises to the labourers for future employment in O&M of the project.

VII.11 ECOP 11: CULTURAL AND RELIGIOUS ISSUES

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Activities near Religious and Cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. • Do not block access to cultural and religious sites, wherever possible • Restrict all construction activities within the foot prints of the construction sites. • Stop construction works that produce noise (particularly during prayer time) should there be any mosque/religious/educational institutions close to the construction sites and users make objections. • Take special care and use appropriate equipment when working next to a cultural/religious institution. • Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the PMT. • Provide separate prayer facilities to the construction workers. • Show appropriate behaviour with all construction workers especially women and elderly people • Allow the workers to participate in praying during construction time • Resolve cultural issues in consultation with local leaders and supervision consultants • Establish a mechanism that allows local people to raise grievances arising from the construction process. • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters
Best Practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • An Occupational, Health and Safety Plan shall be prepared by the Contractor and submitted to ESU of PISSC and ESMU of PMT for review and approval. The plan shall be approved by the ESU of PISSC. The OHS shall include a job hazard analysis and safety precautions (like PPEs, barriers, change to design) and make ensure use of the PPEs and other measures during construction time.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	<p>site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), (ii) risk factors resulting from human behaviour (e.g. STD and HIV) and (iii) road accidents from construction traffic.</p>	<ul style="list-style-type: none"> • The contractor will train his workers and project management staff in (not limited to) first aid and basic infection control at work, transportation and handling of hazardous wastes, use of PPEs, fire safety etc. • Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labour Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national acts and rules of the Government of Sindh • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters.
	<p>Child and pregnant labour</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Pakistani Labour Laws and Employment of Child Act (1977).
<p>Accidents</p>	<p>Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims</p>	<ul style="list-style-type: none"> • The contractor will arrange first aid facilities at the site. A trained first-aider should be present at the site and arrangements made with a local doctor to be available on call. Appropriately equipped first-aid stations should be easily accessible throughout the place of work • Contact numbers and location of the nearest healthcare/emergency centre should be displayed at the worksite. • Document and report occupational accidents, diseases, and incidents.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 14 Construction Camp Management:</p> <ul style="list-style-type: none"> • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECoP:2 • Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for trainings • Security fence at least two m height. • Sick bay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	<ul style="list-style-type: none"> • The contractor shall provide toilets at the construction sites. • Location of toilet facilities should be at least six meters away from storm drain system and surface waters. These toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. Alternatively, each toilet facility should have septic tank and soaking pit. • Contractor should provide clean drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	<p>The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community:</p> <ul style="list-style-type: none"> • ECoP Fuels and Hazardous Substance Management



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none">• ECoP Air Quality Management• ECoP Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. • Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counselling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counselling and testing.

VII.12 ECOP 12: WORKER HEALTH AND SAFETY

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best Practices	<p>Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), (ii) risk factors resulting from human behaviour (e.g. STD and HIV) and (iii) road accidents from construction traffic.</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • An Occupational, Health and Safety Plan shall be prepared by the Contractor and submitted to ESU of PIC and ESMU of PMU for review and approval. The plan shall be approved by the ESU of PIC. The OHS shall include a job hazard analysis and safety precautions (like PPEs, barriers, change to design) and make ensure use of the PPEs and other measures during construction time. • The contractor will train his workers and project management staff in (not limited to) first aid and basic infection control at work, transportation and handling of hazardous wastes, use of PPEs, fire safety etc. • Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labour Office guideline on ‘Safety and Health in Construction; World Bank Group’s ‘Environmental Health and Safety Guidelines’) and contractor’s own national standards or statutory regulations, in addition to complying with the national acts and rules of the Government of Sindh • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	Child Labor	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Not hire children of less than 14 years of age in accordance with the Pakistani Labour Laws and Employment of Child Act (1977).
	Gender Based Violence	<ul style="list-style-type: none"> • The contractor shall: • Train the workers regarding (Gender Based Violence GBV) and also train workers about sexual harassment, child abuse, human trafficking for reducing the risk of GBV. • The contractor will also raise awareness among workers regarding coordination with local law enforcement and code of conduct.
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	<ul style="list-style-type: none"> • The contractor will arrange first aid facilities at the site. A trained first-aider should be present at the site and arrangements made with a local doctor to be available on call. Appropriately equipped first-aid stations should be easily accessible throughout the place of work • Contact numbers and location of the nearest healthcare/emergency centre should be displayed at the worksite. • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP: Construction Camp Management:</p> <ul style="list-style-type: none"> • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Safe storage facilities for petroleum and other chemicals in accordance with ECoP 2 • Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for trainings • Security fence at least two m height. • Sick bay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	<ul style="list-style-type: none"> • The contractor shall provide toilets at the construction sites. • Location of toilet facilities should be at least six meters away from storm drain system and surface waters. These toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. Alternatively, each toilet facility should have septic tank and soaking pit. • Contractor should provide clean drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	<p>The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community:</p> <ul style="list-style-type: none"> • ECoP : Fuels and Hazardous Substance Management • ECoP : Air Quality Management • ECoP : Noise and Vibration Management • ECoP : Road Transport and Road Traffic Management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. • Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counselling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counselling and testing.



ANNEX VIII: SRP SOPS for Management of COVID-19



Standard Operating Procedure for Management of COVID-19

Abstract

This document has been prepared in-line with World Bank Interim Guidance Note on COVID-19. This document provides general guideline for the Contractors to mobilize the team and construction material.

Sindh Resilience Project
Irrigation Department
Government of Sindh



DOCUMENT ISSUE AND REVISION RECORD

This document and its contents have been prepared and are intended solely for the information and use of the Government of Sindh, Irrigation Department concerning the **SINDH RESILIENCE PROJECT (SRP)**.

Document History

Project	Sindh Resilience Project (SRP)
Proponent	Irrigation Department, Government of Sindh
Document Ref	SRP-ESMP-COVID-19
Document Title	Standard Operating Procedure for Management of COVID-19 for Samlee, Sehryoon, Paro Jo Wandhio, Sangchat Jo Tar, Gurrand, Jaganwari, Darigh and Tungwari Small Dams

Revision	Description	Prepared	Checked	Review	Authorized	Date
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Table of Contents

i. PURPOSE.....	2
ii. SCOPE.....	2
iii. Construction Contract Coverage for COVID 19 under Existing ESMP Budget.....	4
ESMP Budget for COVID Management	
iv. Focal Person and their Roles for Management of COVID.....	5
a. SRP-PMT.....	5
b. SRP-PISSC.....	5
c. Contractor Level	6
v. Procedures for Working at Camps located at all sub-projects....	6
vi. Communication with Community.....	8
vii. Procedures for Team Traveling, Material Transportation & Work on Site....	8
viii. Training of ESMP Security Staff	10
ix. Monitoring & Reporting Mechanism ...	10
x. Signages / Communication	10



Hadith of the Prophet (PBUH) that addresses disease outbreaks and how Muslims should deal with it.

The Hadith says:

"If you hear of an outbreak of plague in a land, do not enter it, but if the plague breaks out in a place while you are in it, do not leave that place" (Sahih Bukhari and Muslim)

I. Introduction:

Sindh Resilience Project (SRP) received an ESF/safeguards interim note: COVID-19 considerations in construction/civil works projects on 9 April 2020 from the World Bank. In continuation to this ESMU-SRP team has developed this document. The COVID-19 pandemic has created unprecedented challenges for everyone. Addressing COVID-19 related issues at the construction site starts with recognizing that this is not business as usual and that circumstances require a highly adaptive responsive management design to avoid, minimize and manage what may be a rapidly evolving situation. To use reasonable efforts in the circumstances, recognizing that what may be possible today may be different next week (both positively, because more supplies and guidance may be available, and negatively, because the spread of the virus may have accelerated).

II. Purpose:

This SOP shall provide guidelines to deal with the current situation created due to the epidemic of COVID-19 and to provide preventive measures for prevention from the COVID-19 rampant.

III. Scope:

The scope of this Standard Operating Procedure (SOP) applies to all active work-sites of Sindh Resilience Project (SRP) mentioned below; This is general Standard operating procedure, however, as per guidance note issued on 7th April 2020 by World Bank Section 5, each contractor HSE staff should prepare site-specific COVID Management plan, which needs to be approved by PISSC and PMT team.

S.NO	Name of Sub-project	District
1.	Samlee	Tharparkar
2.	Sehryoon	Tharparkar
3.	Paro Jo Wandhio	Tharparkar
4.	Sangchat Jo Tar	Jamshoro
5.	Gurrand	Jamshoro
6.	Jaganwari	Khairpur
7.	Darigh	Khairpur
8.	Tungwari	Khairpur

IV. Focal Person and their Roles for Management of COVID



Addressing COVID-19 at a project site goes beyond occupational health and safety, and is a broader project issue which requires the involvement of different members of a project management team. Given the project context, a designated team would be established to address COVID-19 issues, at PMT level, PISSC level, and at the contractor level.

Following would be the composition of designated teams at three levels; which are Client

a) SRP-PMT

Name	Designation	Cell number/ WhatsApp number	Email
Muhammad Ibrahim Daudpota	Deputy Director (EHS)	0335-3865861 0300-3317550	mibrahim.daudpota@yahoo.com
Arshad Hussain Memon	Environment Safeguard Consultant	0333-7045597	arshad.memon@hotmail.com
Nasir Ali Panwhar	Social Safeguard Consultant	0300-3079491	napanhwar@gmail.com

b) SRP-PISSC

Name	Designation	Cell number/ WhatsApp number	Email
Ibrahim Samoon	Team Leader		samoonibrahim@yahoo.com
Niaz Ali Baloch	Chief Resident Engineer		niazshar@hotmail.com
Sohail Memon	Resident Engineer		samemon@gmail.com
Farooq Ahmed Memon	Environment Specialist		efarooqm@gmail.com
Jan Muhammad	Social Safeguard Specialist		jansamoon@gmail.com

c) Contractor Level

The immediate contact persons like Project Manager of each contract shall be focal person regarding COVID management. During the execution of the project ESMP team member Environment officer and Health and Safety officer of the each contract shall be contact person after in the absence of Project Manager.

The overall obligation of the Contractor will be:

- to take all necessary precautions to maintain the health and safety of the Contractor's Personnel



- to appoint a health and safety officer at site, who will have the authority to issue directives to maintain the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents
- to ensure, in collaboration with local health authorities, that medical staff, first aid facilities, sickbay, ambulance services and any other medical services specified are available at all times at the site and at any accommodation
- to ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics

V. Procedures for Working at Camps located at all sub-projects

Following is the general standard operating procedure (SOP) and shall be followed by all Contractors, however, each contractor shall prepare site-specific plans according to local conditions and site-specific needs.

- i. Before resuming the work, the contractor should ensure the disinfection of camp premises and this should be done on regular basis subsequently.
- ii. Contractor representative (Project Manager) in consultation with HSE Staff and PISSC -HSE team shall arrange sufficient stock of PPE like coverall, face mask N-95, face shield, surgical mask, hand sanitizer, gloves, temperature Guns shall be arranged before the arrival of the workforce on site.
- iii. Other items like tissues and hand sanitizer for all office workers. Surgical masks are made available to offer anyone, who develops respiratory symptoms.
- iv. The contractor should develop hand-washing areas for all the workers, with the facility of clean water and soap.
- v. Wastewater tank should be developed for the disposal of contaminated water.
- vi. Minimize face to face meetings, on-site maximize telephonic, video, and conference calls as a replacement of physical meetings (where available).
- vii. Maintain physical distance at least 6 feet distance with each other during the meeting.
- viii. Use a face mask and latex gloves while maintaining physical distance
- ix. Use a digital thermometer to screen all the personnel entering site office, site and camp areas and maintain a logbook for record-keeping of temperature readings of all the workers entering office area/building.
- x. DO NOT use a traditional mercury thermometer.
- xi. Promote communication with staff to inform if anyone in their contact (such as within their residential area, community, market area, place of visit for work/ meeting/ religious gathering) has developed any symptoms of COVID-19 and restrict their entry to workplace or meeting with staff.
- xii. If an individual's temperature is on the higher side and exhibits symptoms of high fever, he should be investigated by a medical doctor for further symptoms of COVID-19.
- xiii. If an individual after examination exhibits all the symptoms of COVID-19 immediate attention should be given and contact Pak Corno Helpline (03001111166) for further guidance on an immediate basis.
- xiv. Have details of contact numbers of concerned District Health Officer (DHO), Taluka Hospital and local administration i.e Deputy Commissioner and Assistant Commissioner
- xv. Install sanitizer dispensers at the workplace in each room. Make sure these dispensers are regularly refilled.



- xvi. Ensure that face masks and / or paper tissues are available at workplaces, for those who develop a runny nose or cough at work, along with closed bins for hygienically disposing of them.
- xvii. Signages in local language promoting regular handwashing should be displayed at prominent locations, occupational health and safety officer and Social Officer shall make sure this.
- xviii. All persons including officers, laborers, etc. should frequently wash hands for more than 20 seconds regularly with soap or hand sanitizer.
- xix. All benchtops, door handles, working tables, chairs, etc. should be sanitized by using alcohol-based cleaning liquids or hypochlorite-based chemicals (twice a day).
- xx. COVID-19 waste should not dispose in an open area, and it must be contained properly and disposed of properly, through incineration only.
- xxi. All staff members should be trained for the COVID-19 waste management.
- xxii. All the waste such as face masks, gloves, and other items generated at office and campsites should be stored in a labelled marked container (Hazardous Waste) and should be stored separately in isolation after disinfection. The waste once accumulated should be disposed of via EPA, a certified contractor for Incineration.
- xxiii. In case of any worker/staff member develops the symptoms of COVID-19 he should be referred to the nearest Government facility for the testing.
- xxiv. In case if any of the worker develops symptoms of COVID-19 he should be thoroughly explained about WHO's guidelines of "Home Care for Patients with COVID-19 presenting with mild symptoms and management of their contact"
- xxv. HSE Team shall not allow the overage, person with diabetes, lung infection, cancer, or any other team member having chronic health issues.

VI. Communication with Community

The community may be concerned about the presence of non-local workers, or the risks posed to the community by local workers' presence on the project site. The following actions should be considered by ESMP Staff:

- Other forms of communication should be used; posters, pamphlets, the means used should take into account the ability of different members of the community to access them, to make sure that communication reaches these groups.
- Face to face meetings should be avoided or safe distance should be maintained.
- The community should be made aware of the procedure for entry/exit to the site, the training being given to workers, and the procedure that will be followed by the project if a worker becomes sick.
- Community as well workers should be encouraged to use the existing project grievance mechanism to report concerns relating to COVID-19, preparations being made by the project to address COVID-19 related issues, how procedures are being implemented, and concerns about the health of their co-workers and other staff.

VII. Procedures for Team Traveling, Material Transportation & Work on Site:

a) Team Traveling



- i. Before traveling make sure that the latest information on the area where COVID-19 is spreading is readily available, the information may be accessed through www.covid.gov.pk and www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/.
- ii. Based on the latest information, assess the benefits and risks related to upcoming travel plans and avoid sending a large number of team members on field visits also exclude older employees and those with medical conditions such as diabetes, heart and lung disease to areas where COVID-19 is spreading.
- iii. Make sure all persons traveling to locations reporting COVID-19 are briefed by a qualified professional.
- iv. Employees traveling to sites must have face mask and hand sanitizer of alcohol-based hand rub. This can facilitate regular hand-washing.
- v. Seating arrangement of such vehicles amongst the individuals occupying it shall be such that 3 feet distance is maintained. Individuals occupying such vehicles shall wash hands with soap before entry into site or premises and, subsequently, their hands shall be sanitized
- vi. All Vehicles must have the minimum possible number of travelers as per the Guideline of Sindh Government. (2 to 3 person/vehicle)

b) Material Transportation

- i. The temperature of the drivers, conductors, loaders, and other staff of the vehicle transporting such materials shall be monitored at entry points along with other indicators of COVID-19 that are flu, cough, and muscular pain, etc. No person(s) associated with such vehicles having any or all symptoms of COVID-19 shall be allowed to enter the site or premises.
- ii. The material like steel, wood, and cloth, iron, plastic the COVID-19 for days, therefore, all such raw material shall be properly sanitized and disinfected before entry to site or premises is granted.
- iii. Seating arrangement of such vehicles amongst the individuals occupying it shall be such that 3 feet distance is maintained. Individuals occupying such vehicles shall wash hands with soap before entry into site or premises and, subsequently, their hands shall be sanitized.
- iv. Raw materials, machinery, and any other material required to be processed shall be only allowed to enter the site or premises after the vehicle is completely sanitized and disinfected at the entry point

c) Working on Site

- a. HSE Team should check the COVID parameters of each worker before the start of work and record may be shared on the group by 9:00 am every day.
- b. If any worker **found suspected should not be allowed on-site** for work and after examination exhibits all the symptoms of COVID-19 immediate attention should be given and contact Pak Corno Helpline (03001111166) for further guidance on immediate basis.



- c. Daily toolbox talk should include COVID-19 preventive measures on a regular basis and preventive measures should be made mandatory for the contractors and subcontractors.
- d. All the team members conducting inspections should minimize their time on-site to the barest minimum necessary to ensure compliance with the Specification. **DO NOT LINGER** on-site and return as soon as possible to the colony.
- e. All staff must be sprayed and cleaned on returning to the camp and a wash facility has been set up at the site gate.
- f. The guards may be instructed to enforce these measures. Gloves, masks, shoes and helmet must be left at the gate after spraying.
- g. All the workers working on site, should be provided with protective clothing; coverall, face masks, gloves and hand sanitizers for their regular use.

d) Infected Persons/Team Member Isolation:

- a. At each camp site at least one room should be declared as quarantine quarter, with appropriate facilities.
- b. If an individual after examination exhibits all the symptoms of COVID-19 immediate attention should be given and contact Pak Corno Helpline (03001111166) for further guidance on immediate basis.
- c. Allocate quarantine quarters at camp site and keep the infected person isolated from the remaining staff until the doctor decides return to the wider community.
- d. No healthy person will be allowed to enter or access the quarantine quarter at all times not even after wearing proper PPEs.
- e. Medical doctor handling the infected person for initial first aid; should use following PPEs; medical masks, gown, apron, eye protection goggles or face shield (respirator N95 or FFP2 standard) and boots.
- f. Healthcare wastes produced during the care of COVID-19 patients should be collected safely in designated containers and bags, treated and then safely disposed.

VIII. Training of ESMP Security Staff

- Training of the ESMP staff and security staff will be carried out by the ESMU PMT team and PISSC team.

IX. Monitoring & Reporting Mechanism

Keeping in view the aggressive behavior of pandemic, effective and timely reporting will be the key to success; Environment officer of each sub-project will be the focal person, prepare a report on below format on a daily basis and submit to the PISSC through what sup group already working and PISSC Environment Specialist shall compile and submit the report 10:00 am on daily basis. (10:00 am – 10:00 am- 24hrs)

a) Health Status of Workers

- Contractor shall provide the Status in **Daily/Weekly report** of implementation, which includes following;
 - Total number of staff available on site
 - Number of total patients tested



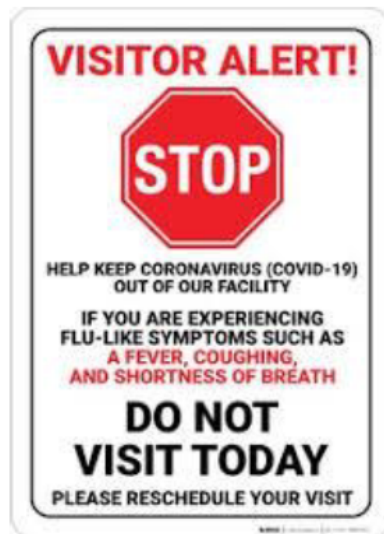
- Number of patients reported positive
- Number patients reported negative
- Number patients reported quarantine at hospital or home

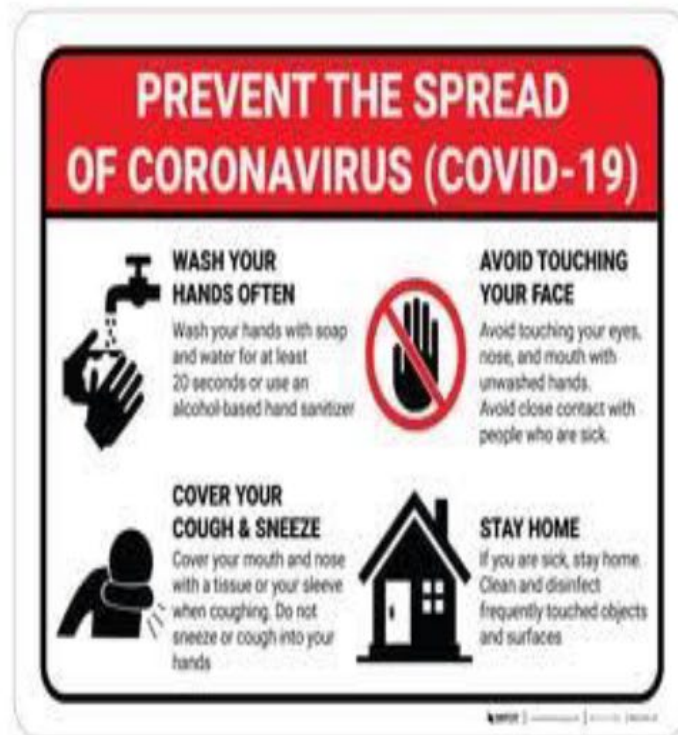
b) Status of Personal Protective Equipment and other supplies at each Sub-project site

- Temperature guns
- Number of Gloves available and used
- Number of Mask available and used
- Availability of Hand sanitizer
- Number of Coverall available and used
- Contractor shall also submit the details of items procured and any actions taken for COVID-19 in each IPC and verified by the PISSC.

X. Signages / Communication

All Contractors shall install following signages at prominent locations after translation into Sindhi language. These are given as sample, while more could be developed jointly.







XI. Budget for COVID-19.

For the proper implementation of SOPs a separate budget for COVID-19 management in BOQ has been allocated which can be used for implementation of SOPs.

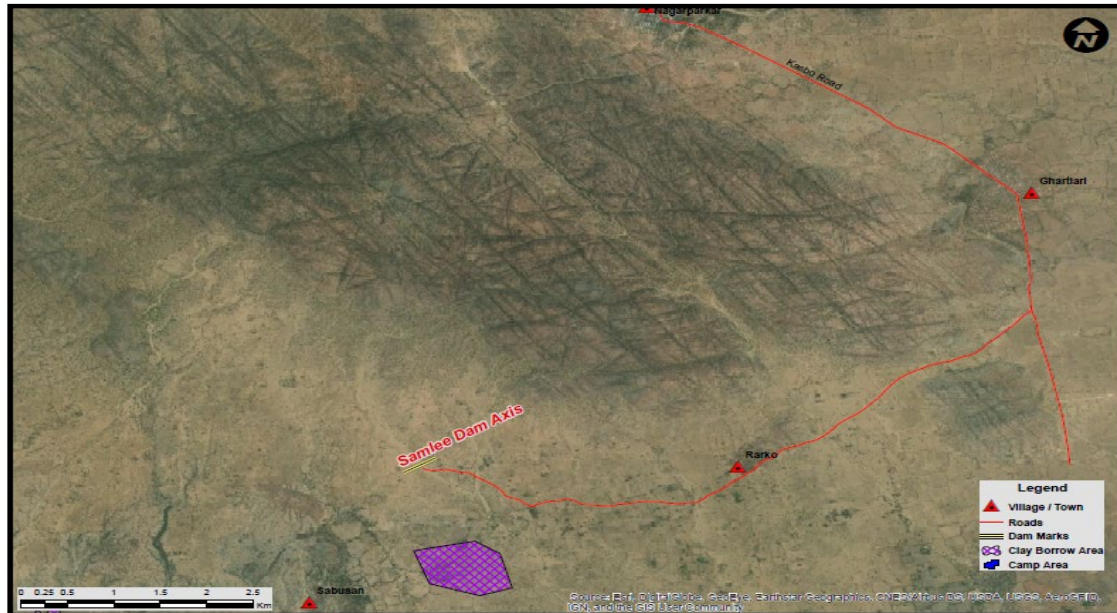
Note:

Find the latest information from WHO on where COVID-19 is spreading:

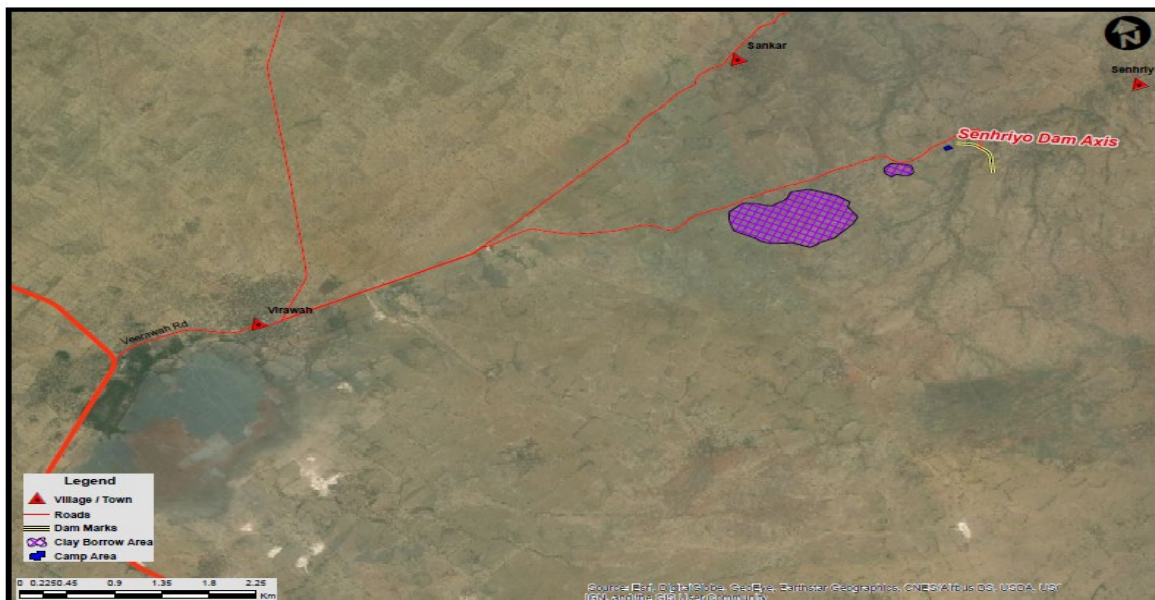
https://www.who.int/docs/default-source/coronaviruse/getting-workplace-ready-for-covid-19.pdf?sfvrsn=359a81e7_6



ANNEX IX: Proposed campsites Location Maps

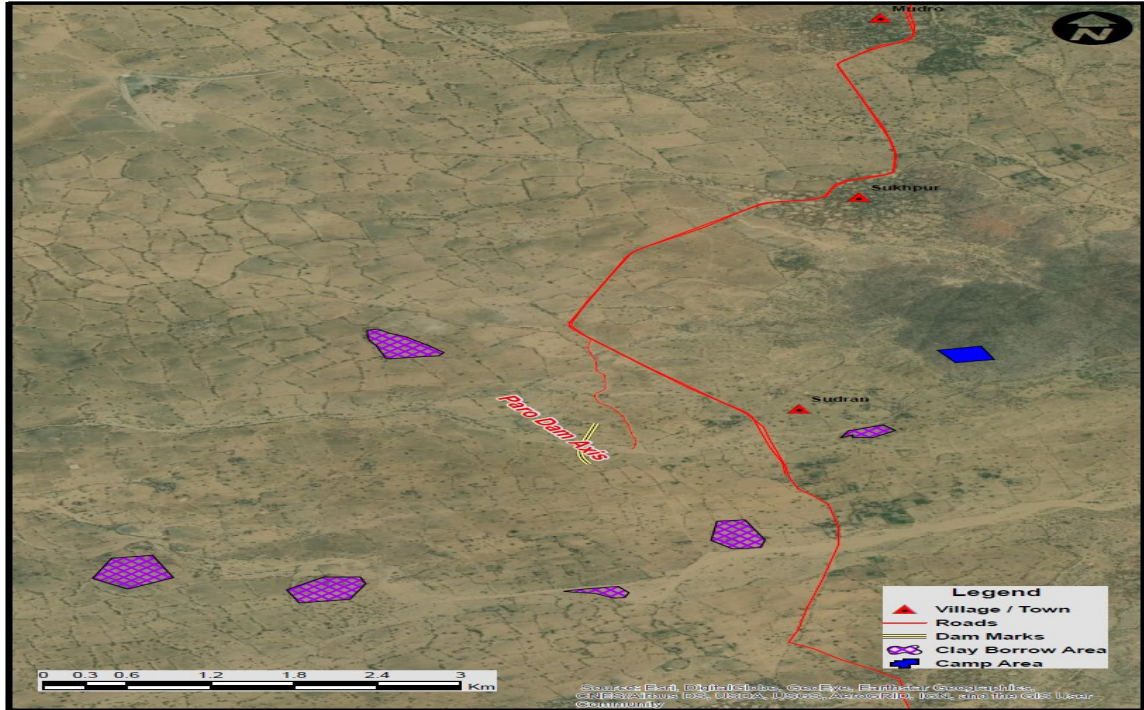


Camp Site and Borrow Area location of Samlee Dam

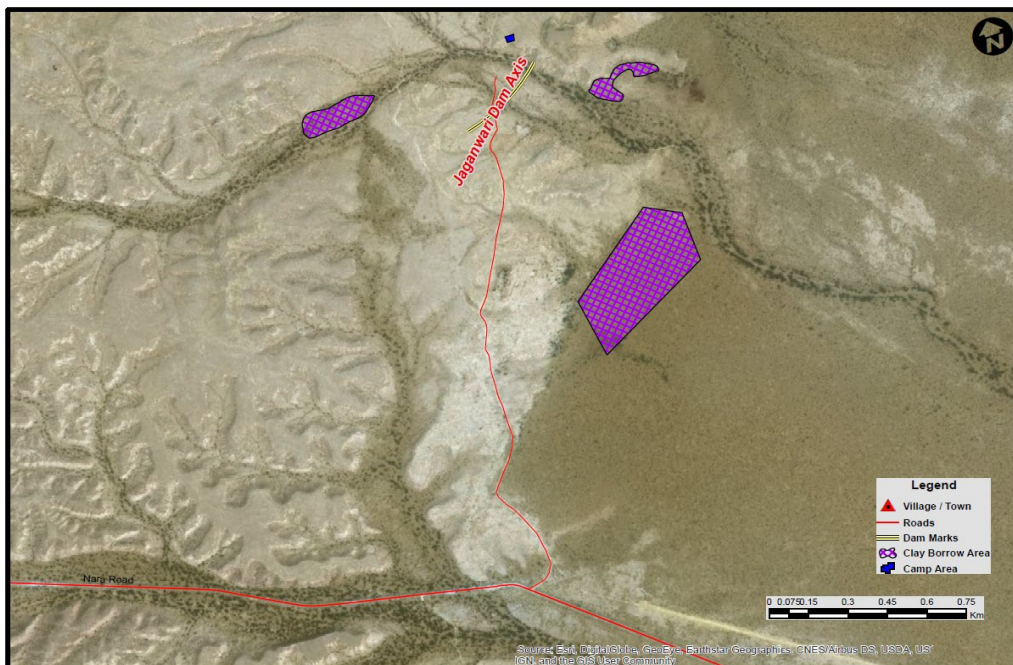




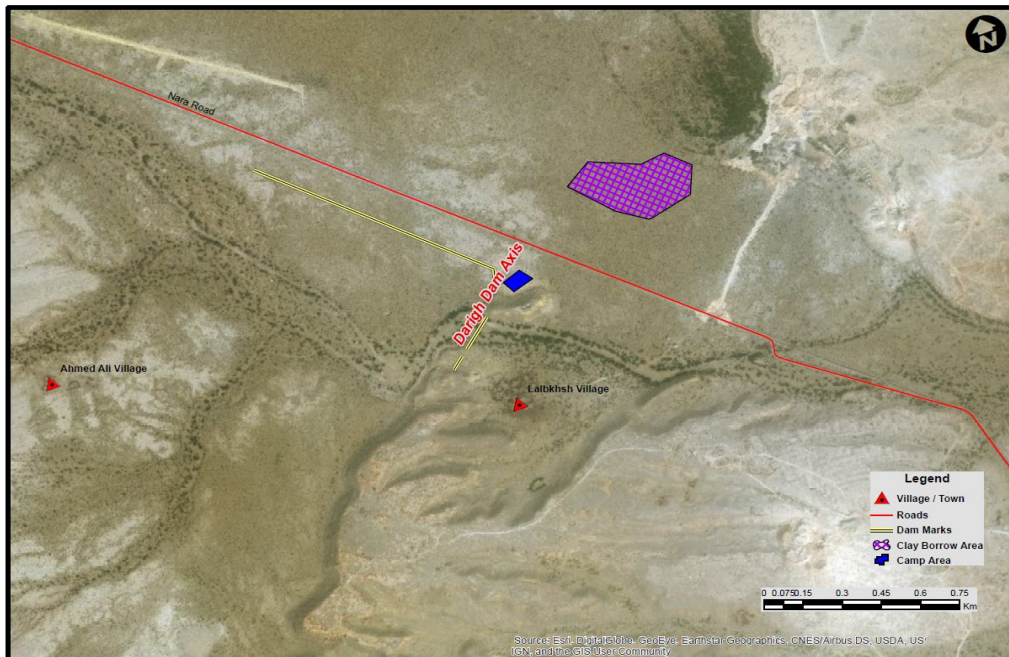
Camp Site and Borrow Area location of Sehriyoon Dam



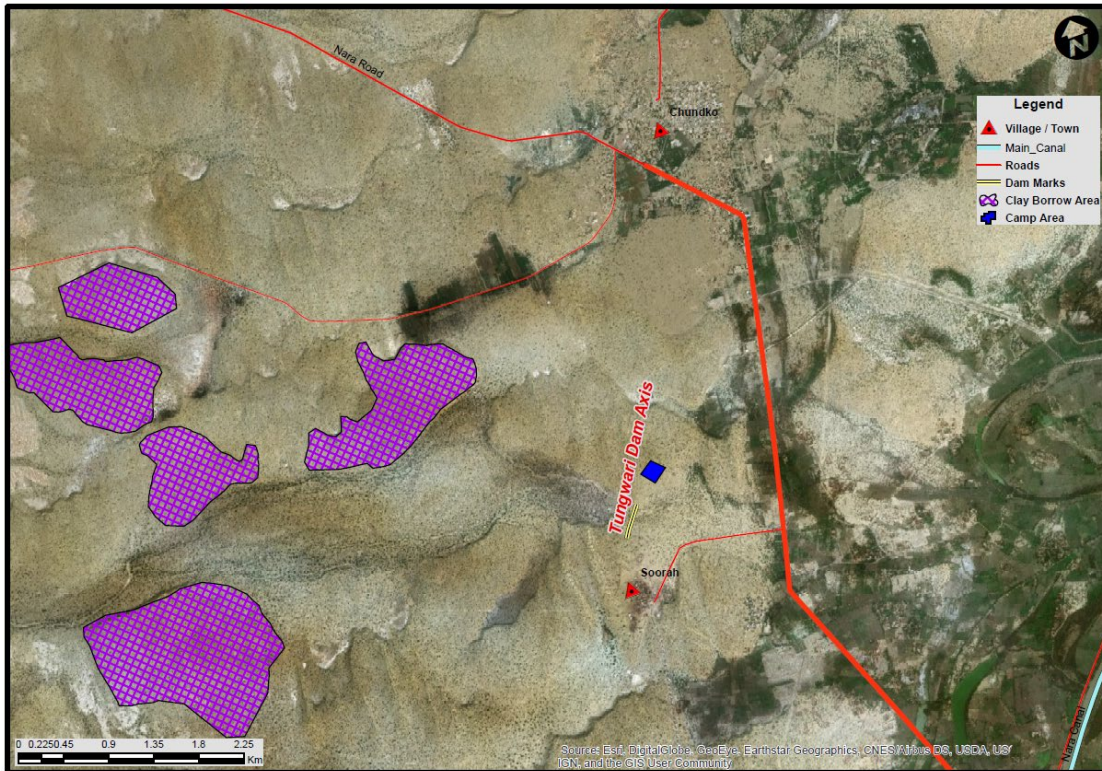
Camp Site and Borrow Area locations of Paro Jo Wandhio Dam



Camp Site and Borrow Area location of Jaganwari Dam



Camp Site and Borrow Area location of Darigh Dam



Camp Site and Borrow Area location of Tungwari Dam