ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

OF SABUSAN, SANKAR, KARMATIANI, KONKAR, JUNGSHAHI AND ARIPIR SMALL DAMS

SINDH RESILIENCE PROJECT (IRRIGATION COMPONENT)

Final Version

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Sindh Resilience Project

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

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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 first year of the SRP implementation, GoS is planning to construct the six small rainwater recharge dams Sabusan and Sankar in Nagarparkar area of district Tharparker; Karmatiani and Konkar in District Malir district; Jungshahi in district Thatta and Aripir in lower Kohistan of Jamshoro district.

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 environmental and social assessment checklist. These subprojects are likely to cause low to moderate level of environmental and/or social impacts, therefore, falls under category “B” in accordance with environmental categorization criteria as specified in the ESMF document prepared for the project and approved by World Bank. Thus, this ESMP has been prepared accordingly to meet the World Bank Category “B” project requirements for the works to be carried out during the first year of SRP implementation.

The present 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 (offset or reduce) environmental and social negative impacts, upto certain acceptable level.

The sub-project areas are located in (i) Kohistan and (ii) Tharparker regions of Sindh. Kohistan is hilly area of the Khirthar Range comprises of both plain landforms and hilly terrain surrounded by mountains. The surface of the surrounding mountains and hill slopes is bare rock without soil cover and vegetation. The valleys between mountains and hills become green with grass when it rains in summers Jun-August and show their capability to be used for crop cultivation. There are hundreds of small catchments and streams emanating from Kohistan region and drains water to the piedmont area where local farmers intercept the rivers and small catchment runoff to capture the moisture to grow the dry land crops. The local settlements in project areas are also using subsurface and ground water for irrigation and its depth ranges varies from 70 to 350 ft in different parts of the Kohistan region. If the rains are absent for more than 2 years, the subsurface water gets dried making local population to get zero harvest. The proposed initiative by building small dams in the Kohistan region would sustain the ground water availability for 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 less losses of the fertile soil erosion, public amenities like link roads, electricity pools and local human settlements. In Kohistan sub-project area 4 small dams are proposed (i)

Karamtiani (ii) Konkar (iii) Jungshahi falling in District Malir and Thatta and (iv) Aripir in district Jamshoro. In the Kohistan region total number of 256 households with 2520 male and female population will be benefited with project intervention.

ii) The Tharparkar region lies in the desert arid zone. The availability of water in region is scarce and 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 other bushes/trees found in the area.

The major water resource in the sub-projects area is seasonal precipitation that enables the groundwater recharge and increases the vegetation covers on the top surface and produce wild grass for animal feed. In some parts of the subproject area direct rainfall moisture is also utilized for local crop production. The rainfall water drains in different Nais (streams) that ultimately ends up either in sea or further drains to Indian occupied Run of Kach area. The major sources of drinking water are the dug wells, and its depth ranges varies from 20 to 30 ft in different parts of the Tharparkar region. The other seasonal source of water is traditional manmade earthen ponds that are made by digging ground and filled up by the surface run off. These ponds get filled during the rainy season mainly in summer months upon occurrence of rains and provide water for 2-6 six months for human use and livestock. They also help in recharging of ground water aquifer and dug wells. The women folks use to fetch water from an average distance ranging from 1-3 km from their villages from the existing earthen ponds. In the Nagarparkar region 2 small dams are proposed (i) Sabusan Village Dam and Sankar Dam. All the 2 dams are in Nagarparkar Tehsil of Tharparkar district. The proposed structure will resolve the drinking water scarcity and comparatively sweet water will be available to the local population for longer time through the year. In the Tharparker region total number of 160 households with 1211 male and female population will be benefited with project intervention.

Since, no acquisition of any private land is required for these subprojects because Nais and Nalas (Rain water 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 population is scattered. However social and environmental impacts may arise only due to temporary use of privately owned or government owned uncultivated 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 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 sub project areas significantly. Rather in the long run it would improve. However, mitigation measures recommended in the report would need to be strictly ensured by the contractor during construction period.

Aanticipated negative impacts can be mitigated through proper inspection and maintenance of vehicles and machinery to reduce exhausted 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 waste water at 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, 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 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.

In addition, it outlines 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.

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 on a regular basis. 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, to be headed by the Project Director. The PMT is supported by 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 specialists to supervise and monitor ESMP implementation. Finally, the construction contractor will also have environmental and social 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 56 trees will be felled or relocated for the construction of the above mentioned 6 dams. The replanting of 5 times trees to this number would cost Rs 0.28 million

rupees @ the rate of Rs 1,000/- per tree. Adding the cost of Rs. 44,308,440/- budget for the implementation of the ESMP has been allocated.

1. 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 SRP include: i) rehabilitation / improvement of existing earthen embankments along River Indus and ii) construction of small rainwater recharge dams in the water-scarce areas of the province. During the first year of the SRP implementation, GoS has planned to construct six small dams in water scarce districts of the Sindh province.

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 first year of SRP implementation. In addition, an Environmental and Social Management Framework and Resettlement Policy Framework (ESMF/RPF) – provided under separate cover.

Sabusan and Sankar Dams are located in tehsil Nagarparkar of district Tharparkar belongs to Tharparkar Region. While the proposed dams of lower Kohistan region, Karmatiani and Konkar dams are in Malir district, Aripeer dam is located in Jamshoro district and Jungshahi dams is located in Thatta district.

The main activities involved in the construction works include concrete works, obtaining soil from borrow area and transporting it to the dam site, soil compaction, and stone pitching on slopes of reservoir. The contractor will also need to establish some temporary facilities as well, including material yard and construction camp for workforce.

1.1. 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) will be 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; and (iii) does not fall in any protected area, such as wildlife sanctuary, game reserve, or national park. 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.

1.2. 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.

1.3. Sub-Project Justification

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 of Sindh, and a strong heatwave in June-July 2015 which caused more than 1200 fatalities from heatstroke and dehydration, mostly in Karachi (the provincial capital).[1]

[1] PAD for SRP, Report No: PAD 1684

For the last ten years, 50 percent of the overall population of reported 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. 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.

Land around the subprojects (dams site areas) proposed to be constructed are not fully exploited. Rather these are totally virgin and of high fertility soils, which can open a huge window of economic opportunity for local population. 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:

- The project will help in recharging the ground water in the areas where it is crucial for the drinking agriculture and livestock.
- The project will help in improvement of domestic water supply.
- With the availability of water, more crops will be grown as compared to current traditional crops, thus helping in social uplift of the local population.

Therefore, Kohistan and Nagarparkar regions are main potential sites in Sindh Province, to construct, Small Dams, Delay Action Dams, and Weirs to retain the run off generated from precipitation and continuous storm rainfall. The

1.4. Sub-Project Duration

The execution works of the subproject are proposed to be completed in twelve months as the subprojects have been placed as Priority 1 projects.

1.5. Policy, Legal and Administrative Framework

This section presents an over view 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.

1.5.1. National/ Provincial Legislation

Sindh Environmental Protection Act, 2014

The provisions of Article 270 AA (6), as amended by section 96 of the18th 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 first draft of the Sindh Environmental Protection Act 2013 was issued in October 2013 during a consultative meeting organized by the IUCN Pakistan in collaboration with the Sindh Environmental Protection Agency (SEPA). The Sindh Environmental Protection Bill, 2014

having been passed by the Provincial Assembly of Sindh on 24th February, 2014 and assented to by the Governor of Sindh on 19th March, 2014 is hereby published as an Act of the Legislature of Sindh.

The Act provides the framework for protection and conservation of species, wildlife habitats and biodiversity, conservation of renewable resources, establishment of standards for the quality of the ambient air, water and land, establishment of Environmental Tribunals, 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 will cause low to moderate level of environmental or social impacts as per assessment carried out with the help of screening checklist. Therefore, this sub-projects fall under Schedule "III" so it will not require any EIA/ IEE. 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. As one site is located with Khirthar National Park, so following measures need careful for working within National Park. 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, 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 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 pertaining to that area should be sought from the provincial forestry and wildlife department.

The Land Acquisition Act (LAA) 1894

The Land Acquisition Act (LAA) of 1894 is the key legislation that has direct relevance to resettlement and compensation in Pakistan. The LAA and its implementation rules require that before implementation of any development project the privately owned land and crops are compensated to titled landowners and/or registered tenants/users.

Based on the LAA, only legal owners and tenants registered with the Land Revenue Department or those possessing formal lease agreements are eligible for compensation. Under this Act, users of the Rights of Way (RoW) are not considered "affected persons" and thus not entitled to any mitigating measure, compensation, or livelihood support. Also, there is no legal obligation to provide compensation to title-less land users, unregistered tenants, squatters or encroachers for rehabilitation. However, after independence and with the passage of time various deviations to LAA have been practiced.

The exceptions to the rule can be explained by the fact that the law is not rigid and is broadly interpreted depending on operational requirements, local needs, and socio-economic circumstances.

The relevant key sections of the LAA, 1894 are briefly described below.

Section 3: According to this Section, land means land along with any superstructure, fixtures, etc., thereon and benefits accruing there from. For the purposes of Act, land includes buildings, and also trees and standing crops. Land thus is a sum total of land plus benefits arising out of land plus all objects/things attached to or permanently fastened to anything attached to it.

Section 4: Section 4 details the first step in the land acquisition process under the LAA. A preliminary notice is served by the government expressing its desire to "enter upon" broadly identified private lands for surveying and soil-testing for the specified public purposes.

Requirements of publication of the notification under LAA are mandatory, and the acquisition proceedings would stand invalid if requirements of this section are not fully satisfied. Notification of LAA is a public pronouncement by appropriate government officer, empowered to publish a notification to that effect in official gazette in order to put those who are affected or likely to be affected on due notice. Purpose of LAA is to carry out preliminary investigation/land survey with a view to find out after necessary survey whether land was suitable for purposes for which it was sought to be acquired. Section 4 puts owners of land on alert that land is going to be acquired.

Section 5: The initial notification under the LAA is followed and confirmed by way of a second notification under the Act. Under this Section, the marking and measurement of the land and assessment of compensation is carried out. The cash compensation is assessed on the basis of five or three years average registered market rate, and is paid to the landowners for their lands being acquired.

Under section 5, the owners of land or those affected or likely to be affected, may raise objections over the intent of land acquisition or survey report to the competent authority within 30 days of notification under section 5 for the hearing of objections.

Section 6: Once an area in the locality is fixed to be acquired, it is notified by publishing the notification. The exact purpose of acquisition of land is also mentioned in the notification, and the land may be acquired only for the purpose thus specified. Any proposal for further acquisition in the same locality would have to be followed up by a fresh notification under the LAA.

Section 8: Affectees are made aware of the exact measurement of their respective lands/structures and the value of land under acquisition through issuance of notification under the LAA.

Section 9: Stating that the land is intended to be possessed and claims for compensation for all interests in the land may be made to the officer concerned and all persons interested/affected should appear before him at a given place and time not being earlier than 15 days after the publication of said notice.

Sections10, 11 and 12: According to section 10, the Collector (defined under section 17 of the LAA) publicly declares/announces awards. Generally the award is declared at place where affectees can get together and hear the award. Affectees can either accept the award or reject the award; however, in any case the affectees have to sign the award mentioning whether they accept the award and the compensation offered therein or reject the award and sign under protest.

Section 17: Under the this section, the Collector is authorized to acquire land on the basis of the situation declared as an "emergency situation" on behalf of the government and can avoid the formalities to be completed and to avoid any delay in proceedings. In such a situation, the Collector under section 17(4) can pass an award without looking into or addressing the objections/complaints of affectees. Proceedings under this section are independent and not subject to any restrictions and conditions.

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 labor. Additional plantation will be made and for that purpose funds have been allocated in the contract under ESMP implementation cost bill.

Antiquity Act, 1934

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.

1.5.2. 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 the 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): For the purpose of this policy, 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 group 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 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 are 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 is not applicable for this sub-project.

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 the OP 4.37. As part of due diligence and considering that Bank's OP 4.37 is applicable and Dam Safety Expert has been engaged by the World Bank to undertake a technical review of sites.

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 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 forms a boundary between or any river or body of surface water that flows through, two or more states. Therefore this OP 7.50 is not applicable on 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 public, and a copy of the report to be sent to the Bank's Info Shop, before the Bank commences the project appraisal. In accordance with this Policy, ESMF has been disclosed to public and has been placed on 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 construction of rain water-fed recharge dams, less than 10 meters in height, that are likely to cause low to moderate level of negative but reversible and localized impacts. Therefore, this OP is.
2	Natural Habitats	OP/BP 4.04	✔		Some interventions are likely to be carried out within or near important habitats. Therefore; this OP is applicable.
3	Involuntary resettlement	OP/BP 4.12	✔		There is no any involuntary resettlement resulting in relocation or adverse impact on livelihood and/or sources of a livelihood. Because sub-projects to be constructed on government own land. Therefore; this OP 4.12 is not triggered on these sub-projects Although this policy is applicable on this sub-project.
4	Project in International water ways	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 forms a boundary between or any river or body of surface water that flows through, two or more states. Therefore this OP 7.50 is not applicable.
5	Safety of Dams	OP/BP 4.37	✔		The selected sub-projects are falling under the definition of Small Dams as specified in the OP 4.37. As part of due diligence and considering that Bank's OP 4.37 applicability, Dam Safety Expert would be engaged by the World Bank to undertake a technical review of sites.

1.6. 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 subprojects/sites mentioned in this ESMP. 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 must be approved PMT/Project Implementation Support and Supervision Consultants (PISSC).

The contractor will be required to prepare other sites plans as mentioned in Chapter 7 including traffic management plan, HSE plan, waste 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, which ever date is earlier.

1.7. Study Team

This report has utilised the baseline data collected for environmental and social impact assessment carried out under DACREP project during 2016. Supplementary field surveys have also been conducted during month of October 2017 and January, 2018 by ESMU-PMT with assistance of PISSC team. List of team members is given in Table-2.

Table 2: Study Team

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

2. DESCRIPTION OF SUB-PROJECT

2.1. Background

[2]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. This subcomponent will support the construction of small rainwater-fed dams, less than 10 meters in height, in the Kohistan and Nagarparkar regions. The two Dams in Nagarparkar area will be storage dams, whereas the four dams in Kohistan area will be ground water recharge dams.

The recharge dams in Kohistan region will augment the groundwater aquifers through percolation. The ground water 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 is not financing the construction of any water supply channels / and tube wells The main objectives of construction of small dams and weirs is to recharge ground water and is not deliberately designated to promote agriculture activities. Further benefits include protection of around 416 households having a population 3305 of persons from hill torrents and flash flooding.

2.2. Sub- project Location

The sub-project area is scattered in Tharparkar, Thatta, Malir and Jamshoro Districts of the Sindh Province of Pakistan. The proposed investments are clustered in two regions: (i) the Nagarparkar area of district Tharparkar; and (ii) Kohistan region, Jamshoro, Malir and Thatta Districts.

Sankar and Sabusan Dams are on streams near to Sankar, Dedhrai and kherario villages in Nagarparkar Tehsil of District Tharparkar, Sindh. The purpose of these dams is to store the seasonal flows of the local streams that generally lost into the Rann of Kutch. This area of Nagarparkar tehsil is located in the extreme southeast of Sindh. Sankar Dam is about 6.5 Km from Virawah and 74 Km from Islamkot whereas Sabusan is 33 Km southwest of Nagarparkar and 109 Km from Islamkot city. The immediate settlements around two dam of Nagarparkar are Virawah, Nagarparkar and Islamkot.

The Kramatiani delay action dam is proposed on Kramatiani nai near Goth Gadap and Konkar dam at Konkar nai near Goth Chanesar, both are located in district Malir. Aripeer dam is proposed on Mol nai near Allah Bux village, tehsil Thano Bula Khan, district Jamshoro and

[2] Project Appraisal Document for SRP Report# PAD 1684

Jhungshahi dam is proposed on Ran Pathani nai near Malmari Jokhio village in tehsil and district Thatta.

The envisaged investments in all planned dams construction are expected to add 26,163 acre feet into fresh groundwater aquifers, thereby raising the water table from the current depth of around 200 feet up to 25-50 feet. The Sub-project areas are shown in the Figure 1 to 3 given below.

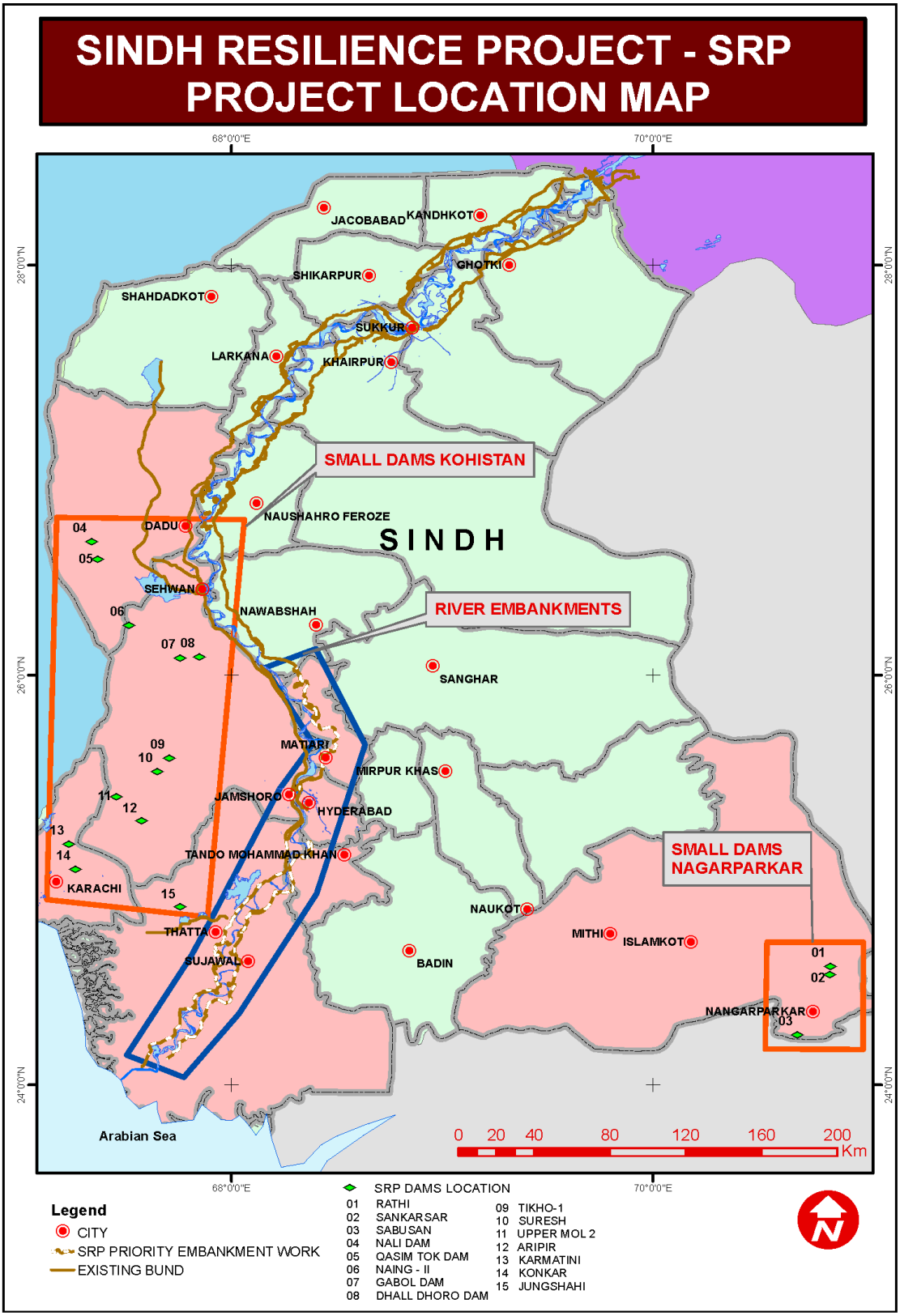

Figure 1: Location of the SRP Project Area

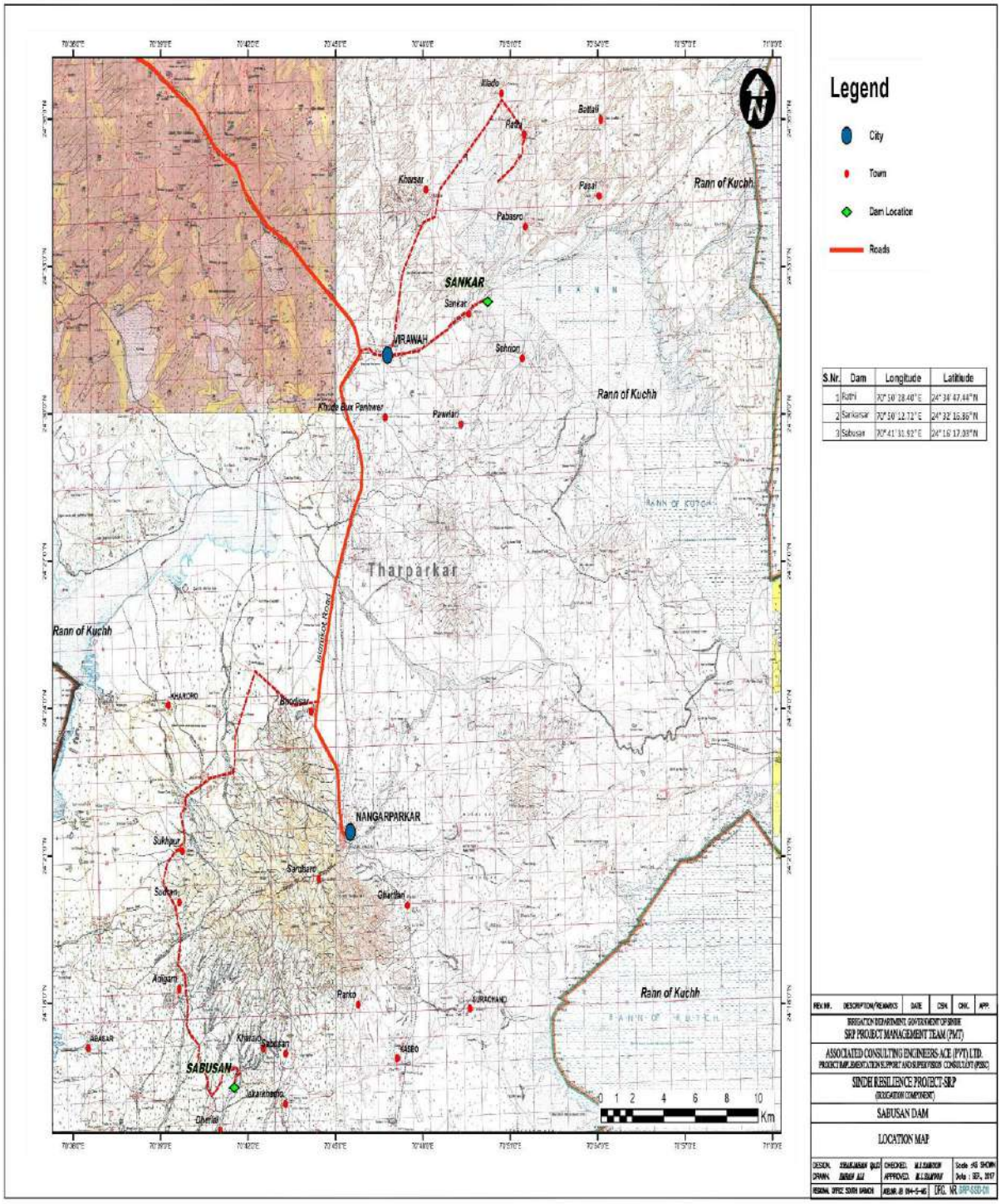

Figure 2: Location Plan of Sankar and Sabusan Dams

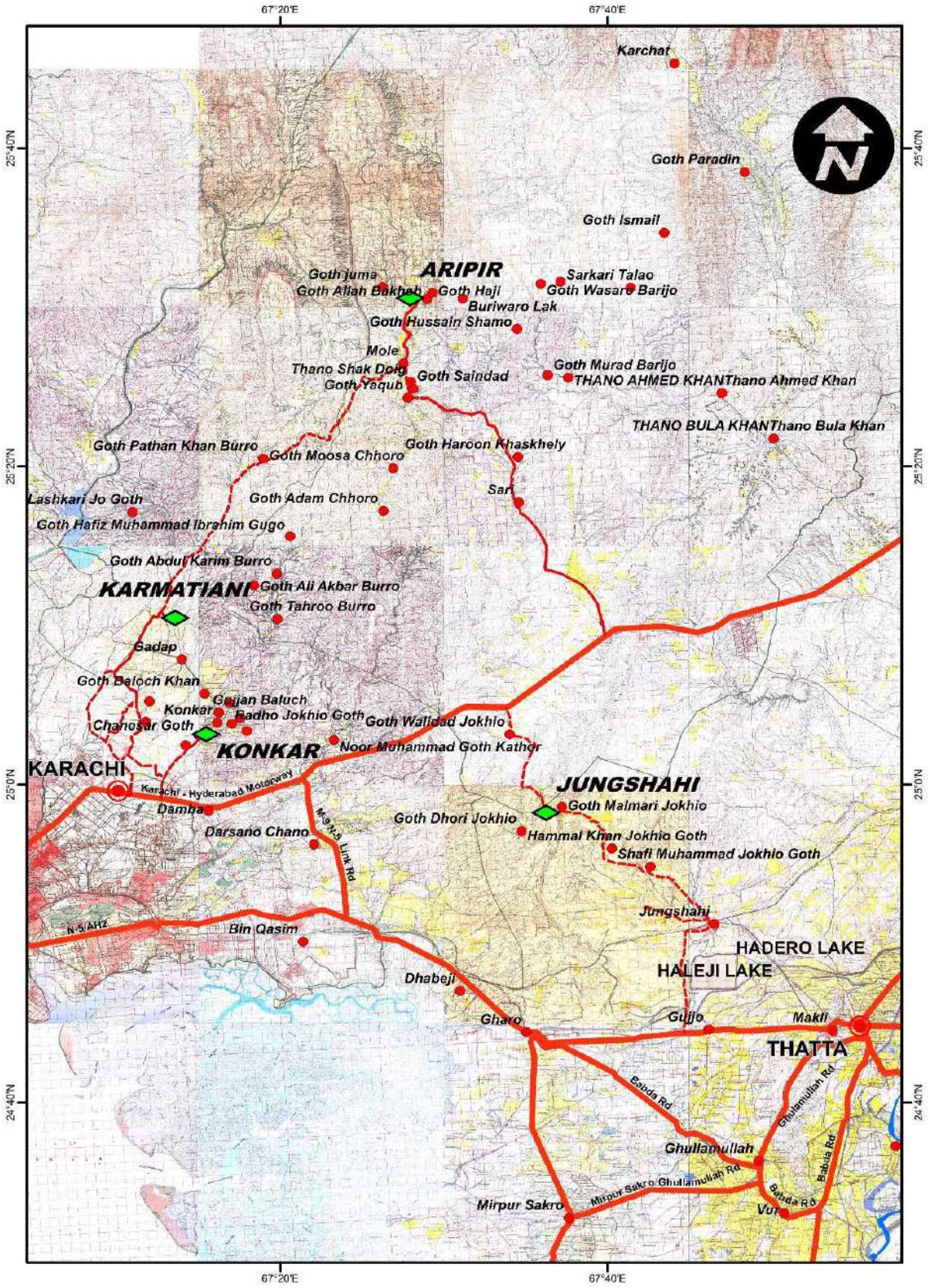

Figure 3: Location Plan Aripir, Karmatiani, Konkar and Jungshahi Dams

2.3. Sub project Components

The main components of the sub-project are construction of small rain water-fed dams, less than 10 meters in height, in Kohistan and Nagarparkar regions. The two Dams in Nagarparkar area will be storage dams, whereas the four dams in Kohistan area will be ground water recharge dams. Details of sub projects components are given in table-3 below.

Table 3: Salient Features of the Sub-projects

Salient Features of Seven Dams						
Description	**Nagarparkar Region**		**Kohistan Region**			
	Sabusan	**Sankar**	**Aripir**	**Karamtani**	**Konkar**	**Jungshahi**
Catchment Area (sq.mile)	5.11	4.02	36.55	16.98	3.55	32.53
Design Flood (cfs)	5,096	2,538	10,585	9,475	7,242	12,475
El.of River Bed (ft)	120.5	41	1238	594	336	416
El.of Spillway Crest (ft)	135.5	56	1253	607	348	431
Spillway Width (ft)	250	200	350	350	230	450
Head Over Crest (ft)	2.99	2.94	3.88	3.61	3.99	3.67
High Flood Level (ft)	138.49	58.9	1256.88	610.61	351.99	434.67
El.Dam of Crest (ft)	141.5	61.5	1259.9	613.7	355	437.7
Dam Height above Riverbed (ft)	21	21	21.9	19.7	19	21.7
Reservoir area at normal pool level (Acre)	80.94	148.57	38.1	8.56	10.93	71.09
Reservoir Area at 100 year flood (Acre)	103	178	51	18	15	112
Reservoir Capacity (Ac-ft)	570	1,003	218	33	32	341
Spillway Capacity (ft3/sec)	4,700	9,780	6,300	10,000	2,300	13,800
Population to be Affected (In case of Dam Break)	13	65	78,108	29,163	74	2,116
Area to be inundated (In case of Dam Break)	2.55	2.19	39.03	15.71	0.96	8.61

Some Dam Site Photos are shown in **Annex 1.**

The water from storage dams will be taken directly from reservoirs 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 later stage.

The recharge dams in Kohistan 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. The recharge dams are not deliberately designated to promote agriculture needs.

2.4. Construction Activities

The Construction activities for various sub-project dams will span from 9 to 12 months. The related activities are 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 and earth fill embankments. 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 approved Traffic management plan.
iv. Formation of embankments/ bunds for 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 camp site and Contractor's demobilization.

2.5. Construction Materials

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

a) Embankment fill
b) Coarse filter
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-4.

Table 4: Estimated Quantities of Construction Materials

Dams	Earth work (cft)		Cement Concrete	Reinforcement	Stones Protection	Filter		PVC Waterstoper	Water for Concrete and Earth fill
	Excavation	Fill	(cft)	(cwt)	(cft)	Fine (cft)	Coarse (cft)	(ft)	(cft)
Sabusan	857,780	2,902,904	428,271	12,044	817,709	514,993	282,506	2,053	118,016
Sankar	1,162,380	3,059,934	338,857	10,451	865,990	533,613	298,842	977	108,639
Aripir	778,561	76,648	561,715	14,937	135,496	39,385	24,528	2,577	80,173
Konkar	1,011,134	319,263	295,212	9,142	217,232	37,109	22,232	1,8672	47,715
Karamtani	1,659,736	139,387	437,100	11,104	177,561	34,764	22,479	2,474	63,982
Jungshahi	2,060,271	187,484	705,962	17,169	208,899	56,605	34,990	3,058	102,584
Total	**7,529,862**	**6,685,620**	**2,767,117**	**74,847**	**2,422,887**	**1,216,469**	**685,577**	**29,811**	**521,109**

The natural materials such as coarse aggregate, toe drain stones, riprap stones and coarse filter can be obtained from crusher 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 vicinity of each dam site.

Cement is supposed to be procured from Karachi, Hyderabad and Thatta. Most of the other construction supplies such as fuel, steel and lubricants can also be arranged from the big cities indicated above. Some other construction materials such as rolled steel bars, PVC water stops, and steel plates for formwork, pumps installation material may also be brought from Karachi.

2.6. Contractor's Camp

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 case of private land, an agreement will be made between Contractor and Landowner for restoration of land in 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 site. The contractor will give preference to local people for unskilled labor from the communities with the consultation of elders of different communities on 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 checkup to labors. 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. Camp will be established after the approval of the layout plan. Details are given in below Table-5.

Table 5: Details of the Camps site for each sub-project

S.No	Sub-project Name	Co ordinates		Away from Dam site	Land Required	Details
		N	E			
1	ARIPIR	25°30'39.71"N	67°28'3.38"E	200 Meters downstream of dam site on left side.	3 Acers	9500 Meters north from mole village -mole sari road
2	KONKAR	25° 3'4.15"N	67°15'30.18"E	150 Meters downstream of dam on left side	4 Acers	800 Meters north east of chanesar goth-gadap road
3	JUNGSHAHI	24°58'9.25"N	67°36'22.52"E	150 Meters downstream of dam on right	5 Acers	1600 Meters south west of goth malmari

S.No	Sub-project Name	Co ordinates		Away from Dam site	Land Required	Details
		N	E			
				side		jokhio-goth malmari road
4	KARMATIANI	25°10'26.78"N	67°13'44.64"E	250 Meters downstream of dam on left side	4 Acers	4800 Meters north from gadap
5	SABUSAN	24°16'42.03"N	70°41'32.59"E	800 Meters upstream of dam on right side	3 Acers	3300 Meters south west of sabusan village
6	SANKAR	24°31'57.20"N	70°50'6.62"E	1000 Meters right side of dam site.	4 Acers	1000 Meter east south of sankar village

Prospective camp sites location are also shown in below given Figures 4 to 9.

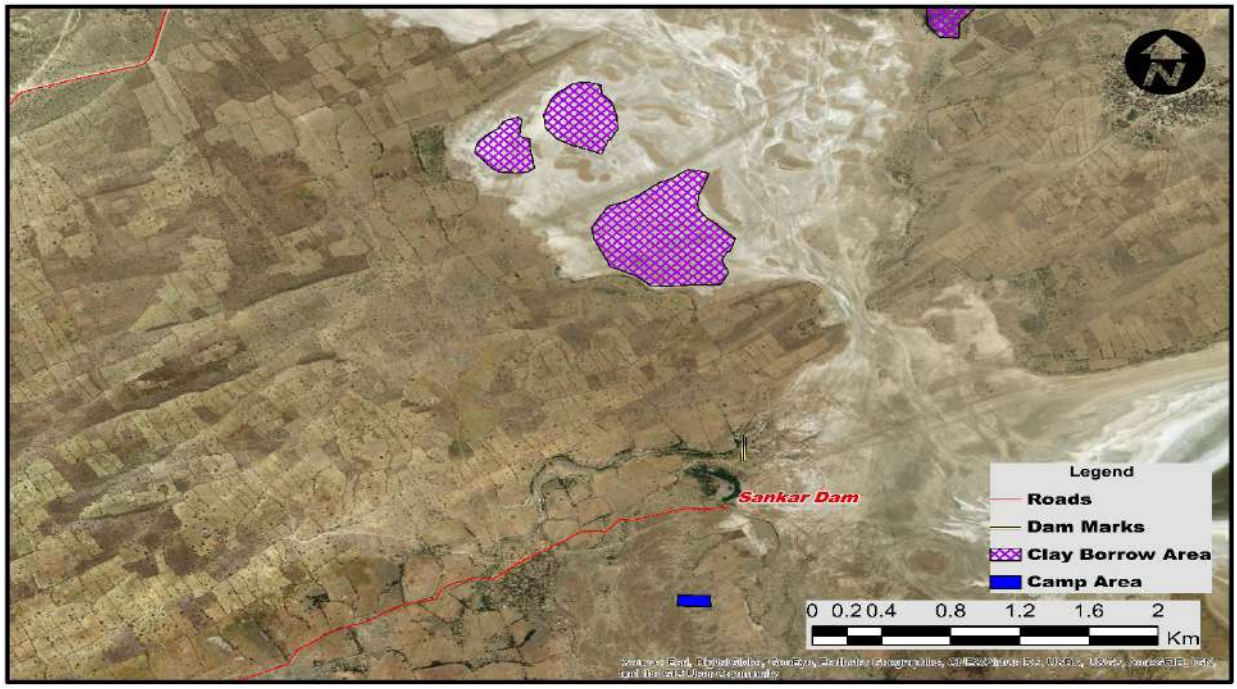

Figure 4: Camp Site and Borrow Area location of Sankar Dam.

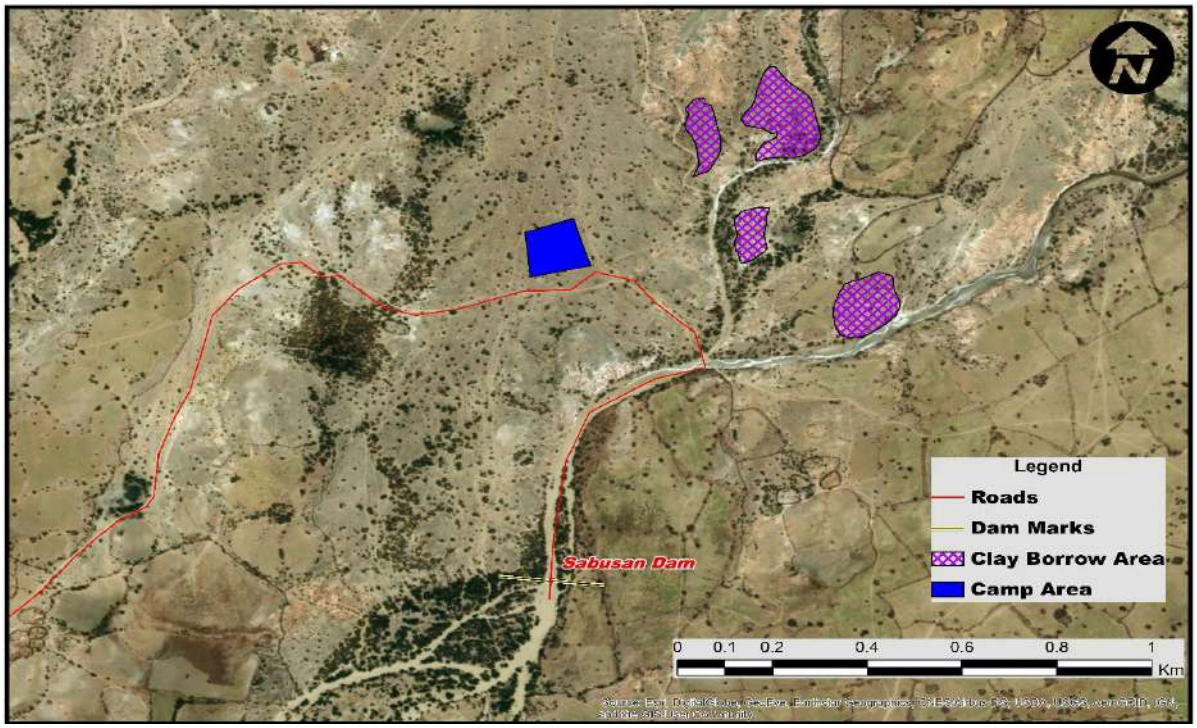

Figure 5: Camp Site and Borrow Area location of Sabusan Dam

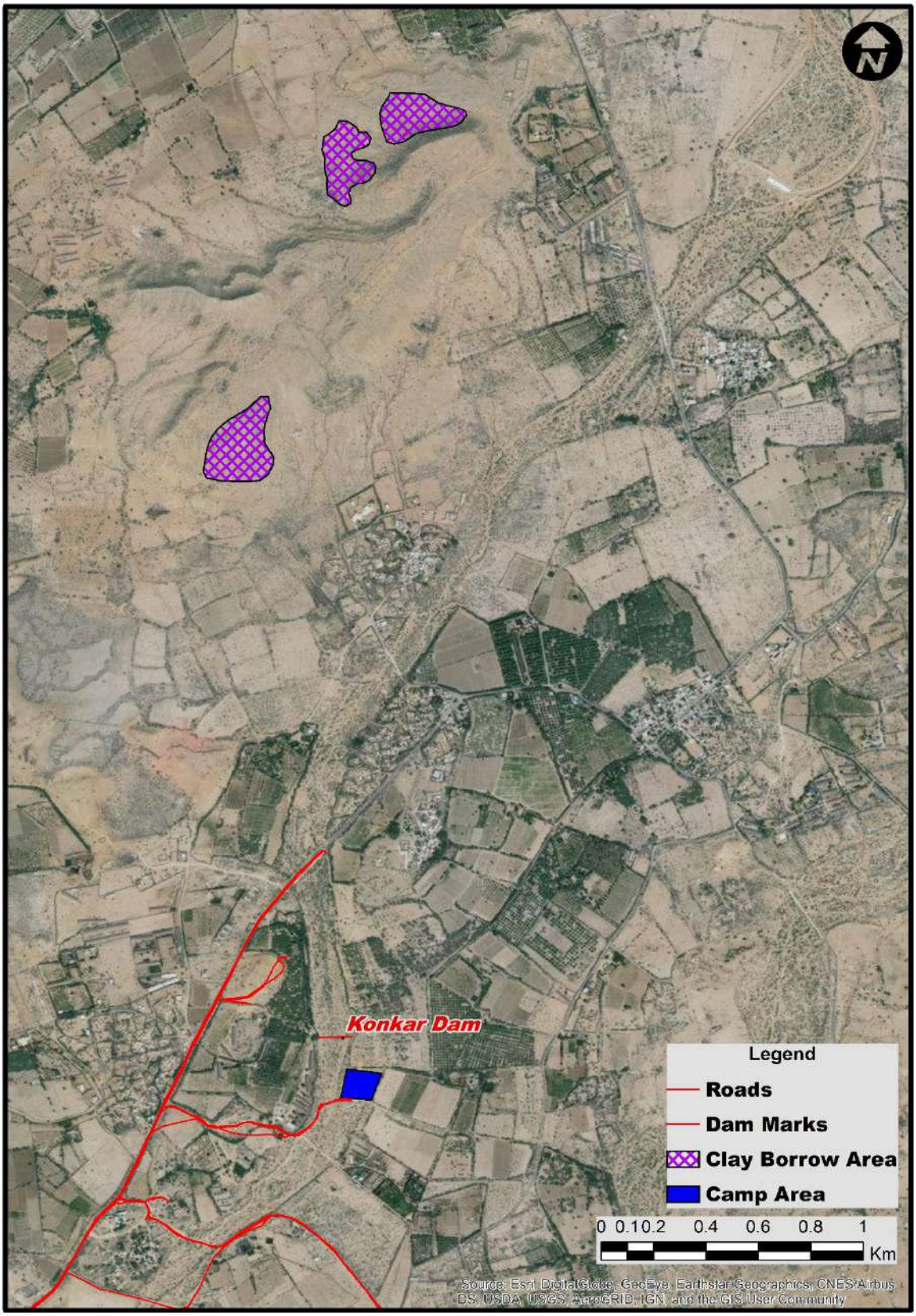

Figure 6: Camp Site and Borrow Area location of Konkar Dam.

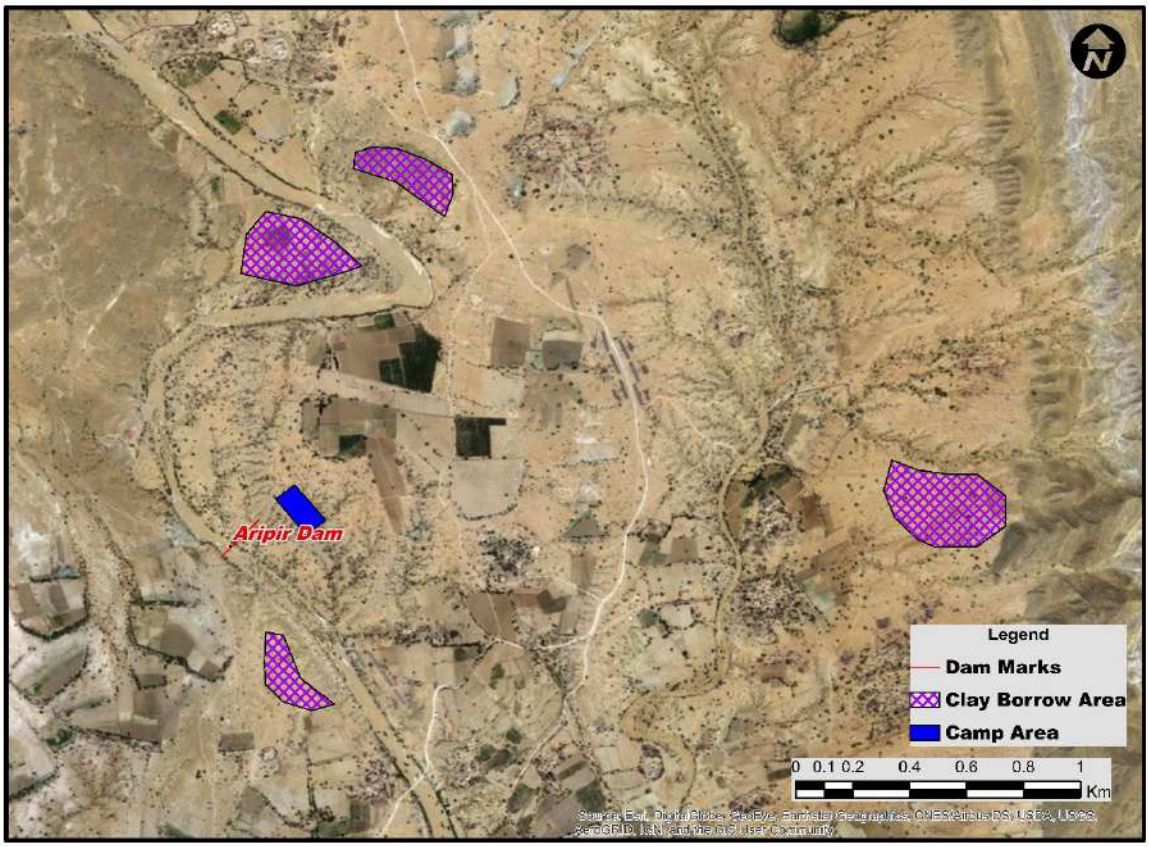

Figure 7: Camp Site and Borrow Area location of Aripir Dam.

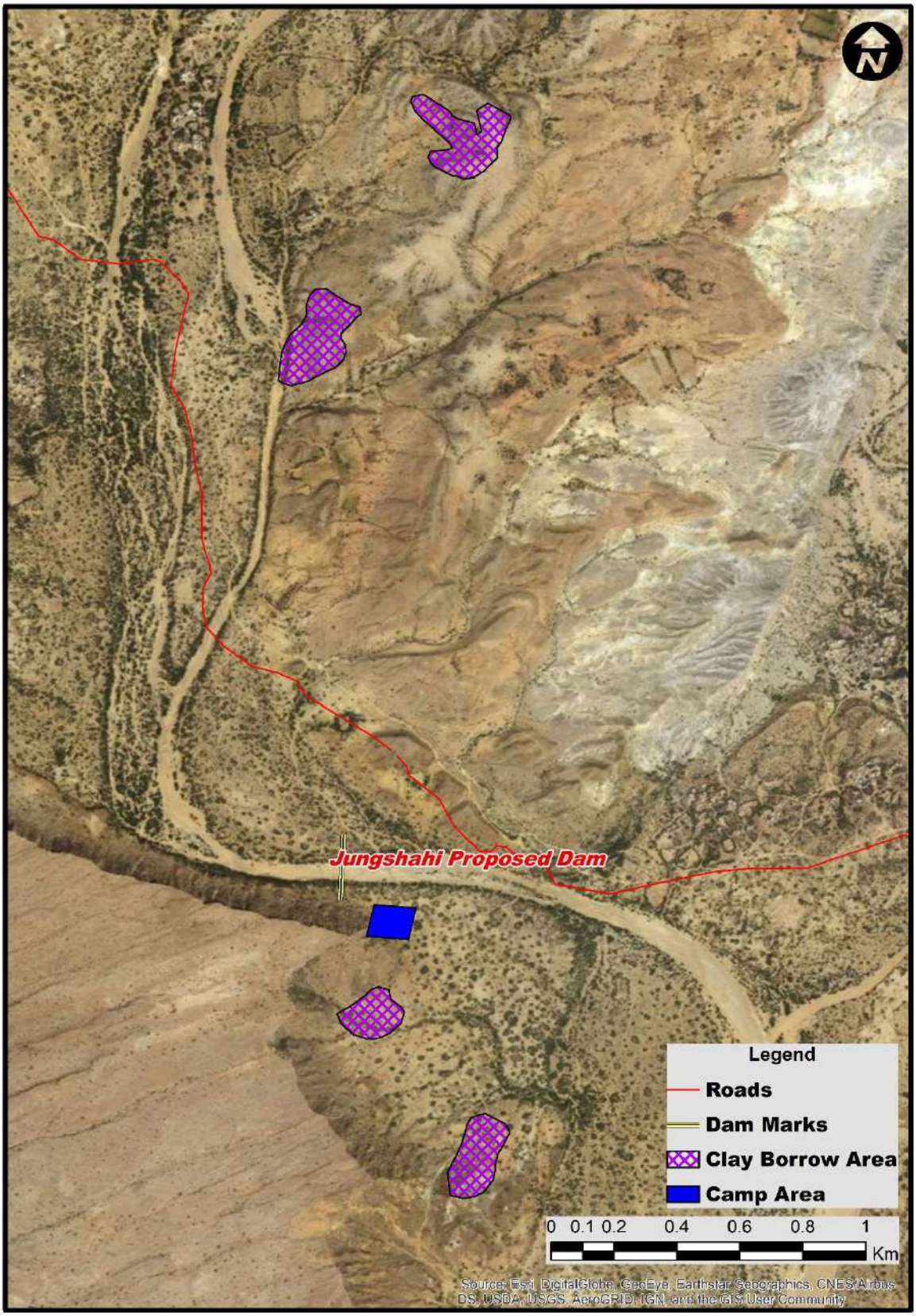

Figure 8: Camp Site and Borrow Area location of Jungshahi Dam.

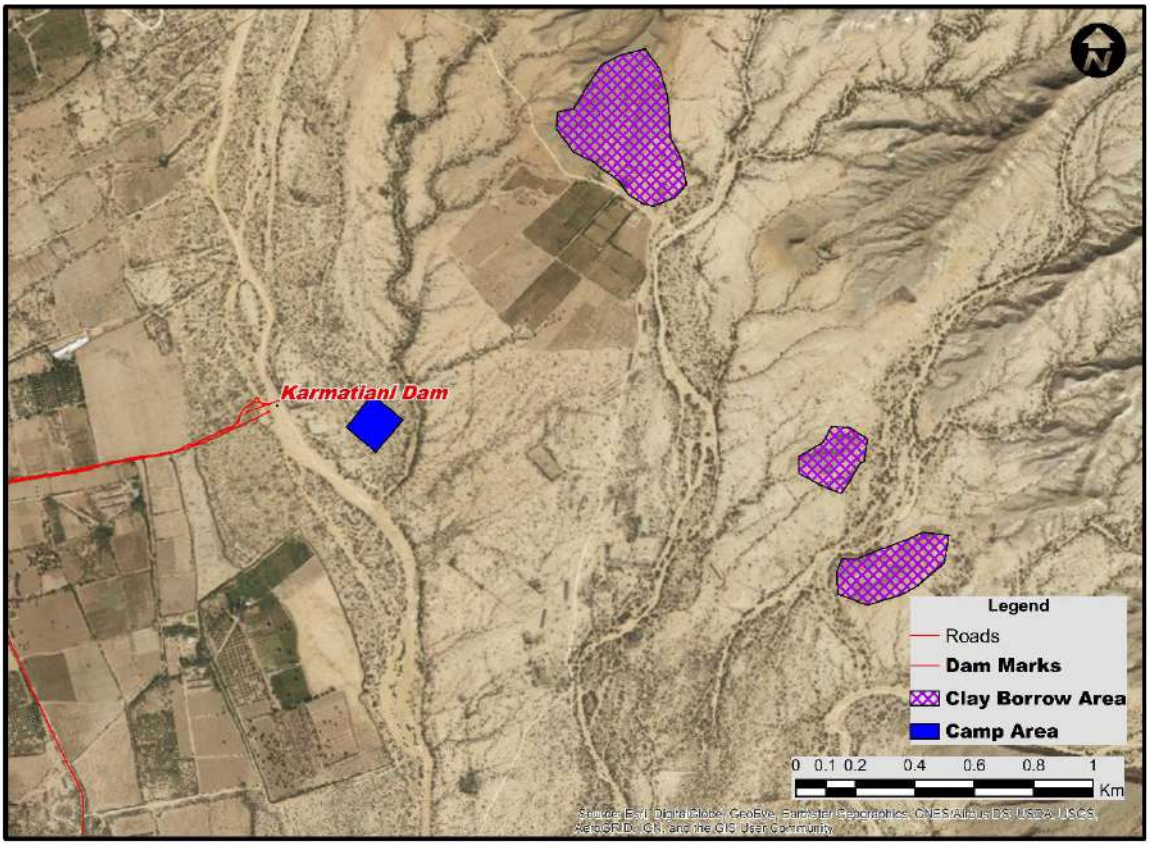

Figure 9: Camp Site and Borrow Area location of Karmatiani Dam

2.7. 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 4 to 9 above. The Contractors will be allowed to choose their own borrow areas as per their arrangement. Contractor will however be bound to take the borrow 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. Large area of government owned land is available for borrow material. Quantities of fill material are given in Table-4**.**

2.8. Machinery & Equipment

The construction work includes earthwork and concrete work. These works will require earthmoving machinery such as excavators, dumpers, graders and rollers, transom 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 is given in Table-6. However, the actual number of equipment required on the site will be determined by the contractor to carry out the strengthening work.

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Table 6: List of Machinery and Equipments to be used on each sub-projects

S.No	Machinery/ Equioement	No of Machinery on each Sub-project						Total
		Aaripir Dam	Karmatani Dam	Konkar Dam	Jungshahi Dam	Sabusan Dam	Sankar Dam	
1	Loader	3	4	4	3	3	3	20
2	Tractor Trolley dumper	10	10	10	10	10	10	10
3	Earth leveler machine	2	2	2	2	2	2	12
4	Excavator	4	4	4	4	4	4	24
5	Transit Mixtures	5	5	5	5	4	4	28
6	Batch Plant	1	1	1	1	1	1	6

2.9. Manpower Requirement

The manpower required by the contractor during execution of the sub-projects are given in Table-7. For unskilled labors, local people will be preferred. Machinery Loader/ Dumper/Trucks/ Tractor Trolley will be used for bringing earth material from the designated sites. 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 finalization of bid documents by the contractor(s).

Table 7: Required Manpower

S.No	Type of Manpower	No of Manpower on each Sub-project					
		Aaripir Dam	Karmatani Dam	Konkar Dam	Jungshahi Dam	Sabusan Dam	Sankar Dam
1	Construction Supervisor	1	1	1	1	1	1
2	Surveyor	3	3	3	3	3	3
3	Skilled laborer	4	4	4	4	4	4
4	Semi skilled laborer	5	5	5	5	5	5
5	Unskilled laborer	10	10	10	10	10	10
6	Drivers/operators	120	120	120	120	120	120

3. DESCRIPTION OF ENVIRONMENT

3.1. Introduction

This Chapter describes the existing environmental and socioeconomic conditions of the SRP project area. The aim of the environmental and social baseline is to provide a generic baseline against which the project impacts can be measured. This chapter 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 Chapter.

3.2. Physical Environment

3.2.1. 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 Figure-10. The features of these parts are briefed below.

i) Khirthar Range

The Khirthar range consists of three parallel tiers of ridges, which run from north to south with varying width between 20 and 50 kilometres. The range consists of ascending series of ridges from east to west, which are about 4,000 to 5,000 meters high. The hills decrease in altitude from north to south. Towards the south, they spread out in width and form a Sindh Kohistan. The Khirthar range has little soil corner and is mostly dry and barren. The small dam sub-projects of Jamshoro District are located in this zone.

ii) Central Alluvial Plain:

The fertile central plain constitutes the valley of the Indus River. This plain is about 580 kilometers long and about 51,800 square kilometres in area and gradually slopes downward from north to south. It is a vast plain, around 100 meters high above sea level. The lower part of this plain, which starts from Hyderabad is predominantly covered with flood silt. There are a few limestone ridges in this plain. Some of them are near Rohri in Sukkur district commonly known as Rohri cuesta, which extends about 50 kilometres South of Rohri and has an average height of about 75 meters above sea level. Another such ridge is the Ganjo Takkar, a cuesta of limestone, which stretches southward from Hyderabad up to a distance of 25 kilometres. There are also a few depressions and lakes in this plain. According to the past tradition, the Central Alluvial Plain has been divided into three distinct zones:

- Lar or Southern Sindh comprising the areas south of Hyderabad.
- Wichalo or Central Sindh, the area lying immediately around Hyderabad.

- Siro, or Northern Sindh, comprising the area beyond Naushahero Feroze and Sehwan.

iii) Eastern Desert Belt:

The eastern desert region includes low dunes and flats in the north, the Achhro Thar (white sand desert) to the south and the Thar Desert in the southeast. Its major portion lies in India. In the north, it extends up to Bahawalpur division of Punjab, where it is called Cholistan. With little rainfall and low water table, most of the area is a barren land with scattered stunted thorny bushes. In the extreme southeast corner of the desert is Nagar Parkar taluka of Tharparkar District. 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 Archean system, which constitutes the oldest rocks of the earth crust. The small dam sub-projects (Sankar and Sabusan) of Tharparkar District are located in this zone.

iv) Indus Delta

The distributaries of the Indus start spreading out near Thatta across the deltaic flood plain in the sea. The even surface is marked by a network of active and abandoned channels. At a high tide, a coastal strip of 10 to 40 kilometers wide is flooded. The embankment sub-projects along the Indus River are falling in this zone.

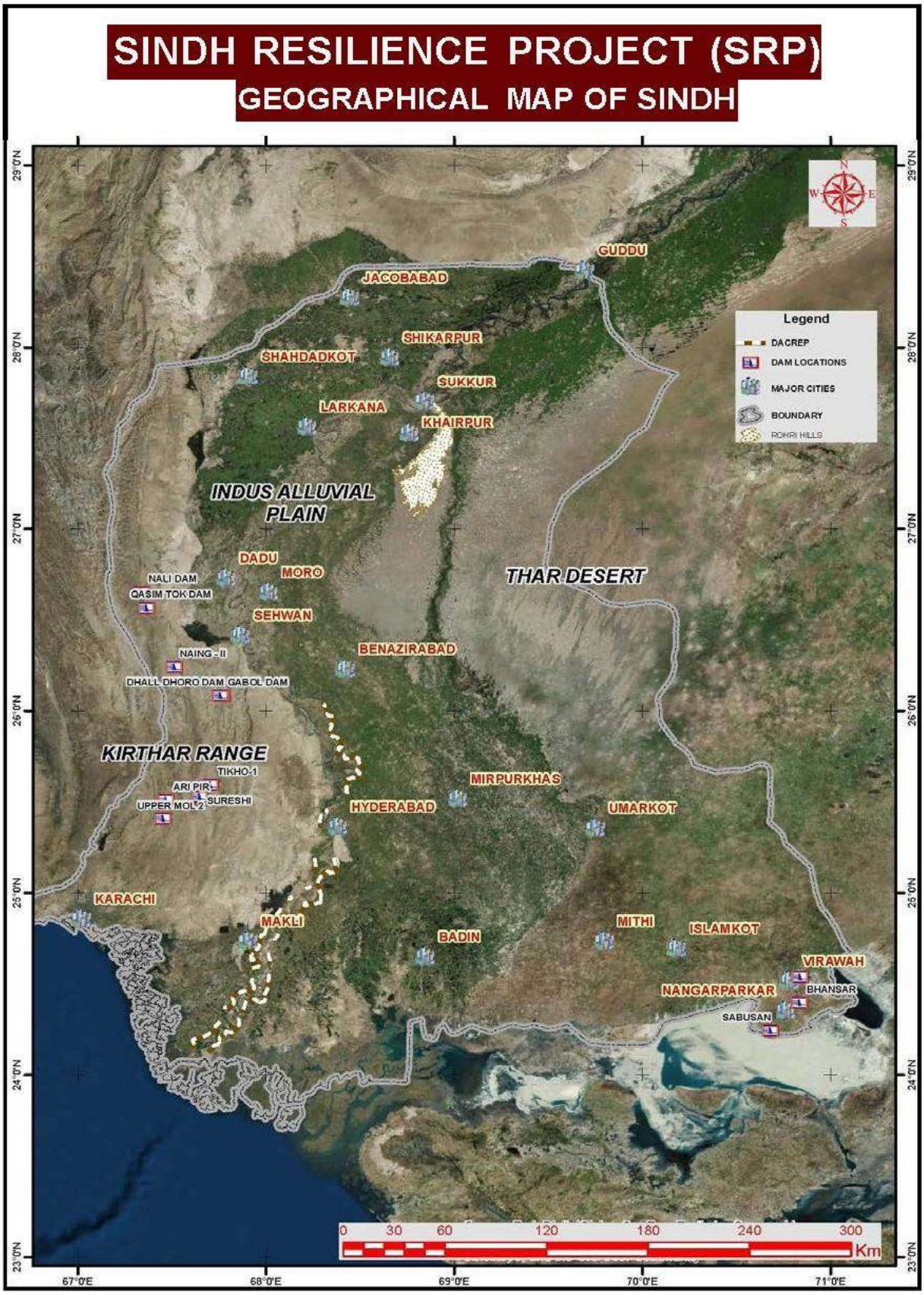

Figure 10: Geographical Map of Sindh

3.3. Geology

The geology of Sindh is divisible in three main regions, the mountain ranges of Kirthar, 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 southern most 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 (Figure-11).

Nagarparkar

The geology of Nagarparkar is a remarkable feature 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 south west monsoon just passes over Thar Desert.

The Nagarparkar Figure-12 is surrounded on three sides by Rann of Kutch shelf which was a shallow arm of 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.

Kohistan Region

The area of the various sites lies in central and lower Kirthar Ranges which are technically disturbed having parallel anticlines and synclines running almost north south (Figure-13).

The geological formations in the reported area are covered with Miocene and Oligocene formations.

1. Recent to Sub-recent
2. Manchar formation
3. Gaj formation
4. Nari formation

The oldest formation in the area is Nari which belongs to Oligocene. The Nari formation is dominantly comprised of yellowish brown, fine to coarse grained sandstones interbedded with layers of shales/silts and arenaceous lime stones.

Gaj formation is dominated by brackish limestone, sandstone and shales of variegated gray and gypsiferrous.

The Manchar formation contains brownish sandstone and shale with conglomerate. At places in foot hill regions where stream flows through sub-recent and recent deposits consist of sand, silt and gravel.

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

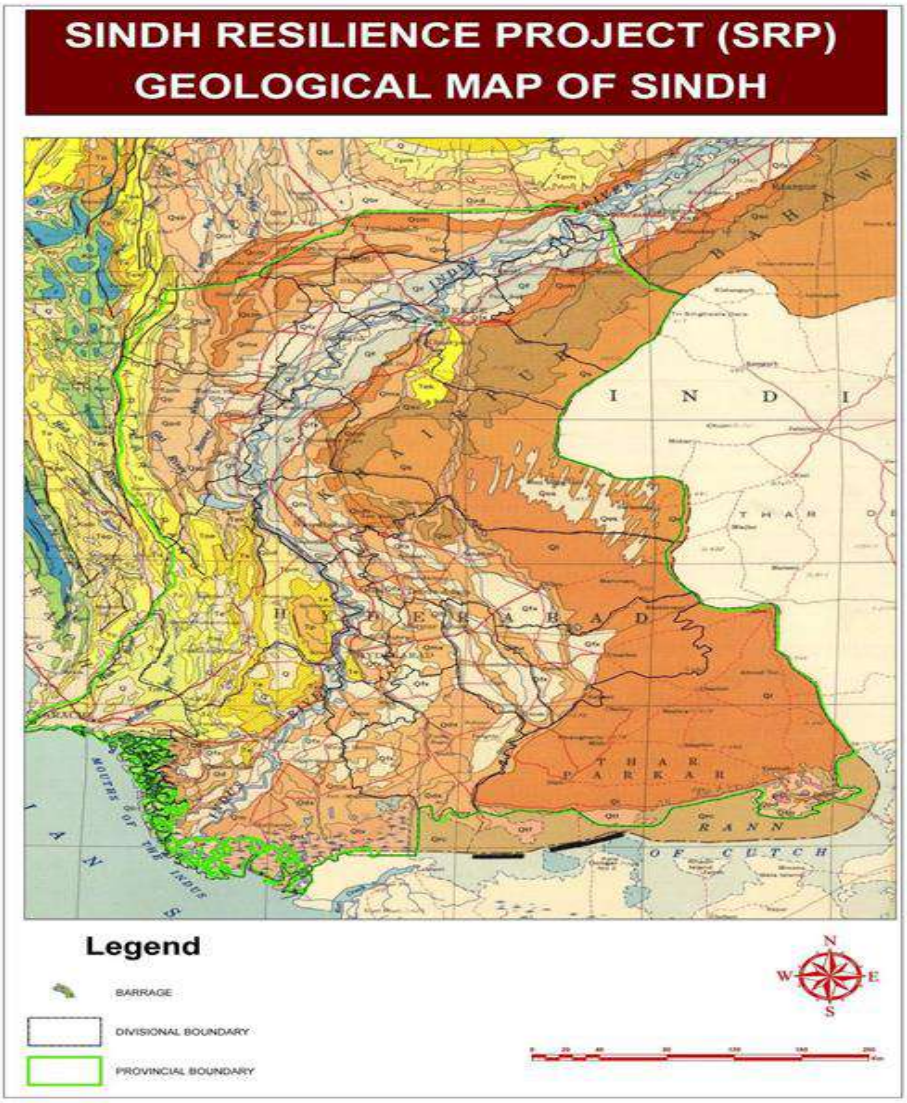

Figure 11: Geological Map of Sindh
(Source: Geological Survey of Pakistan – GSP)

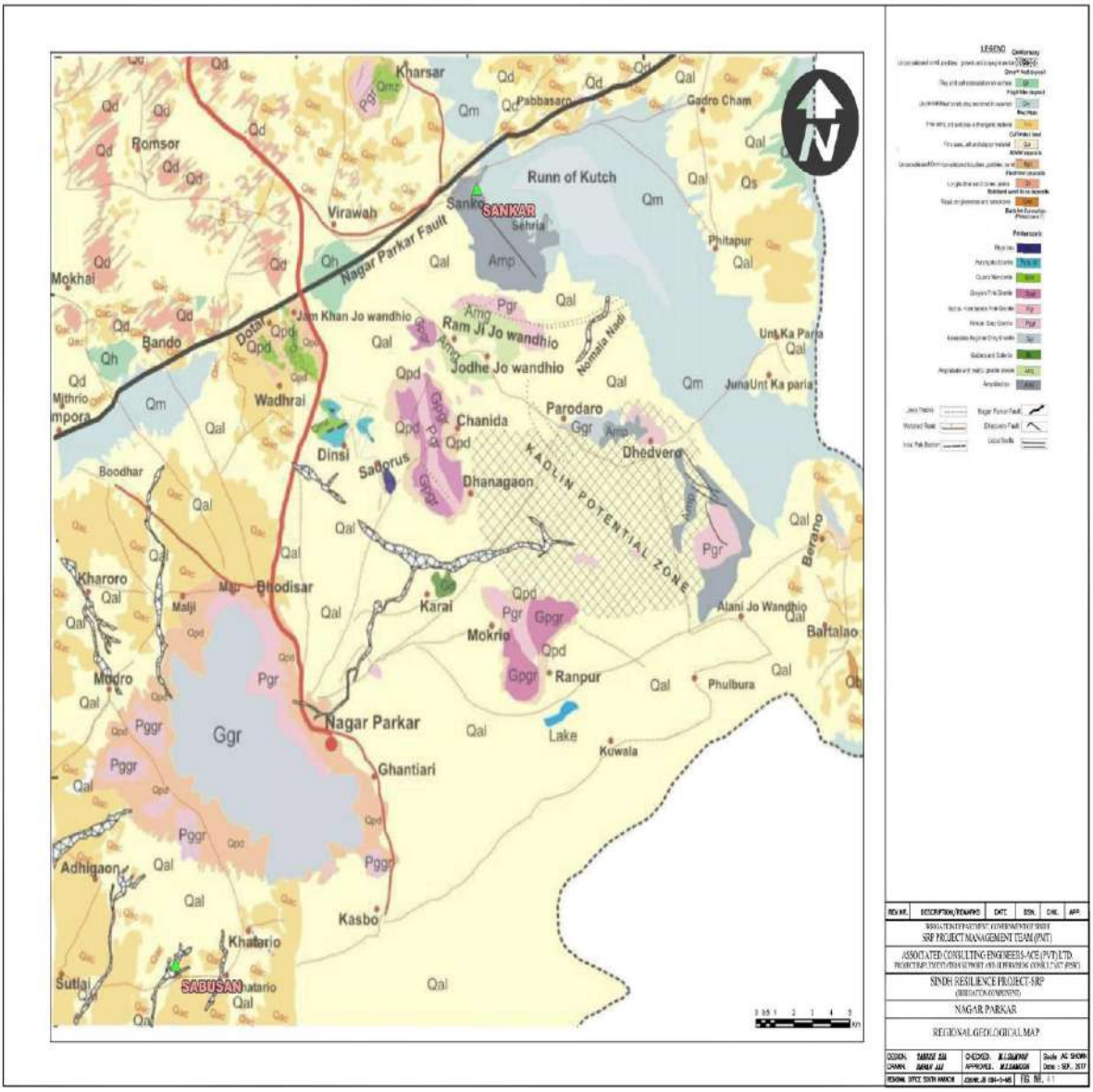

Figure 12: Regional Geological Map of Nagarparkar

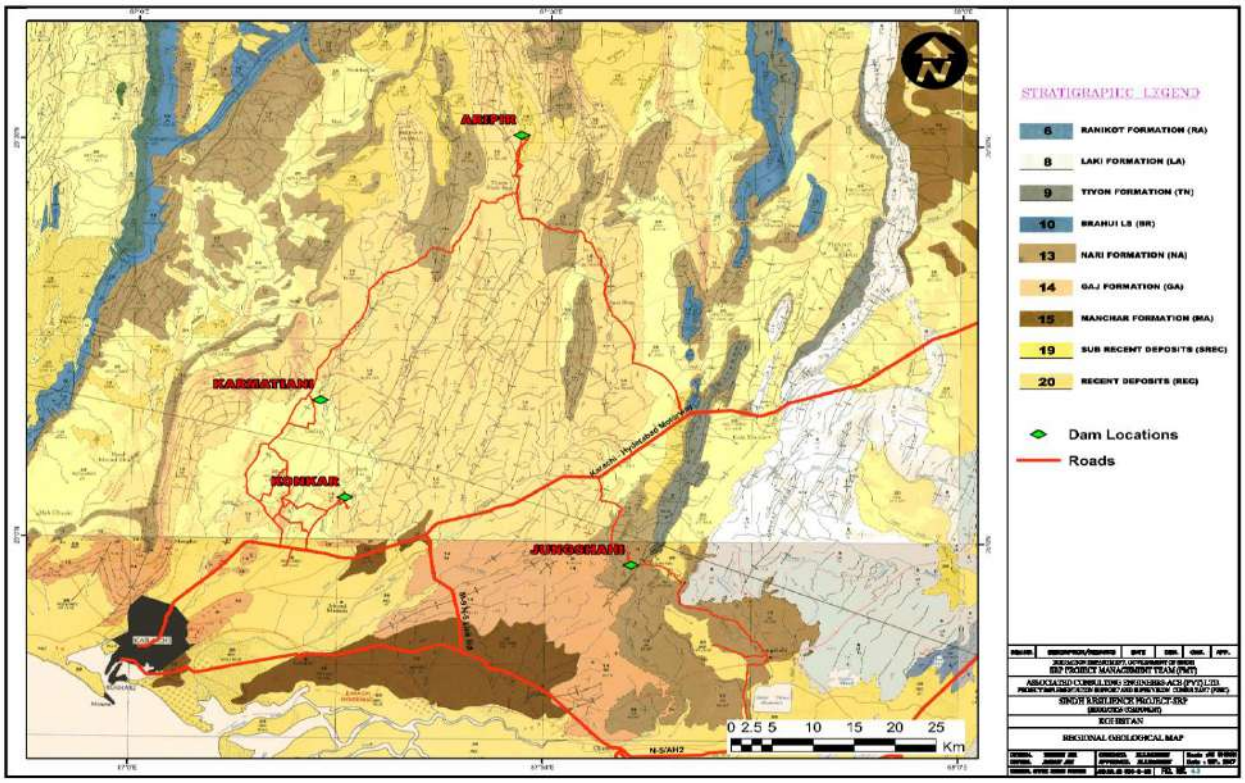

Figure 13: Regional Geological Map of Lower Kohistan

Seismicity

The map shown as Figure 14 indicates that most of the SRP area is falling in Zone 2A and Zone 2B, with peak ground acceleration (PGA) varying from 0.08 to 0.16g and 0.16 to 0.24g, respectively (Pakistan Building Code of Pakistan, 2007). A small portion of Thar District is falling in Zone 4 which is called the High Damage Risk Zone and covers areas liable to MSK VIII. The PGA will be more than 0.32 g in this zone.

Details of seismic data of each dam site is given in Table 8 below:

Table 8: Seismic Data of Dam Site

Seismicity of Dam Site			
S.Nr.	**Dam**	**Zone**	**Magnitude**
1	SANKARSAR	2 B	0.16g to 0.24g
2	SABUSAN	2 B	0.16g to 0.24g
3	ARIPIR	2 A	0.08g to 0.16g
4	KAMATINI	2 B	0.16g to 0.24g
5	KONKAR	2 B	0.16g to 0.24g
6	JUNGSHAHI	2 A	0.08g to 0.16g

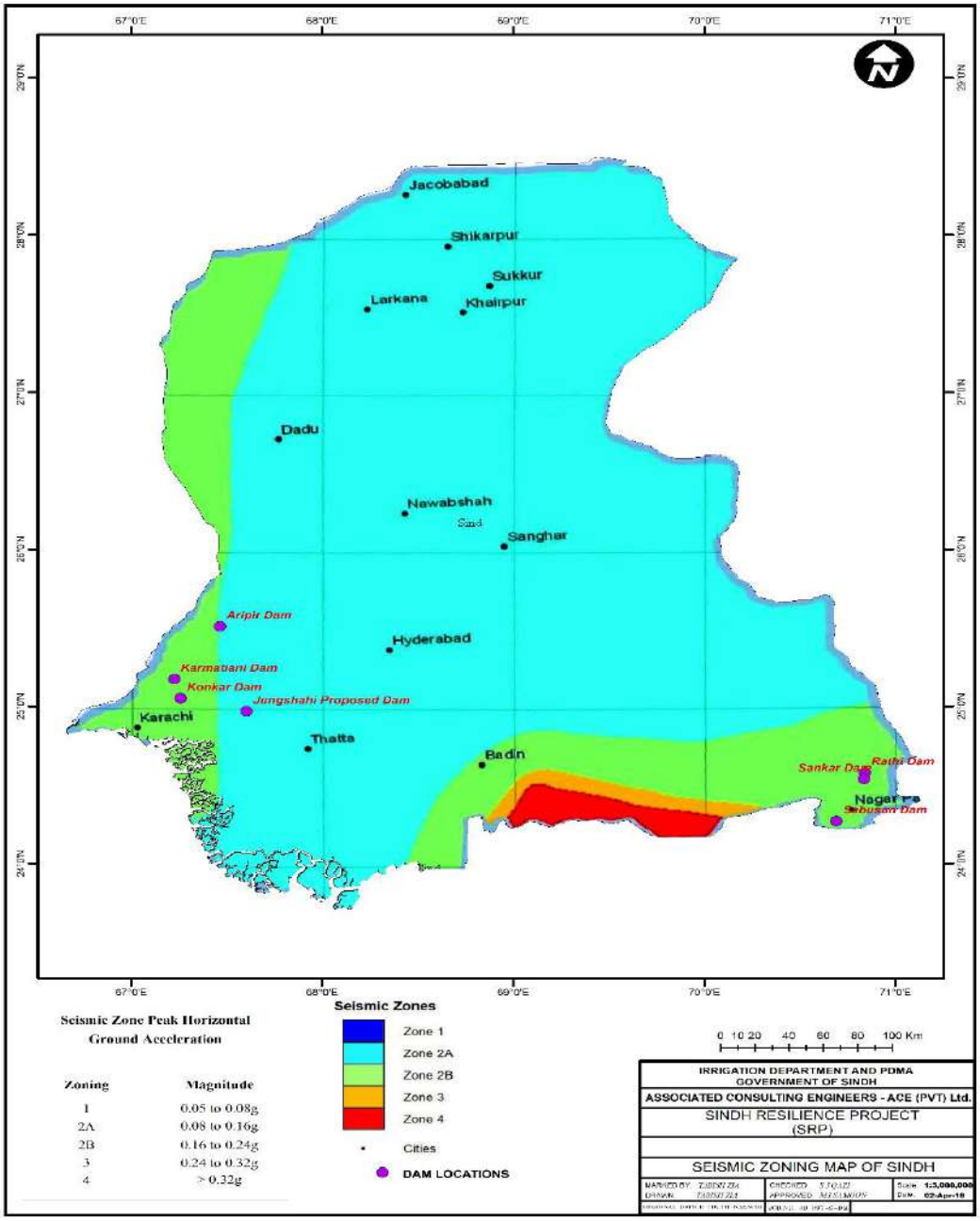

Figure 14: Seismic Zones of the Project Area

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

i) Soil Morphology

In Tharparkar area, the undulating flat plain is covered with variable soils mainly derived by erosion and residual weathering of the granites, granite gneisses and amphibolite's. While in the case of Khirthar area, the soils in the plain near the subproject sites have homogenous porous structure, mainly silt and fine silt clayey, strongly calcareous with 18-20 % lime content uniformly distributed in the profile. Small patches contain shallow or very shallow, strongly

calcareous, gravely and stony loams. While the soils afford very sparse shrub and grass vegetation offering limited grazing, the rocky outcrop only has a water catchment value.

In addition, the soil samples were collected from some of the 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.**

3.4. Climate and Rainfall

The climate of Sindh is arid and hot. According to 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, coastal region receives a maximum rainfall of 175-200 mm. The rainfall pattern in the SRP sub-project area is collected by Pakistan Metrological Department.

The Aripir, Karmatiani, Jungshahi and Konkar dams lie in Lower Kohistan and the nearest meteorological station is Karachi. Therefore rainfall data, obtained from Pakistan Meteorological Department, Karachi, has been used. The one day yearly maximum rainfall data for Karachi is available for 42 years (1968 to 2011). While Rainfall data of Nagarparkar has been used for Sabusan and Sankar dams. The one day yearly maximum rainfall data is available for 57 years (1926 to 1986), as shown in Figures 15 to 17.

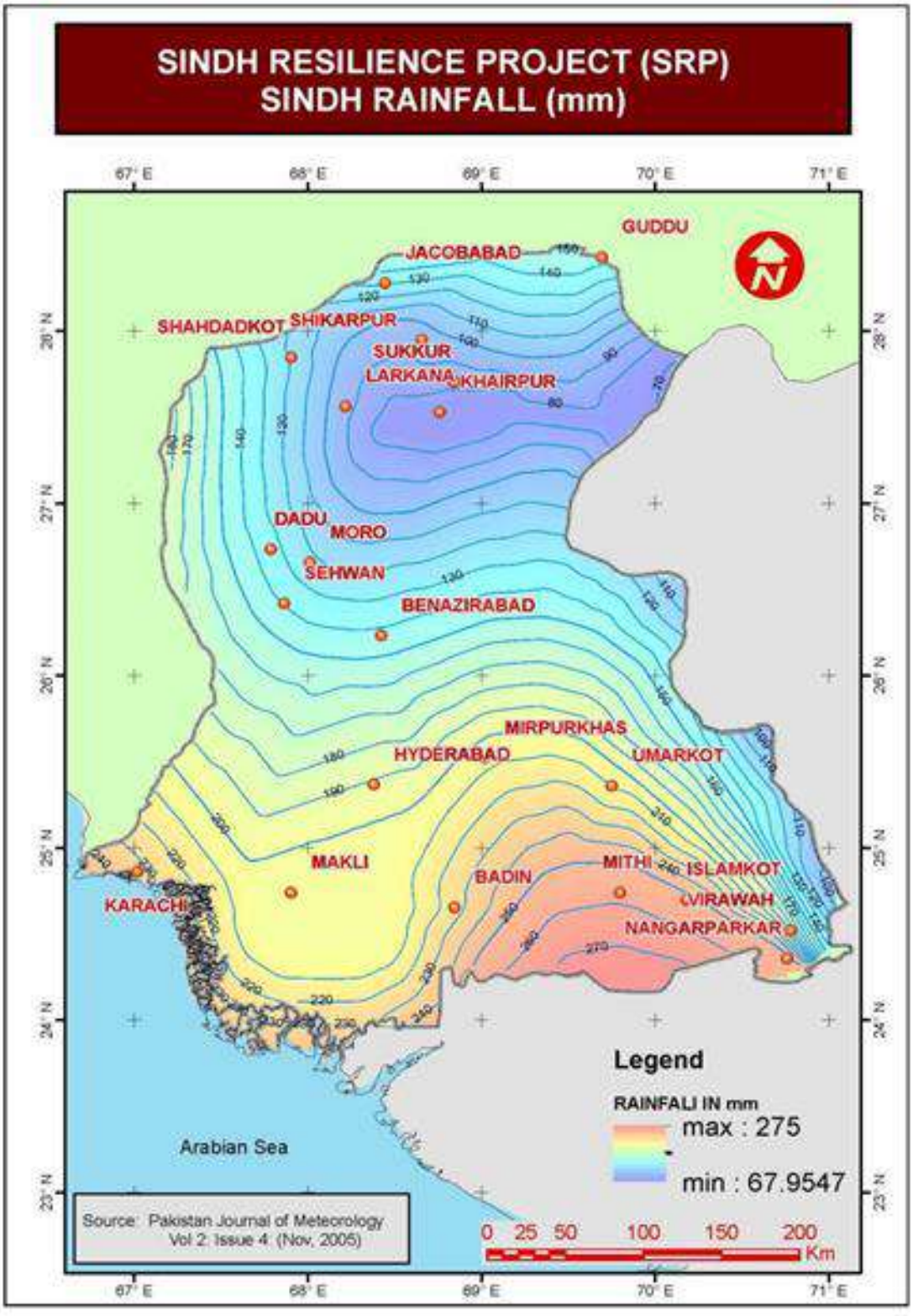

Figure 15: Annual Rainfall in Project Area

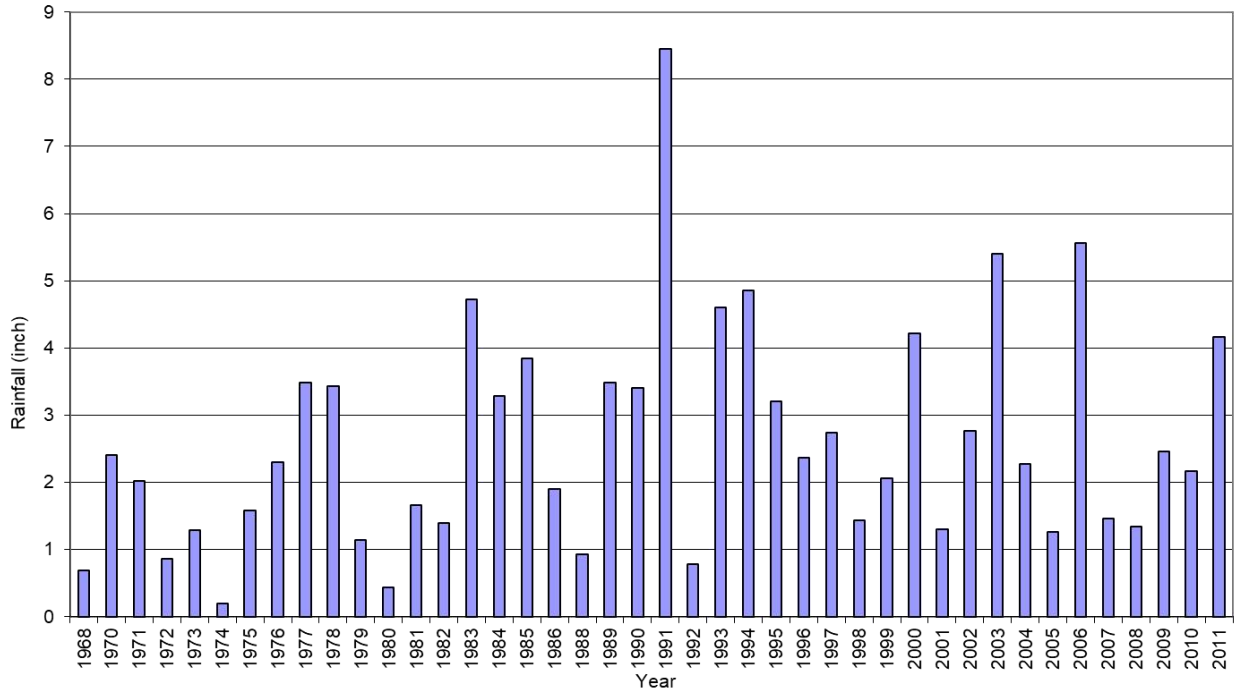

Figure 16: One Day Yearly Maximum Rainfall at Karachi

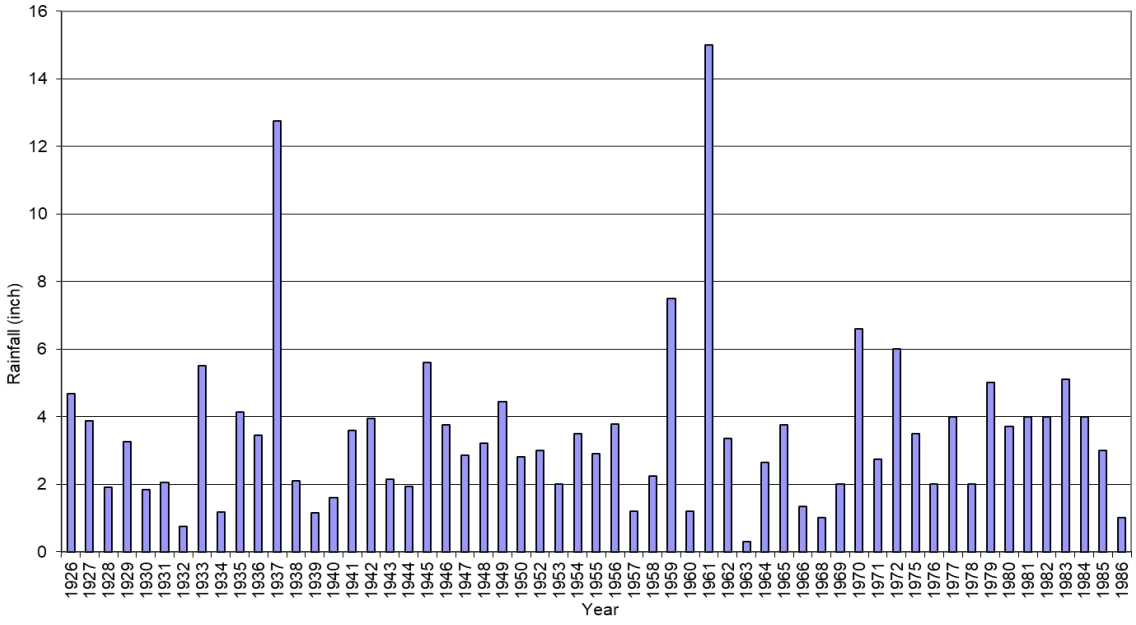

Figure 17: One Day Yearly Maximum Rainfall at Nagarparkar

I) Temperature

The coldest season extends from December to February when dominating influence is the eastern winds. Mean monthly temperature during winters varies from 20°C near the coast to

14°C in the north. Mean daily temperature rises rapidly from February onwards to its peak in May and June, rather earlier in the south than in the north. Mean maximum temperature reaches about 24°C in May in the south and as high as 45°C in June in the north. The severity of the heat varies from year to year - the highest temperature ever recorded on the subcontinent was 53°Cat Jacobabad.

II) Humidity

The average humidity is 40-60% in the Sindh. Monthly rate of evaporation in the irrigated areas varies from 76 mm in the north to 114 mm in the south. Rainfall for the three months is less than 25 mm... Winds are rather variable, being transitional from the northeast to southwest as the season develops. Humidity is at its lowest generally below 40%, but increases as the sea breeze becomes dominant. Evaporation is correspondingly at its highest exceeding 25 mm in rocky desert areas.

July to mid-September is the monsoon season and is characterized comparatively by low day temperature, high humidity (over 60% in the south and 50% in the north), reduced evaporation (only 15 or 18 mm at some stations in August) and a considerable increase inclouds in coastal areas. Occasional depressions from the east result in a 4 or 5-day period of rain and thunderstorm, especially in the south. The rainfall is very variable; instances have been recorded where a single day has considerably exceeded the highest annual average. Mid-September to November is the period of sea breeze with occasional north winds. Temperature rises slightly then falls back in November. Humidity falls to about 10 to 15% of the monsoon level and the evaporation decreases about 100 mm in the north, 125 mm in the south.

3.5. 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 a number of wetlands also exist in the province. Major important wetlands of province are Keenjhar, Manchhar and Haleji Lakes. Wetlands of entire province and nearest to the sub-project area are provided in Table 9 below.

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 million acre feet (MAF or 59.0 billion cubic meters- BCM) of water annually to the 14 main canal commands in Sindh. These canal systems have an aggregate length of 13,325 miles (21,445 km), which serve a gross command area (GCA) of 14.391 million acres (5.8 million ha). There are about 42,000 watercourses (tertiary channels), which have an aggregate length of about 75,000 miles (120,000 Km).

Table 9: Important Wetlands in Province and Sub-Project Area

S.No	Name of Wetland/Lakes	District	Province	Away from Project Area (KMs)
1	Keenjhar	Thatta	Sindh	55 K.m away from Jungshahi Dam
2	Manchhar	Dadu	Sindh	100 km away from Aaripir
3	Haleji	Thatta	Sindh	30 Km away from Jungshahi dam
4	Deh Akro-II Desert Wetland Complex	Nawabshah	Sindh	200 Km away from Aaripir Dam site
5	Drigh Lake	Qambar Shahdad kot	Sindh	300 Km away from Aaripir Dam site
6	Jubho lagoons	Sujawal	Sindh	60 km away from Jungshahi dam site
7	Runn of Kutch	Tharparkar	Sindh	3 Km away from Sankar Dam site.
8	Hub Dam	Malir Karachi	Sindh/Balochistan	20 km away from Konkar and Karmatiani Dam site.

a) Characteristics of Streams / Nais/Nalas in Nagarparkar

Nagarparkar area has Small nala/nadi and rivers originates form Karoonjhar hills and drain towards the Run-of-Kutch. None of the river is perennial and as such there is no base flow. Only flood flowkeeps on flowing for few hours to couple of days after each sizeable rainfall event. Nagarparkar is situated in the extreme south-east corner of the Sindh Province extending in the Rann of Kutch. It is spread over an area of about 1,560 sq. km. In Nagarparkar area, there exist the Karoonjhar hills, which are surrounded by plains. A number of streams/nais are emerging from these hills where recharge and storage dams can be constructed. As shown in Figure 5.16, 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 Rann of Kutch (seasonal HYPERLINK "https://en.wikipedia.org/wiki/Salt_marsh" \o "Salt marsh" salt marsh). Some portion of this runoff goes to the groundwater recharge before reaching the Rann 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 construction of recharge dams.

b) Characteristics of Streams / Nais/Nalas in Kohistan

Large number of hill torrents emanate from Kirthar Range in Western Sindh. Kirthar Range is almost barren having rainfall in the range of 82 to 221 mm. The highest rain floods normally come in July and August, though some high discharges have been recorded in the winter and the early spring. The flows are usually low in early summer. Due to lack of proper management,

most of the water flows unused through the Indus River into the Arabian Sea. As the flashy floods rapidly disappear, the irrigation is uncertain. It is realized that if these flood waters are harnessed, continuous irrigation supplies can be ensured.

II) Ground Water

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 fresh water is available.

Ground water in sub-project areas of Nagarparkar and Kohistan are from the dug wells, whose depth ranges from 120 to 400 ft. The results of groundwater are summarized in Table-11 and details are attached in **Annex-2**. These results reveal that the pH, Carbonate, EC, and Arsenic were within permissible limit of NEQS and WHO standards, while Hardness, Nitrate, TDS, TSS, Turbidity and in some cases Cal exceeding the permissible limits. Similarly, the micro-biological parameters were also exceeding the limit.

Groundwater is found mostly in a strip parallel to the left bank of Indus River and some pockets in other areas (Figure-18).

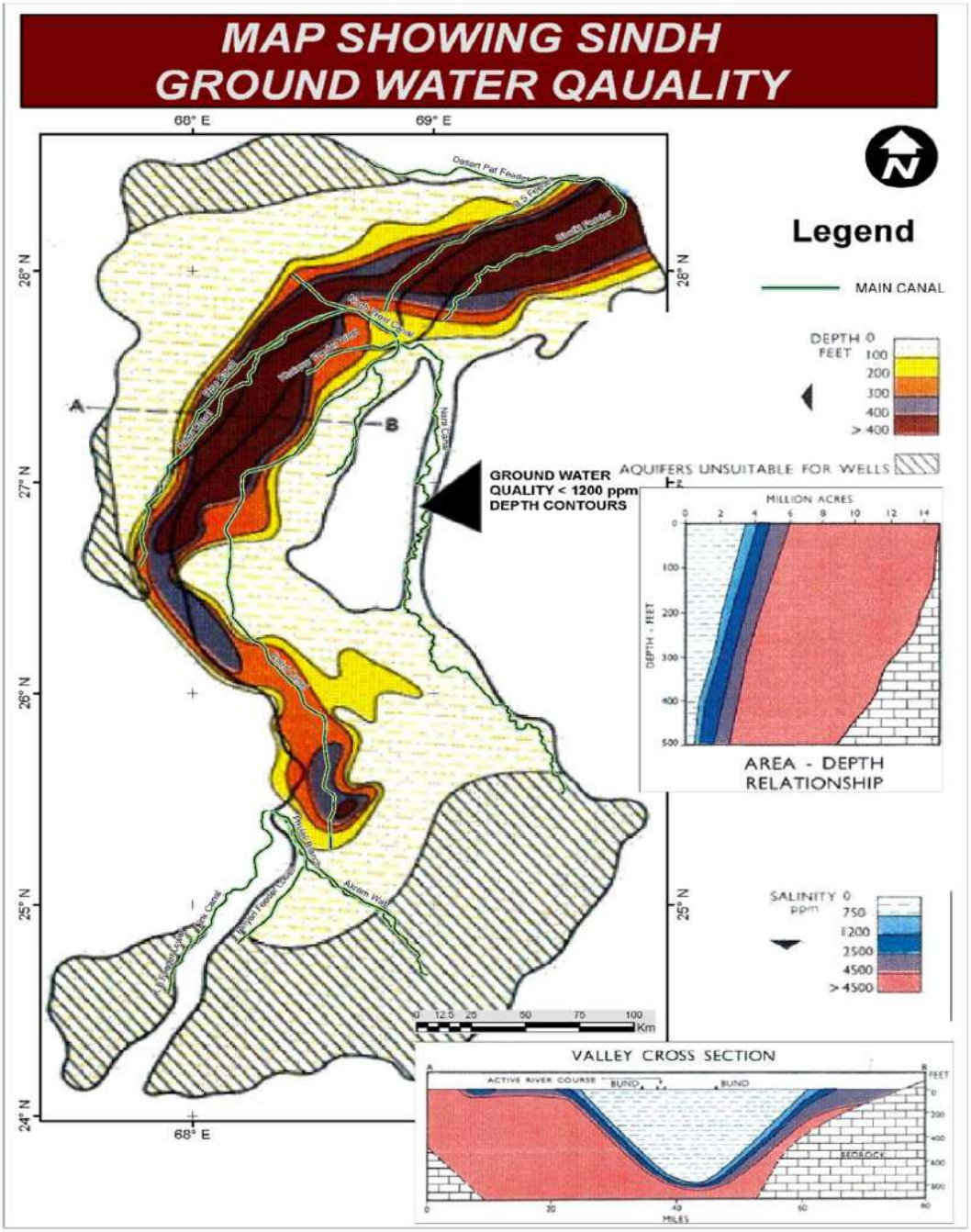

Figure 18: Map Showing Groundwater Quality

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

III) Surface and Groundwater Analysis

During the Baseline survey ground water samples of reported sub-projects were collected for water quality evaluation. The samples were tested for pH, Ec, TDS, TSS, Carbonate, Calcium, Arsenic and Micro Biological status from Pakistan Council of research in water resources PCRWR on 29-03-2016 and 14-04-2016. These results are given in Table-10. Detail may be seen in **Annex 2.**

Table 10: Ground Water Quality Analysis for Dam

Sr. #	Parameter	Unit	Results Groundawater Quality of Sub-projects (Dams)						Permissible Limits
			Sankar	Sabusan	Jungshahi	Aripir	Konkar	Karmatiani	
1	Odor	-	Un-objectionable						
2	pH	-	7.18	6.94	7.45	7.42	7.54	6.96	6.5-8.5 (who)
3	Color	-	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless
4	Conductivity	dS/m	14390	2290	457	1240	3230	2360	NGVS
5	Total Dissolved Solids (TDS)	mg/l	9210	1466	292	794	2067	1510	1000 (WHO)
6	Potassium	mg/l	16.7	9.8	4.3	4.4	6.3	4.5	12 (EC)
7	Nitrite(No_2)	mg/l	1.566	2.366	0.024	0.056	0.026	6.691	10 (WHO)
8	Taste	-	Un-objectionable						
9	Carbonate	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	NGVS
10	Bicarbonate	mg/l	940	350	160	240	380	250	NGVS
11	Phosphate (PO_4)	-	0.93	0.58	0.26	0.58	0.58	0.58	NGVS
12	Calcium	mg/l	144	104	40	88	80	0.58	75 (PSI)
13	Arsenic (ppb)	-	0	0	0	0	0	0	50 (PSQCA)
14	Total Hardness	mg/l	1320	500	180	470	470	760	500 (WHO)

3.5.1. Air Quality

The sub-project areas of Nagarparkar and Kohistan are located in a sparsely populated area 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 lead, 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, so it is unlikely that any significant air quality concerns exist for communities living close to them.

3.5.2. 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 NEQS and WHO standards. Details are present in Table-11.

Table 11 : Ambient Noise Levels in Sub-project Areas

S. No.	Sub-Project	Location	Location		Noise Levels	
			N	E	Min	Max
1	Aripir	Dam Site	N 25º 30’ 34.45”	E 67º 27’ 56.23”	42	47
2	Karmatiani		N 25º 10’ 28.21”	E 67º 13’ 34.52”	52	56
3	Konkar		N 25º 03’ 09.45”	E 67º 15’ 27.75”	49	54
4	Jungshahi		N 25º 58’ 13.40”	E 67º 36’ 14.74”	44	46
5	Sabusan		N 24º 16’ 17.03”	E 70º 41’ 31.92”	42	44
6	Sankar		N 24º 32’ 16.86”	E 70º 50’ 12.72”	42	44

3.5.3. Soil

The Soil texture in sub-project area are generally sandy loam, while soil cover of the Kohistan 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 on 29-03-2016 and 14-04-2016. The test results revels that all the parameters are within the permissible. The details are given in Table 12 and in **Annex 2.**

Table 12: Soil Analysis of Sub-project Area

S.No	Parameter	Units	Aripir Dam	Karmatani Dam	Konkar Dam	Jungshahi Dam	Sabusan Dam	Sankar Dam
1	EC	(ds/m)	1.35	1.15	3.2	0.82	1.36	3.45
2	pH	-	7.4	8	7.6	7.8	8.2	7.6
3	Bicarbonate	(HCO3)Meq/l	6.3	2.5	5	2	4.5	7
4	Chloride	Meq/l	5	6.2	15.05	5.07	6.08	15
5	sulfate	Meq/l	2.05	2.76	11.41	1.1	3	12.15
6	Calciam+megnisum	Meq/l	7	3.6	9.9	2.8	5.5	15.5
7	Sodium	Meq/l	5	6.54	19.98	4.65	6.9	12.78
8	SAR	-	2.67	4.87	8.98	3.93	4.16	4.6
9	ESP	-	2.6	5.59	10	4.34	4.653	5.23
Soil Texture								
1	Sand %		72.4	84.4	76.4	86.4	75.8	73.8
2	Silt%		20	4	8	8	23.96	17.96
3	Clay%		7.6	11.6	15.6	5.6	0.24	8.24
4	Texture Class		Sandy Loam	Loamy Sand	Sandy Loam	Sandy	Loamy Sand	Sandy Loam

3.6. 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 Tharparkar, and from Kirthar mountains to the mangroves forest of Indus Delta. 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.

3.6.1. Flora and Fauna of the Sub-projects Area

Fauna of Sub-projects of Kohistan

During the field study of Aripir, Karmatiani, Konkar, and Jungshahi, four (4) large mammal species were observed in which Asiatic Jackal is common and can be easily seen, while Hog deer is rare and in listed as endangered IUCN led list was found in captivity at Haleji lack near

study area it is also potential site for local and migratory birds. Haleji lack is one of Ramsar site among Pakistan and declared as wildlife sanctuary by Sindh wildlife department. Construction of proposed dam will supplement to wetland and provide alternate site for water birds and other aquatic fauna. Wild cat is also threatened wildlife species rarely fund in the field.

During the study, 9 small mammal species from different micro habitats were recorded, 13 reptile and amphibians were recorded, among Marsh crocodile was in captivity at Haleji wetland, it is also endangered reptile species found selective sites in Sindh province, Indian back cobra is poisonous snake is being killed ruthlessly, its population drastically declined through its fragile habitats. 52 bird species including resident and migratory birds were observed in the study area. Common babbler has become very rare from the region, while pheasant crow, Jungle Babbler, Common Myna, Bank Myna, House Sparrow, Common Crow, Indian Roller and Rose ringed Parakeet population is quite satisfactory in Indus co-region. Chestnut-bellied sand grouse, Pied crested cuckoo, Red-vented bulbul and Red turtle dove population is declining in the region. Migratory water birds especially the water fowl visiting trend is highly declined even the present survey has been conducted in January 2016 which is climax of migratory birds, but the trend of winter visitors were highly disappointing at large scale. Detail of mammals, Reptiles and bird found in Kohistan Sub project area is given in Table-13.

Table 13: Fauna in Kohistan Sub Project Area

S.No	English Name	Scientific Name	Conservation status	Aripir	Karmatiani	Konkar	Jungshahi
	Large Mammals						
1	Indian Hog deer (in captivity)	Axis porcinus	EN				+
2	Indian Mongoose	Herpestes auropunctatus	LC	+	+	+	+
3	Asiatic Jackal	Canis aureus	LC	+	+	+	+
4	Wild cat	Felis chaus	LC	+			+
Total				**3**	**2**	**2**	**4**
	Small Mammals						
1.	Palm squirrel	Funambulus pennantii	LC	+	+	+	+
2.	Indian 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	+			

S.No	English Name	Scientific Name	Conservation status	Aripir	Karmatiani	Konkar	Jungshahi
7.	Indian gerbil	Tatera indica	LC	+			
8.	House shrew	Suncus murinus	LC			+	+
9.	Indian Gerbil	Tatera indica	LC				+
Total				**7**	**4**	**5**	**6**
	Reptiles & Amphibians						
1	Skittering frog	Euphlyctis cyanophlyctis	LC		+	+	+
2	Marble toad	Bufo stomaticus	LC	+	+	+	
3	Bull Frog	Hoplobatrachus tigerinus	LC				+
4	Yellow-bellied house gecko	Hemidactylus flaviviridis	LC	+	+		+
5	Keeled Back Gacko	Hemidactylus brookii	LC	+			
6	Bengal monitor	Varanus bengalensis	LC	+	+	+	+
7	Ground Agama	Trapelus agilis	LC	+			
8	Spotted gecko	Hemidactylus maculatus	LC	+			
9	Saw-scale viper	Echis carinatus	LC	+	+	+	+
10	Marsh crocodile (in captivity	Crocodylus palustris	VU				+
11	Indian cobra	Naja naja	Not listed				+
12	Indian flap shell turtle	Lissemys punctate	Not listed				+
13	Grass skink	Eutropis macularia	Not listed				+
Total				**7**	**5**	**4**	**9**
Birds							
1	Black Drongo	Dicrurus macrocercus	LC		+	+	+
2	Black Redstart	Phoenicurus ochruros	LC	+	+	+	+
3	Green Bee-eater	Merops orientalis	LC	+	+	+	+
4	White cheeked bulbul	Pycnonotus leucotis	LC	+	+	+	+

S.No	English Name	Scientific Name	Conservation status	Aripir	Karmatiani	Konkar	Jungshahi
5	Blue-throat	Luscinia svecica	LC	+	+	+	
6	Collared Dove	Streptopelia decaocto	LC	+	+	+	+
7	Common Babbler	Turdoides caudata	LC	+	+	+	+
8	Common Myna	Acridotheres tristis	LC		+		
9	Common/Barn Swallow	(Hirundo rustica	LC				+
10	Crested Lark	Galerida cristata)	LC	+	+	+	
11	Eastern Pied Wheatear	Oenanthe pleschanka	LC	+	+	+	+
12	Hoopoe	Upupa epops	LC		+	+	
13	Indian house crow	Corvus splendens	LC	+	+	+	+
14	Indian House Sparrow	Passer domesticus	LC	+	+	+	
15	Indian Roller	Coracias benghalensis	LC	+	+	+	
16	Jungle Babbler	Turdoides striata	LC	+	+	+	
17	Grey Shrike	Colluricincla harmonica	LC	+	+	+	+
18	Night Jar	Caprimulgus asiaticus	LC	+	+	+	
19	Red wattle Lapwing	Vanellus indicus	LC		+	+	+
20	Sun Bird	Cinnyris asiaticus	LC		+	+	+
21	Grey partridge	Perdix perdix	LC		+	+	
22	Little Owl	Athene noctua	LC	+	+	+	
23	Black sholder Kite	Elanus axillaris	LC		+	+	
24	Eurasian sparrow hawk	Accipiter nisus	LC				+
25	Indian Pond Heron	Ardeola grayii	LC		+		+
26	Little Egret	Egretta garzetta	LC		+		+
27	Bank Myna	Acridotheres ginginianus	LC	+			+
28	Black winged Stilt	Himantopus himantopus	LC		+	+	+
29	Blue Rock Pigeon	Columba livia	LC		+	+	+

S.No	English Name	Scientific Name	Conservation status	Aripir	Karmatiani	Konkar	Jungshahi
		domestica					
30	Collared Dove		LC	+	+	+	+
31	Common Crow Pheasant	Centropus sinensis	LC			+	+
32	Common Kingfisher	Alcedo atthis	LC			+	+
33	Pied kingfisher	Ceryle rudis	LC	+	+	+	+
34	Common Myna		LC	+	+	+	+
35	Rose ringed parakeet	Psittacula krameri	LC		+	+	
36	Black partridge	Melanoperdix niger	VU	+			+
37	Common coot	Fulica atra	LC				+
38	Common moorhen	Gallinula chloropus	LC				+
39	Tufted duck	Aythya fuligula	LC				+
40	Common teal	Anas crecca	LC				+
41	Grey heron	Ardea cinerea	LC				+
42	Flycatcher	Muscicapa striata	LC				+
43	Tree pie	Dendrocitta vagabunda	LC		+		+
44	Barhamni kite	Haliastur indus	LC				+
45	Green shank	Tringa nebularia	LC				+
46	Indian cuckoo	Cuculus micropterus	LC				+
47	Yellow wagtail	Motacilla flava	LC				+
48	White wagtail	Motacilla alba	LC		+	+	+
49	Grey Fantail	Rhipidura albiscapa	LC				+
Total				**20**	**35**	**32**	**39**

Note: Endangered (EN), Vulnerable (VU), Least Concern (LC)

Flora in the Sub-projects of Kohistan

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 Acacia nilotica, Prosopis cineraria, Tecomella undulata, Zizyphus nummularia, Commiphora and stocksiana, Commiphora wighgtii, Capparis decidua. All reported

species are least concern as per IUCN list 201. Details of the flora are provided in Table-14 below and photo gallery of fauna and their habitats in Figure-19.

Table 14: Flora in Kohistan Sub Projects

S No	Family	Plant species	Habit	Conservation by IUCN 2018 list
1.	Arecaceae	Phoenix sylvestris	Tree	Not assessed
2.	Aristolochiaceae	Aristolochia bracteolata	Herb	NA
3.	Asclepiadaceae	Calotropis procera	Shrub	AN
4.	Asclepiadaceae	Caralluma edulis	Herb	NA
5.	Asclepiadaceae	Glossonema varians	Herb	NA
6.	Asclepiadaceae	Leptadenia pyrotechnica	Shrub	NA
7.	Asparagaceae	Asparagus dumosus	Shrub	NA
8.	Asteraceae	Grangea maderaspatana	Herb	LC
9.	Asteraceae	Pluchea wallichiana	Shrub	NA
10.	Asteraceae	Vernonia cinerascens	Shrub	NA
11.	Asteraceae	Xanthium strumarium	Shrub	NA
12.	Boraginaceae	Coldenia procumbens	Herb	NA
13.	Boraginaceae	Cordia gharaf	Tree	NA
14.	Boraginaceae	Heliotropium calcareum	Subshrub	NA
15.	Boraginaceae	Heliotropium curassavicum	Subshrub	LC
16.	Boraginaceae	Heliotropium strigosum	Herb	NA
17.	Boraginaceae	Sericostoma pauciflorum	Subshrub	NA
18.	Boraginaceae	Trichodesma indicum	Subshrub	NA
19.	Brassicaceae	Farsetia hamiltonii	Herb	NA
20.	Caesalpiniaceae	Senna italic	Subshrub	NA
21.	Capparidaceae	Cadaba fruticosa	Shrub	AN
22.	Capparidaceae	Capparis decidua	Large Shrub	NA
23.	Capparidaceae	Capparis spinosa	Subshrub	NA
24.	Capparidaceae	Cleome brachycarpa	Herb	NA
25.	Capparidaceae	Cleome scaposa	Herb	NA
26.	Capparidaceae	Cleome viscosa	Herb	NA
27.	Capparidaceae	Gynandropsis gynandra	Herb	NA
28.	Capparidaceae	Maerua arenaria	Shrub	NA

S No	Family	Plant species	Habit	Conservation by IUCN 2018 list
29.	Caryophyllaceae	Polycarpaea spicata	Herb	NA
30.	Chenopodiaceae	Salsola imbricata	Shrub	NA
31.	Chenopodiaceae	Suaeda fruticosa	Shrub	NA
32.	Euphorbiaceae	Euphorbia	Herb	NA
33.	Fabaceae	Alhagi maurorum	Subshrub	NA
34.	Fabaceae	Alysicarpus ovalifolius	Herb	NA
35.	Fabaceae	Crotalaria medicaginea	Herb	NA
36.	Fabaceae	Cyamopsis tetragonoloba	Shrub	NA
37.	Fabaceae	Indigofera cordifolia	Herb	NA
38.	Fabaceae	Melilotus indica	Herb	NA
39.	Fabaceae	Trifolium alexandrianum	Herb	NA
40.	Hydrocharitaceae	Hydrilla verticillata	Herb	LC
41.	Hydrocharitaceae	Ottelia alismoides	Herb	LC
42.	Malvaceae	Abutilon bidentatum	Subshrub	NA
43.	Malvaceae	Abutilon muticum	Subshrub	NA
44.	Malvaceae	Hibiscus micranthus	Subshrub	NA
45.	Malvaceae	Senra incana	Subshrub	NA
46.	Malvaceae	Sida ovata	Subshrub	NA
47.	Mimosaceae	Acacia nilotica	Tree	LC
48.	Mimosaceae	Prosopis cineraria	Tree	NA
49.	Mimosaceae	Prosopis juliflora	Large Shrub	NA
50.	Molluginaceae	Glinus lotoides	Herb	NA
51.	Poaceae	Paspalum vaginatum	Grass	LC
52.	Poaceae	Phragmites australis	Large Grass	LC
53.	Poaceae	Phragmites karka	Large Grass	LC
54.	Poaceae	Saccharum benghalense	Large Grass	NA
55.	Poaceae	Saccharum griffithii	Large Grass	NA
56.	Poaceae	Saccharum spontaneum	Large Grass	NA
57.	Poaceae	Sporobolus nervosus	Grass	NA

S No	Family	Plant species	Habit	Conservation by IUCN 2018 list
58.	Poaceae	Sporobolus sp. nov.	Grass	NA
59.	Poaceae	Tetrapogon tenellus	Grass	NA
60.	Poaceae	Tragus roxburgii	Grass	NA
61.	Portulacaceae	Portulaca oleracea	Herb	NA
62.	Potamogetonaceae	Potamogeton lucens	Herb	LC
63.	Potamogetonaceae	Potamogeton natans	Herb	LC
64.	Potamogetonaceae	Potamogeton perfoliatus	Herb	LC
65.	Rhamnaceae	Ziziphus nummularia	Shrub	NA
66.	Rubiaceae	Kohautia retrorsa	Subshrub	NA
67.	Salicaceae	Populus euphratica	Tree	LC
68.	Salvadoraceae	Salvadora oleoides	Tree	NA
69.	Salvadoraceae	Salvadora persica	Tree	NA
70.	Salviniaceae	Salvinia molesta	Herb	NA
71.	Solanaceae	Solanum cordatum	Straggling Shrub	NA
72.	Solanaceae	Solanum nigrum	Herb	NA
73.	Solanaceae	Solanum surattense	Herb	NA
74.	Tamaricaceae	Tamarix alii	Shrub	NA
75.	Tamaricaceae	Tamarix indica	Shrub	NA
76.	Tamaricaceae	Tamarix sp	Shrub	NA
77.	Typhaceae	Typha dominghensis	Reed	NA
78.	Verbenaceae	Phyla nodiflora	Herb	NA
79.	Violaceae	Viola stocksii	Herb	NA
80.	Zygophyllaceae	Fagonia indica	Herb	NA

Habitat of study sites	
	
Habitat of study area	Reptile habitat
Fauna	
	
Monitor Lizard	Rock Pigeon
	
Hogdeer in breeding form in Haleji wildlife sanctuary	Marsh crocodile in breeding form in Haleji wildlife sanctuary
	
Turtle Dove found in study site	Finch lark in study site

Figure 19 : Picture Gallery of Kohistan Sub Project Areas

Fauna of Sub-projects Nagarparkar Area

Study site is situated near to Rann of Kuchchh which is international significant site for its biological diversity, it has been designated as Ramsar site, it is geographically the widest Ramsar site. Rann of Kuchchh was also declared a wildlife sanctuary by the Sindh government. This sanctuary is supporting nature's richest ecosystem. It provides food and shelter to a number of migratory and local wildlife species. The marshy Rann of Kutch, with its surrounding Thar Desert area in Sindh, is one of the most potential habitats for a number of animals and birds in the province.

This area is known to be a breeding ground for flamingos and staging ground for pelicans, cranes, storks and many species of waterfowl. It is also an important site for animals like blue bulls, Chinkara and desert wolves, which have been sighted over here regularly. The site supports many species of birds and mammals which are locally and globally threatened. The site is also a wintering area for water birds.

The marshy habitat is most attractive for water bird species such as common teal, shell duck, mallard, Pochard, flamingo and pelican. Occasionally, the range of other species has also been seen in the outskirts of the site. These include peafowl, Sarus cranes, Houbara bustard and the peregrine falcon and Saker falcons, but in the desert of Thar land is famous for Indian Peafowl (Mor).

Furthermore, the area has its unique identity among one of the five famous eco-ranges of Pakistan. Out of seven routes for migratory birds in Central Asia, the Indus green route passes through the Thar Desert, making it more important zone from wildlife perspective.

During the field study of Sabusan and Sankarsar, five (5) large mammal species were observed in which Wild cat, Desert fox and Grey Mongoose are the rare while Indian wild boar and Asiatic Jackal is common throughout Sindh. Indian Wild Ass is nearly threatened by IUCN is found in Rann of Kuchchh plan and roaming in the area between Pakistan and India boundryline. Construction of proposed dam will supplement to wetland and provide source of fresh water for wildlife. During the study, 8 small mammal species from different micro habitats, 10 reptile and amphibians were recorded, among whom Indian Star Tortoise is vulnerable by IUCN red list found in the area, Indian black cobra is poisonous snake is being killed ruthlessly, it population drastically declined through its fragile habitats. 40 bird species including resident and migratory birds were observed in the study area. 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 in Nagarparkar Sub Project Areas is given in Table-15.

Table 15: Fauna in Nagarparkar Sub Project Areas

S.#	English Name	Scientific Name	Conservation by IUCN	Sabusan	Bhansar/Rathi	Sankarsar
	Large Mammals					
1	Indian Mongoose	Herpestes javanicus	LC	+	+	+
2	Grey Mongoose	Herpestes edwardsi)	LC	+		
3	Asiatic Jackal	Canis aureus)	LC	+	+	+
4	wILDt cat	Falus chaus	LC	+		
5	Indian wild boar	Sus scrofa	LC	+	+	+
6	Desert fox	Vulpes bangalinces	LC		+	+
Total				3	2	2
	Small Mammals					
1	Palm squirrel	Funambulus pennantii	LC	+	+	+
2	Indian porcupine	Hystrix indica	LC	+		+
3	Kuhls' bat	Pipistrellus kuhlii	LC		+	+
4	House mouse	Mus booduga	LC	+		
5	Hedgehog	Parachinus micropus	LC	+	+	+
6	Persian gird	Meriones persicus	LC	+		
7	Indian Gerbil	Tatera indica	LC	+		+
8	Indian desert Jird	Meriones hurrianae	LC	+	+	+
Total				**7**	**4**	**6**
	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		+	+
6	Indian fringe-fingered lizard	(Acanthodactylus cantoris	LC		+	
9	Indian Star tortoise (reported ZSD)	Geochelone elegans	VU	+	+	+
10	Skittering frog	Euphlyctis cyanophlyctis	LC		+	+
11	house gecko	Hemidactylus frenatus	LC	+	+	+
12	Keeled Back Gacko	Hemidactylus brookii	LC	+	+	+
Total				**6**	**9**	**8**
1	**Birds**					
2	Grey Partridge	Perdix perdix)	LC		+	
3	Indian Koel	Eudynamys scolopaceus	LC	+	+	+
4	Common quail	Coturnix coturnix	LC	+		
5	Ashy crowned finch-lark	Eremopterix griseus	LC	+	+	+
6	Bank Myna	Acridotheres ginginianus	LC	+	+	+
7	Grey Shrike	(Lanius excubitor	LC	+	+	+
8	Black Drongo	Dicrurus macrocercus	LC		+	
9	Desert Lark	Ammomanes deserti	LC	+	+	
10	Black winged Stilt	Himantopus himantopus	LC	+	+	+
11	Green Bee-eater	Merops orientalis)	LC	+	+	+
12	Blue-throat	Luscinia svecica	LC		+	+
13	Cattle Egret	Bubulcus ibis	LC	+	+	+

14	Collared Dove	Streptopelia decaocto	LC	+	+	+
15	Common Babbler	Turdoides caudata	LC	+	+	+
16	Common Crow Pheasant	Centropus sinensis	LC	+	+	+
17	Common Kingfisher	Alcedo atthis	LC			+
18	Pied Kingfisher	Ceryle rudis	LC		+	+
19	Common Myna	cridotheres tristis	LC	+	+	+
20	Common/Barn Swallow	(Hirundo rustica	LC		+	+
21	Crested Lark	alerida cristata	LC			
22	Eastern Pied Wheatear	Oenanthe pleschanka	LC		+	
23	Eurasian sparrow hawk	Accipiter nisus	LC		+	
24	Hoopoe	Upupa epops	LC		+	
25	Indian house crow		LC	+	+	+
26	Indian House Sparrow	Passer domesticus)	LC	+	+	+
27	Indian Pond Heron	Ardeola grayil	LC		+	+
28	Indian Roller	Coracias benghalensis	LC			+
29	Jungle Babbler	Turdoides striata	LC			+
30	Little Egret	Egretta garzetta	LC		+	+
31	Grey Shrike	Lanius meridionalis	LC	+		
32	Tree pie	Dendrocitta vagabunda	LC			
33	Indian peacock	Pavo cristatus	LC	+	+	+
34	Grey Shrike	Lanius meridionalis	LC			
35	Black Redstart	Phoenicurus ochruros	LC		+	+
36	Black winged Stilt	Himantopus himantopus)	LC			
37	Tawny eagle	Aquila rapax	LC			+
Total				**19**	**27**	**24**

Flora of Nagarparkar Sub-project Area

Sweet water is scarce throughout Thar and because of aridity, the soil is generally infertile because of severe wind erosion it is over blown with sand. This has resulted in limiting the vegetation to stunted scrub and bush, although trees such as kandi (Prosopis cineraria) do occasionally grow on the landscape. The main natural ground cover is provided by grasses which are nutritive and a palatable fodder for livestock.

The common plants of Thar Desert are Thuhar (Euphorbia caducifolia), phog (Calligonum polygonoides), and (Calotropis gigantea). In irrigated tracts, babul (or Babur), Acacica nilotica), talhi (Dalbergia sissoo) neem (Azadirachta indica), jar (Salvadora oleoides), and kri (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., Tribulus longipetalus and Limeum indicum were forming common

vegetation on them. There is no previous report available on the vegetation of this area. Detail of flora found in Nagarparkar Sub Projects Areas is given in Table-16 and a phot gallery of is fauna and their habitats in Figure-20.

Table 16: Flora of Nagarparkar Sub Projects Areas

S No	Family	Plant species	Habit	Conservation by IUCN 2018 list
1.	Arecaceae	Phoenix sylvestris	Tree	NA
2.	Aristolochiaceae	Aristolochia bracteolata	Herb	NA
3.	Asclepiadaceae	Calotropis procera	Shrub	AN
4.	Asclepiadaceae	Caralluma edulis	Herb	NA
5.	Asclepiadaceae	Glossonema varians	Herb	NA
6.	Asclepiadaceae	Leptadenia pyrotechnica	Shrub	NA
7.	Asparagaceae	Asparagus dumosus	Shrub	NA
8.	Asteraceae	Grangea maderaspatana	Herb	LC
9.	Asteraceae	Pluchea wallichiana	Shrub	NA
10.	Asteraceae	Vernonia cinerascens	Shrub	NA
11.	Asteraceae	Xanthium strumarium	Shrub	NA
12.	Boraginaceae	Coldenia procumbens	Herb	NA
13.	Boraginaceae	Cordia gharaf	Tree	NA
14.	Boraginaceae	Heliotropium calcareum	Subshrub	NA
15.	Boraginaceae	Heliotropium curassavicum	Subshrub	LC
16.	Boraginaceae	Heliotropium strigosum	Herb	NA
17.	Boraginaceae	Sericostoma pauciflorum	Subshrub	NA
18.	Boraginaceae	Trichodesma indicum	Subshrub	NA
19.	Brassicaceae	Farsetia hamiltonii	Herb	NA
20.	Caesalpiniaceae	Senna italic	Subshrub	NA
21.	Capparidaceae	Cadaba fruticosa	Shrub	AN
22.	Capparidaceae	Capparis decidua	Large Shrub	NA
23.	Capparidaceae	Capparis spinosa	Subshrub	NA
24.	Capparidaceae	Cleome brachycarpa	Herb	NA
25.	Capparidaceae	Cleome scaposa	Herb	NA
26.	Capparidaceae	Cleome viscosa	Herb	NA
27.	Capparidaceae	Gynandropsis gynandra	Herb	NA
28.	Capparidaceae	Maerua arenaria	Shrub	NA
29.	Caryophyllaceae	Polycarpaea spicata	Herb	NA
30.	Chenopodiaceae	Salsola imbricata	Shrub	NA
31.	Chenopodiaceae	Suaeda fruticosa	Shrub	NA
32.	Euphorbiaceae	Euphorbia	Herb	NA
33.	Fabaceae	Alhagi maurorum	Subshrub	NA
34.	Fabaceae	Alysicarpus ovalifolius	Herb	NA
35.	Fabaceae	Crotalaria medicaginea	Herb	NA
36.	Fabaceae	Cyamopsis tetragonoloba	Shrub	NA
37.	Fabaceae	Indigofera cordifolia	Herb	NA
38.	Fabaceae	Melilotus indica	Herb	NA
39.	Fabaceae	Trifolium alexandrianum	Herb	NA
40.	Hydrocharitaceae	Hydrilla verticillata	Herb	LC
41.	Hydrocharitaceae	Ottelia alismoides	Herb	LC
42.	Malvaceae	Abutilon bidentatum	Subshrub	NA
43.	Malvaceae	Abutilon muticum	Subshrub	NA
44.	Malvaceae	Hibiscus micranthus	Subshrub	NA
45.	Malvaceae	Senra incana	Subshrub	NA
46.	Malvaceae	Sida ovata	Subshrub	NA
47.	Mimosaceae	Acacia nilotica	Tree	LC
48.	Mimosaceae	Prosopis cineraria	Tree	NA

S No	Family	Plant species	Habit	Conservation by IUCN 2018 list
49.	Mimosaceae	Prosopis juliflora	Large Shrub	NA
50.	Molluginaceae	Glinus lotoides	Herb	NA
51.	Poaceae	Paspalum vaginatum	Grass	LC
52.	Poaceae	Phragmites australis	Large Grass	LC
53.	Poaceae	Phragmites karka	Large Grass	LC
54.	Poaceae	Saccharum benghalense	Large Grass	NA
55.	Poaceae	Saccharum griffithii	Large Grass	NA
56.	Poaceae	Saccharum spontaneum	Large Grass	NA
57.	Poaceae	Sporobolus nervosus	Grass	NA
58.	Poaceae	Sporobolus sp. nov.	Grass	NA
59.	Poaceae	Tetrapogon tenellus	Grass	NA
60.	Poaceae	Tragus roxburgii	Grass	NA
61.	Portulacaceae	Portulaca oleracea	Herb	NA
62.	Potamogetonaceae	Potamogeton lucens	Herb	LC
63.	Potamogetonaceae	Potamogeton natans	Herb	LC
64.	Potamogetonaceae	Potamogeton perfoliatus	Herb	LC
65.	Rhamnaceae	Ziziphus nummularia	Shrub	NA
66.	Rubiaceae	Kohautia retrorsa	Subshrub	NA
67.	Salicaceae	Populus euphratica	Tree	LC
68.	Salvadoraceae	Salvadora oleoides	Tree	NA
69.	Salvadoraceae	Salvadora persica	Tree	NA
70.	Salviniaceae	Salvinia molesta	Herb	NA
71.	Solanaceae	Solanum cordatum	Straggling Shrub	NA
72.	Solanaceae	Solanum nigrum	Herb	NA
73.	Solanaceae	Solanum surattense	Herb	NA
74.	Tamaricaceae	Tamarix alii	Shrub	NA
75.	Tamaricaceae	Tamarix indica	Shrub	NA
76.	Tamaricaceae	Tamarix sp	Shrub	NA
77.	Typhaceae	Typha dominghensis	Reed	NA
78.	Verbenaceae	Phyla nodiflora	Herb	NA
79.	Violaceae	Viola stocksii	Herb	NA
80.	Zygophyllaceae	Fagonia indica	Herb	NA

Habitat of study sites

Wild habitat of site

Water pond near dam site

	
Karoonjhar wildlife sanctuary hills	**Vegitation cover on sand-dune**

Fauna	
 **Indian Peafowl (Mor)**	 **Blue rock Pigeon in crop field**
 Common myna in Nagarparkar area	 Green Bee eater in Nagarparkar town area

Figure 20: Picture Gallery of Nagarparkar Study Area

3.6.2. 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-17. A total of 91 mature and young trees including 21 trees are of Kikar (Acacia nilotica) varying from 10 to 15 years maturity and 18 young trees of 6 months to 1 year of age, 36 trees are of Kandi (Prosopis Cinereria) varying from 10-15 years of age (Mature) and 16 trees including young six months to 1 year of age. 56 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 17 : 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	**Sankar**	Sindhi Babur	Acacia nilotica	18	08	16	10
2	**Sabusan**	Sindhi Babur	Acacia nilotica	01	0	01	0
3	**Aari peer**	Kandi	Prosopis Cinereria	35	20	15	15
4	**Junshahi**	-	-	0	0	0	0
5	**Konkar**	Kandi	Prosopis Cinereria	1	0	1	1
6	**Karmatiani**	Sindhi Babur	Acacia nilotica	2	2	1	0
Sub total				**57**	**30**	**34**	**26**
Total Number of Existing trees				**91**			
Total Number of cut down trees				**56**			

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

4.1. Methodology

This chapter describes the socio economic condition of the subproject area. The socio-economic survey and social impacts assessment was made by Consultants team comprising of environment specialist, ecologist, and resettlement and social expert as well as male and female sociologists during the months of December, 2015 and January, 2016 under DACREP preparatory study.. The previous data has now been updated through supplementary field visits by Mr. Farooq Ahmed Memon, (Environmentalist) Mr. Naimatullah Khan Kakar (Sr. Sociologist) Mr. Attaullah Pandrani (Ecologist). The team used a Questionnaire and a checklist for Focus Group Discussions (Attached at **Annex-3**). In order to have comprehensive detailed information, consultation meetings were also 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.

4.2. 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 with 4 villages on Aripir dam in Jamshoro district, 2 villages on Karmatiani dam and 1 village on Konkar dam in Malir district, 1 village on Jungshahi dam in Thatta district, while 1 village on Sabusan dam, and 1 village on Sankar dam in Tharparkar district. All of these 10 villages were within the primary impact zone. All these schemes are small scale dams, so the survey carried out in all villages which are direct beneficiaries of these schemes. This survey was conducted in the months of December 2015 and January, 2016 in order to establish a social baseline of the project area. A list of the villages visited is provided in Table-18.

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 18: Villages Visited as Part of Socio-Economic Baseline Data Collection

Details Surveyed Villages						
S.No	Village Name	Dam Name	Location		Sub-Division	District
			N	E		
01	Subosan	Subosan dam	24,14.812	070,40.729	Nagarparkar	Tharparkar
02	Sankar Sar	Sankar Sar dam	24,32.351	070,50.190	Nagarparkar	Tharparkar
03	Haji Jokio/Malang Goth	Karmatiani Dam	25,10.474	067,13.550	Gadap	Malir
04	Yar Mohammad Goth	Kankar Dam	25,02.716	067,15.195	Gadap	Malir
05	Goth Mal Mari	Jung Shahi Dam	24.58.375"N	067,37.365"E	Thatta	Thatta
06	Mubarak/Poto khan/Allah Jurio/Yaqoob Goth	Aripir Dam	25,30.579	067,27.958	Tana Bula Khan	Jam Shoro

In each village visited during the study, the female sociologist arranged meetings with women of all ages in a separate room where local males were discouraged from attending. Meetings were conducted in Sindhi languages.

The details of the project were described and explained using simple language. During the meetings, the gender related questions were asked in an informal way. Women were encouraged to ask questions and share their concerns related to project which were carefully noted.

4.3. Population

According to the results of the survey, total households of sub-projects of Aripir, Karmatiani, Konkar, Jungshahi, Subosan, and Sankar dams are 416 with a total population of 3305. Aripir dam is in Jamshoro district, Karmatiani and Konkar dams are in Malir district, Jungshahi is in Thatta district while Subosun, and Sankar dams are in Tharparkar district. Population of the Project area belongs to the Khaskhely, Burfat, Jokio, Baloch and Kohli (Hindu community). Khaskheli and Burfat are found on Aripir dam, Jokio, Burfat and Baloch on Karmatiani dam, Jokio and Baloch on Konkar dam, and on Jungshahi dam all belong to Jokio tribe. While Subosan, and Sankar dams beneficiaries are Kohli (Hindu). Sindhi is the main language in the Sub-Project area though most men can also speak Urdu and Parkari.

The dominant ethnic group in the project area are Burfat in Aripir, and Karmatiani dams and Jokio is on Konkar and Jungshahi dams. The sub-project wise details are given in the Table-19.

Table 19: Population and Tribes on Sub-Projects

Population, Tribe and Land Owned Detail of Sub-Projects of SRP							
S.No	Name of Sub-Project	Village	Tribe/Clan	Population			No of House holds
				Male	Female	Total	
1	Aripir dam	Goth Mubarak	Burfat	84	79	163	10
		Goth Pato	Khaskhely	82	111	193	11
		Goth Allah Juraio	Burfat	31	38	69	4
		Goth Yaqoob	Burfat	29	31	60	4
		Total		**226**	**259**	**485**	**29**
2	Karmatiani dam	Goth Malang	Burfat/Jokio	95	101	196	22
		Haji Goth	Burfat/Jokio/Baloch	176	204	380	44
		Total		**271**	**305**	**576**	**66**
3	Konkar dam	Goth Yar Mohd/Konkar	Jokio/Baloch	167	186	353	43
		Total		**167**	**186**	**353**	**43**
4	Jungshahi dam	Goth Mal Mari	Jokio	595	511	1106	118
		Total		**595**	**511**	**1106**	**118**
5	Subosan dam	Subosan	Kohli/Muslim	417	466	883	108
		Total		**417**	**466**	**883**	**108**
6	Sankar dam	Sankar	Kohli	164	164	328	52
		Total		**164**	**164**	**328**	**52**
		Grand Total		**1559**	**1746**	**3305**	**416**

4.4. Languages

Sindhi is the dominant language spoken in the project area about 63.4 per cent of the population speaks Sindhi and Urdu are also spoken and understood by the majority of the people in the project area. While 36.6 speaks Parkari, Sindhi and Urdu.

4.5. Family System

The majority of those in the study area live together with their extended family (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-20.

Table 20: Population and Average family size on Sub-Projects

S.No	Village Name	Total House Holds	Population			Average Family Size
			Male	Femal	Total	
1	Subosan	108	417	466	883	8.15
2	Sankar Sar	52	164	164	328	6.30
3	Haji Jokio/Malang Goth	66	271	305	576	8.71
4	Kankar Goth/Yar Mohammad Goth	43	167	186	353	8.20
5	Mal Mari	118	595	511	1106	9.3
6	Mubarak/Poto khan / Allah Jurio/ Yaqoob Goth	29	226	259	485	16.7
Total		**416**	**1559**	**1746**	**3305**	8.67

4.6. Religious Affiliation

During the socio-economic field survey it was observed that about 60 percent of the population are Muslim whereas about 40 percent consist of Hindu and other minority religions i.e Koolhi).

4.7. Social Cohesion and Conflict

Social organization in all villages is strongly based on community (tribal) system, where each tribe has a tribal 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.

Interactions between different tribes are less common. There are a large number of villages in the area. Separate villages have been established as tribes and families have grown and the land owned by one family is further sub-divided between the brothers of successive generations.

During the survey it was found that most communities had built their own mosques and maintenance of these mosques is the joint responsibility of residents.

4.8. 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, right of vote, 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 survey that 90 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.

4.9. Housing

The project area consists of rural population living comparatively in isolation. There are few villages of the conventional type. Majority of the population live in small settlements of five to ten houses. In Aripir, Karmatiani, Konkar and Jungshahi dam sub-project area blocks masonry houses are built without layout or plan. Some of the houses usually have a boundary wall enclosing enough space for cattle and storage. While in Subosan and Sankar dam sub-projects area of Tharparkar district fifty to hundred 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. It was observed that all the people were living in self-owned houses.

4.10. Literacy

A person who can read and write statements with an understanding, in any language prevalent in Pakistan, is considered as literate. Pakistan Bureau of Statistics (PBS) carried out the survey from August 2013 to June 2014. The report reveals that in Sindh the percentage of educated people dropped by 4% to 56% in 2013-14. Just over about 5% of those living in project area have received education to any level.

4.11. Education Facilities

During socio-economic field survey, it was noted that, there are 6 boys and 2 girls Primary schools, and the enrolment is 337 and 100 and only one boy's high School in jungshahi with 62 enrolments. Education facilities in the sub-project area are given in Table-21.

Table 21: Education Facilities in the Sub-Project Area

Name of Project	Boys Primary School			Girls Primary School			Boys Middle School	Girls Middle School	Boys High School	Girls High School
	No.	Teacher (nos)	Enroll -ment	No.	Teacher (nos)	Enroll -ment				
Aripir Dam	0	0	0	0	0	0	0	0	0	0
Karmatiani	2	4	90	0	0	0	0	0	0	0
Konkar	1	2	80	0	0	0	0	0	0	0
Jungshahi	1	2	46	1	2	40	0	0	1	0
Sankar Sar Dam	0	0	0	0	0	0	0	0	0	0
Sobo Sun Dam	1	1	80	1	2	60	0	0	0	0
Total	**5**	**9**	**296**	**2**	**4**	**100**	**0**	**0**	**1**	**0**

4.12. Health Facilities

It is found that many of the people have suffered from hepatitis, typhoid, malaria, eye problems, diarrhoea and other hygiene related complaints. Some of women expire during delivery cases. Majority of the women are malnourished usually being the last ones to eat their meals in the family. Only one Dispensary in Jungshahi dam (in Malmari the benefishries of dam village) is reported and in all other project area there are no any health facility like Basic Health Units (BHU), dispensary, midwifery centres and medical stores in the project area. The seriously ill patients are taken for treatment to Karachi, Hyderabad and Mithi Civil/district hospitals.

4.13. Transport

Most of surveyed villages have an average 6.1 kilometers village tracks or unsurfaced (Kacha) roads that are in bad condition except some of the villages. Construction and maintenance of village roads is the responsibility of local government. One National highway Karachi-Thatta, after that provincial highway from Thatta to Nagarparkar via Badin and Mithi passes at the end of the sub-projects area of Nagarparkar and Thatta.

While M-9 Motorway connects Karachi and Jamshoro for sub-projects area of Jamshoro districts and Malir districts.

The socio-economic baseline survey reveals that the major source of the human transport in the villages of the project area 85.7% is Buses, 43% Suzuki/Pickups for the general public, 28.6% individual cars and in 85.7% villages use motor bikes. The farm inputs and outputs are transported through Trucks Trailer 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-22.

Table 22: Transport Facilities in the Project Area

Transport Facility from Village to Nearby town in Project Area				
Name of Project	**Van/pickup**	**Bus/Truck**	**Car**	**M,bike**
Aripir Dam	0	1	0	1
Karmatiani	1	1	0	1
Konkar	1	1	1	1
Jung shahi	0	0	0	1
Sankar Sar Dam	0	1	0	1
Sobo Sun Dam	0	1	0	0
Percentage	**33.3**	**83.3**	**16.6**	**83.3**

4.14. Telecommunication

During the field survey the respondents reported that there is no landline facility available in the Project area. Mobile phone communication is widely spread in Karmatiani, Konkar and Jungshahi dam sub-project area, the frequent use of mobile phone was observed during the project field visits in these area.

While Aripir, Sankar and Subusan sub-projects area have no any telecommunication facility.

4.15. Energy Sources

Electricity is available in 57 per cent villages in the study area. This energy source is being utilized mainly for lighting of the houses and operation of tube wells for drinking water supplies and irrigation etc. While Karmatiani and Konkar dams project area are also connected with natural gas. Instead of it, the people collect firewood from the surrounding area and some people purchase firewood from nearby town. The fire wood per 40 kg cost is Rs.250.

4.16. Drinking Water and Sanitation

It is observed that women and children are responsible for fetching of water for drinking and domestic use. The underground water is mostly saline in the sub-project areas. Survey results showed that in Karmatiani, Konkar and Aripir dams area the drinking water source was their irrigation tube wells. The water level was observed 350 – 70 feet deep. Villagers of Mal Mari have developed a tube well in their village and also a distribution network for few house on their own cost just for drinking purpose. Whole the village and their live stocks depend on this single tube well. Karmatiani and Konkar villages are purchasing tankers of water. In Subosan village there were only 4 dug wells of 30 feet depth at the time of visit.

In Sankar dam area people depended on rainfall where the ground water is saline and unsuitable for drinking purposes, the population relies on the rainfall stored water in earthen reservoirs for drinking.

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-23.

Table 23: Drinking Water Sources in the Sub-Project Areas

Drinking Water Sources in Project Area							
Name of Project	Hand Pump (nos)	Drinking	Tube-Well			Piped Water	Purchaseing Water Tankers
			(nos)	Drinking	Irrigation		
Aripir Dam	0	×	20	√	√	0	×
Karmatiani	0	×	0	×	×	0	√
Konkar	0	×	4	√	√	0	×
Jung shahi	0	×	0	×	×	0	√
Sankar Sar Dam	0	×	0	×	×	0	×
Sobo Sun Dam	0	×	4	√	√	0	×
Sum	**0**		**28**			**0**	
Percentage		**0**		**50**	**50**	**0.0**	**33.3**

4.17. Women in Sub-project Area

This section provides baseline information and description of the socio-economic and cultural background pertinent to female in the project area. The purpose of this socio-economic survey was to gather first-hand information about the generic characteristics of nearby female communities, their socio-economic status, cultural conditions and social issues. The Female Sociologist carried out the study of socio-economic and cultural environment with reference to femininity of the project area. The approach and methodologies used during data gathering were interviews, focus group discussions and rapid rural appraisal techniques to qualitative data collection. Socio-economic and cultural data were collected through semi structured questionnaire and focus group interviews with female cluster at village level. This survey was carried out in 13 villages detail of which is given in Table-24. A detailed results/description of the survey is presented in the following sections.

The Gender specialists visited the villages and interviewed the women in a group form. Details of the villages visited are included in the following sections. The result of the surveys revealed that women of the project area are fully responsible for household activities and also take an active part in the field and livestock activities, and thus support the household income generation.

Women within the project area are infrequently consulted and men commonly have the decision power. Men usually make purchases on behalf of the female members of their family. Rural women mostly remain inside the home or work in the field. The result of the surveys revealed that the household and farming activities were carried out by the women in the project area as

under: Women in the area are skilled at embroidery. Many women spend their free time in embroidering. There is the opportunity for women to use these skills for the source of income.

Houses pattern in the Tharparker district area

Houses pattern in the Jungshahi project area

Table 24: Location of conducted cluster meetings with females

Name of the Villages	Name of the Dam	Co-ordinates	House Holds (No)	Income and Skills	Education level	Women rights	Health and Hygiene	Income Source
Mubarak/Poto khaskhely/Allah Jurio/Yaqoob Goth	Aripir	N 25.30 34.94 E 67 27 57.27	29	Net making, embroidery	0 %	Poor	Poor	Embroidery, and agriculture
Haji Jokio/Malang Goth	Karamtani	N 25,10.474 E 67,13.550	66	Net making, embroidery	40 %	Poor	Poor	Embroidery, Poultry and agriculture
Konkar Goth/Yar Mohammad Goth	Konkar	N 25,02.716 E 67,15.195	43	Net making, embroidery	50%	Poor	Fair	Embroidery, ,Poultry and agriculture
Mal Mari	Jungshahi	N 24.58.375" E 67.37.365"	118	Handy crafts, embroidery	30%	Poor	Poor	Fuel Wood, G/jobs and live stock
Subosan	Subosan	N 24,14.812 E 70,40.729	108	embroidery	0%	Poor	Fair	Fuel Wood and agriculture and livestock
Sankar	Sankar	N 24,32.351 E 70,50.190	52	embroidery	0%	Poor	Poor	Fuel Wood and agriculture and livestock

All women living within the sub-project areas were found illiterate. Only about 7.4% of the women in Karmatiani, Konkar and Jungshahi dam project area were founds to be educated in overall project area and of these none had attended school beyond middle school. Overall the total educated population of the project area, only 4% are female.

The health and hygiene condition of females and children are very poor. Many diseases are identified within the project area. Skin diseases, diarrhoea, hepatitis, typhoid, and flue. Many women are suffering from endemic diseases.

4.18. NGOs

During the field survey it was observed that only two NGOs: were reported working in the project area (Baanh Beli and Participetory Village Development Program PVDP). The NGOs working in the area along with their area of interest are detailed in Table-25.

Table 25*: NGOs working in Sub-project Area*

Name of Project	NGO working in the village		Area of interest.				Any major development projects in the village under implementation	What are the social impacts of these projects
	Yes	No	Health	Education	Micro cradit	Others		
Aripir Dam	0	1	0	0	0	0	0	0
Karmatiani	0	1	0	0	0	0	0	0
Konkar	0	1	0	0	0	0	0	0
Jung shahi	0	1	0	0	0	0	0	0
Sankar Dam	1	0	0	0	0	Solar energy	0	0
Sabusan Dam	1	0	1	1	1	0	0	0

4.19. Priority Needs of Male Community

During consultation meeting with the male groups they 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.
- It was observed that the clean drinking water was the key requirement during consultation.

The sub-project wise needs are given in the following Table-26.

Table 26: Priority Needs of the Male Community Members in Sub-project Area

Name of Project	Drinking Water	Edu-cation	Link Road	Health	Electr-city	Gas	Employ-ment
Aripir Dam	×	√	×	√	×	×	×
Karmatiani Dam	√	√	×	×	×	×	×
Konkar Dam	√	√	×	×	×	×	×
Jung shahi Dam	√	√	×	×	×	×	×
Sankar Dam	√	×	×	×	×	×	×
Sobo Sun Dam	√	√	√	√	×	×	×

4.20. Priority Needs of Female Community

During consultation meeting with the women groups they prioritized their needs. The ranking of prioritized needs are derived from the individual rankings of priorities generated from the discussions with the separate groups in each village, the comprehensive priorities for the overall project area is summarized as follows;

- The female community members demanded for the provision of basic living facilities including (health, education and drinking water, electricity and road communication).
- Demanded for water and sanitation water and sanitation facilities in the villages.
- Demanded for hand pumps in the villages
- Requested for provision of separate school for girls where girls school is not available
- Demanded for health facilities like (Maternity homes) in each village
- The female community members requested for engaging their male members as daily labor during project work

4.21. Archaeological and Cultural Heritage

The archaeological survey was conducted by the Culture and Tourism Department, GoS in 1993 and 1996. There are total of 34 archaeological sites situated in sub-projects district areas. The names and number of nearby archaeological sites are given in the Table-27.

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 project area.

Table 27: Archaeological Sites in sub-Project District

S.No	Name/Description	Location	District	Estimated distance from sub-project site KM
1	Bhodesar mosque	Bhodesar	Tharparkar	40
2	Temples at Bhodesar	Bhodesar	Tharparkar	40
3	Gori Temple	14 miles north-west of Virawah	Tharparkar	40
4	Mound at Bhiro	Sherwah	Tharparkar	30
5	Mound at Shadi Pali	Deh Khuda Bux	Tharparkar	50

S.No	Name/Description	Location	District	Estimated distance from sub-project site KM
6	Jain Temple	Vira Wah	Tharparkar	20
7	Makli Graveyard (On UNESCO World Heritage Monuments List)	Makli Hill	Thatta	50
8	Kalan Kot	Makli Hill	Thatta	40
9	Nawab Amir Khan's mosque	Makli Hill	Thatta	40
10	Building with two domes	Near Civil Hospital, Thatta	Thatta	50
11	Jama Masjid	Makli Hill	Thatta	40
12	Sasian-Jo-Takar	Mirpur Sakro	Thatta	60
13	Jama Masjid	Thatta city	Thatta	50
14	Stonehenge	Gadap Town	Malir	5

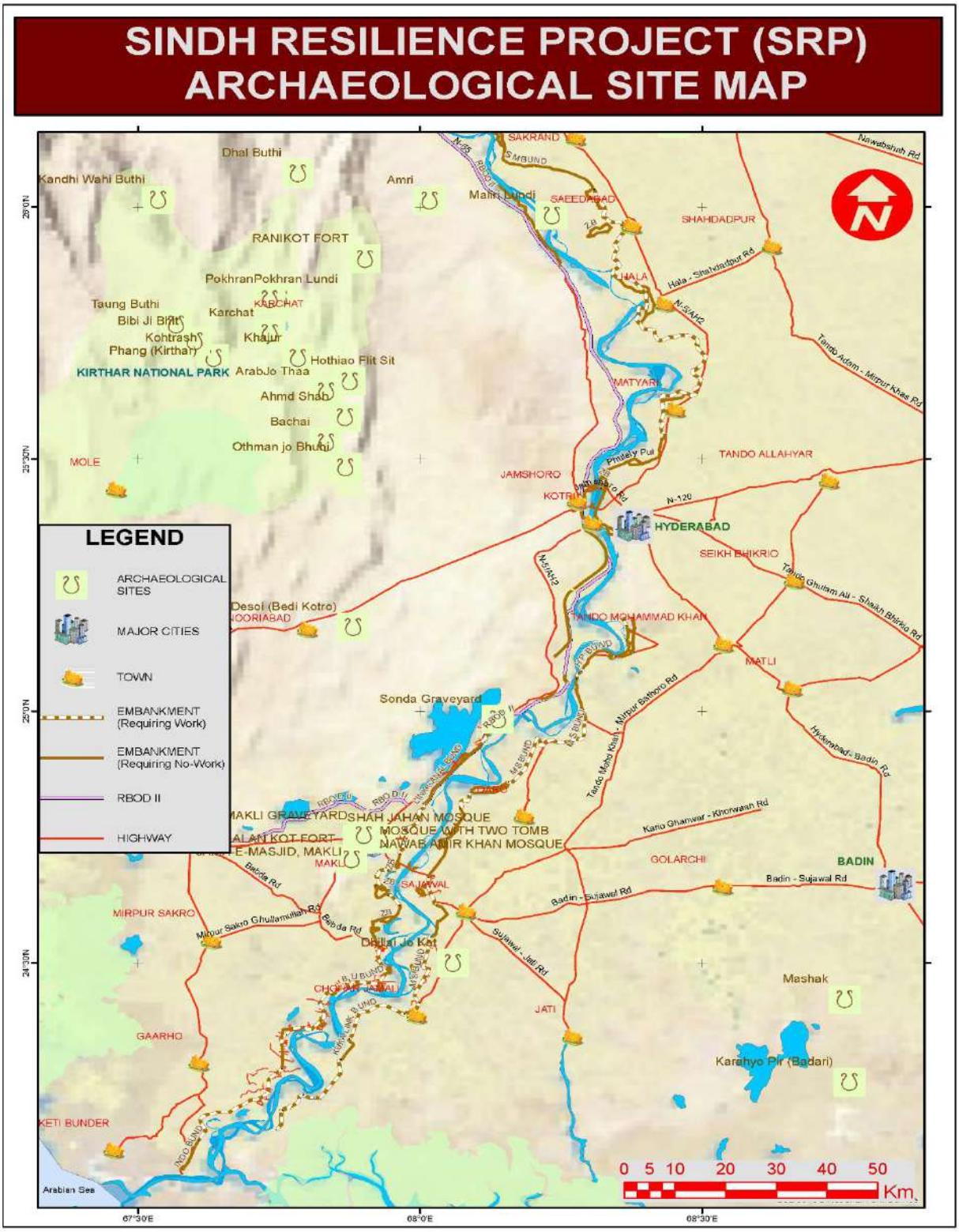

Figure 21: Archaeological Map of the Subproject Area

5. STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

5.1. Consultation

This Chapter 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.

5.2. 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 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 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 Irrigation department, Fisheries department, Consulting firm, SIDA, Education department, forest department, and NGOs participated in dialogue.

5.3. Community Consultation for Sub-projects

Consultation was carried out during field visits conducted on 16/03/2016 to 06/04/2016. Field team comprising staff of ACE (Pvt) Ltd 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 their welfare. Team assured them that the sub-project will not damage any structures or crops rather it will get them out from droughts. Team told that execution of subproject will ensure welfare of human lives as well livestock.

Moreover, another round of consultation was undertaken in January 2018, in which validation of data and signing of community resolution regarding land ownership was carried out. 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 dams would also protect their houses, agriculture lands and other livelihood assets from the damages of flash floods.

List of villages visited during 2nd round of consultations

S#	Name of Village	Date	No of Participants
1	**Aripir Dam**		
	Mubarak	31/1/2018	11
2	**Karmatiani Dam**		
	Haji Jokio Goth	2/1/2018	7
3	**Konkar Dam**		
	Konkar Goth	2/1/2018	12
4	**Jhungshahi Dam**		
	Village Malmari	17/1/2018	10
5	**Subosan dam**		
	Sabusan Goth	16/1/2018	10
6	**Sankar dam**		
	Sankar Goth	16/1/2018	10

Figure 22: Consultation with Residents of Sabusan Village at Sabusan Dam

Figure 23: Consultation with Residents of Mubarak Village at Aripir Dam

The respondents were asked about the sub-project benefits to the surroundings villages. They were of the view that construction of dams will store the rain water for them and recharge the ground aquifer in the surroundings villages. In future they will not go far away to fetch drinking water. Most of the community members were familiar with the sub-project and they were in touch with the staff of Irrigation Department for its timely completion to avoid further shortage of water. As all sub-project activities will be carried out in the Government owned land no structures will be demolished or relocated. Hence, no physical resettlement is involved.

The main focus of consultation with local community was on discussion and village meetings. Respondents from nearby villages took part in discussion. Planned meetings with the beneficiaries of the subproject were arranged at different villages of the dam sub-projects. The participants and the stakeholders were briefed about the subproject objectives and scope as per World Bank policies and guidelines on social and environmental safeguard. List of villages and number of participants during field visit of the sub-projects is given in Table-28.

Table 28: List of Villages visited during field visits of the sub-projects

S#	Name of Village	Date	No of Participants
A	**Aripir Dam**		
1	Mubarak	18/03/2016	10
2	Patho Khan Goth	18/03/2016	10
3	Allah Juraio Goth	18/03/2016	10
4	Yaqoob Goth	18/03/2016	10
B	**Karmatiani Dam**		
1	Haji Jokio Goth	17/03/2016	6
2	Malang Goth	17/03/2016	6
C	**Konkar Dam**		
1	Konkar Goth	16/03/2016	7
2	Yar Mohammad Goth	16/03/2016	7
D	**Jhungshahi Dam**		
1	Village Malmari	20/03/2016	4
2	Goth Arbab	20/03/2016	4
3	Goth Ali Mohammad	20/03/2016	4
E	**Subosan dam**		
1	Subosan Goth	06/04/2016	10
F	**Sankar dam**		
1	Sankar Goth	06/04/2016	8

During impact assessment survey, consultations with women were also conducted by female sociologist with women of all ages in a separate rooms where local males were discouraged from attending. Meetings were conducted in local language (Sindhi language). 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.

Figure 24: Female Sociologist while consultation with Women of Sankar Dam

They were informed that with the successful completion of these sub-projects, 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. List of female respondents which were consulted and interviewed during field visit of the subprojects is given in Table-29.

Table 29: List of Villages and Number of participants visited by Female Sociologist

S#	Name of Village	Date	No of Participants
A	**Aripir Dam**		
1	Mubarak	20/03/2016	12
2	Patho Khan Goth	20/03/2016	11
3	Allah Juraio Goth	20/03/2016	09
4	Yaqoob Goth	20/03/2016	14
B	**Karmatiani Dam**		
1	Haji Jokio Goth	19/03/2016	09
2	Malang Goth	19/03/2016	11

C	**Konkar Dam**		
1	Konkar Goth	18/03/2016	12
2	Yar Mohammad Goth	18/03/2016	10
D	**Jhungshahi Dam**		
1	Village Malmari	23/10/2017	13
2	Goth Arbab	23/10/2017	14
3	Goth Ali Mohammad	23/10/2017	10
E	**Sabusan dam**		
1	Sabusan Goth	11/04/2016	08
F	**Sankar dam**		
1	Sankar Goth	10/04/2016	11

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 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 are as follows.

Comments / Observations	Actions / Responses
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
Participants from the village Mallari were of the concerns that Dams should be built after deep and intensive cared survey, as they have earlier bitter experience of Mula dam in nearby vicinity.	Participants were briefed by Consultant's Geologist, Sociologist and Environmentalist that before construction activity, a detailed Geological survey will be carried out to check the feasibility of Dam, its engineering parameters and also we are here to meet the beneficiaries of Dam to make it successful project.

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.

5.4. Information Disclosure

As disclosure requirement, the Environmental and Social Management Framework (ESMF), prepared by ACE (Pvt) Ltd has been uploaded on the Irrigation Department website, while whole document of Environmental and Social Management Plan (ESMP) of the reported sub-projects will be translated into Urdu, after approval from the Wold Bank same will also be uploaded on the Website of Irrigation Department.

6. 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 Kohistan 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.

6.1. Objectives

6.1.1. 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.

6.1.2. 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:

6.1.3. Health and Safety of Community and Construction Staff/Workers

During construction stage of small dams there shall be impacts to the health and safety 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.

6.1.4. Health and Safety Related Mitigations.

All works (including construction of new access routes) 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 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 contactor 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;
- He will provide a traffic man at appropriate places particularly near settlements to control traffic;
- Provision of speed breakers at appropriate places in consultation with/approval of the Engineer which should be removed after completion of the project;
- Obey speed limits;
- The Contractor will arrange a rescue team and first-aid facility in case of any accident;
- 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.

6.1.5. Noise Pollution

During 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.

6.1.6. 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.

6.1.7. 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.

6.1.8. Air related Impacts Mitigation

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;
- Planting rapidly growing trees, shrubs and grasses in the Project Area;
- 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;

6.1.9. 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 ben 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 the 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 blasting, 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-30.

Table 30: 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**

As there is no major population of plants, animal habitats, fish fauna and reptile animals in the reservoir area, so there would no major effect on them. After the construction of the bunds, a positive impact on plants, animal habitats, fish fauna and reptile animals in the reservoir area are anticipated. It is expected that reservoirs would retain water for ten to twelve weeks. The

reservoir areas would turn into fishing ponds, which would be a good source for income for local population and also prove to be a picnic spot.

- **Impact on Command/Lower Riparian**

The dams in Kohistan area, i.e. Jungshahi, Konkar, Karmatiani and Aripir will be constructed on well-defined nais (rivers) with following values of mean annual flow and reservoir capacity:

Dam	Reservoir Capacity (Ac.ft)	Mean Annual Flow (Ac.ft)	Ratio of Reservoir Capacity against Mean Annual Flow (%)
Aripir	218	4817	4.5
Karmatiani	33	5114	0.8
Konkar	32	1348	2.4
Jungshahi	341	6809	5.0

From above table it can be noted that the size of reservoirs as compared to mean annual inflow in the rivers is negligible (varying between 0.8% to 5.0%). Thus there will be negligible impact on downstream flows, as about 95 to 99.2% flows will pass over the spillway of each dam.

On the other hand the two dams in Nagarparkar area have appreciable sizes of reservoirs as compared to mean annual inflows as given below:

Dam	Reservoir Capacity (Ac.ft)	Mean Annual Flow (Ac.ft)	Ratio of Reservoir Capacity against Mean Annual Flow (%)
Sabusan	456	1149	40
Sankar	1003	904	111
Total	1459	2053	--

It may be noted that Sankar dam will be storing 100% of the mean annual flows and Sabusan Dam will be storing about 40 % of the mean annual flows. However it may be noted that these dams will be constructed at the tail ends of nais (small rivers) just before their drop into the salty marshes of Rann of Kutch. Thus these dams will harvest (store) the rain water before it is released into salty marshes.

The parts of Rann of Kutch in Nagarparkar area receive their fresh water 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 natural drainage pattern is shown in Figure-25. The total catchment area is spread on 1810 sq.-miles. The total catchment areas for the two sub-projects of Nagarparkar is 9.13 given in Table-3 chapter-2.

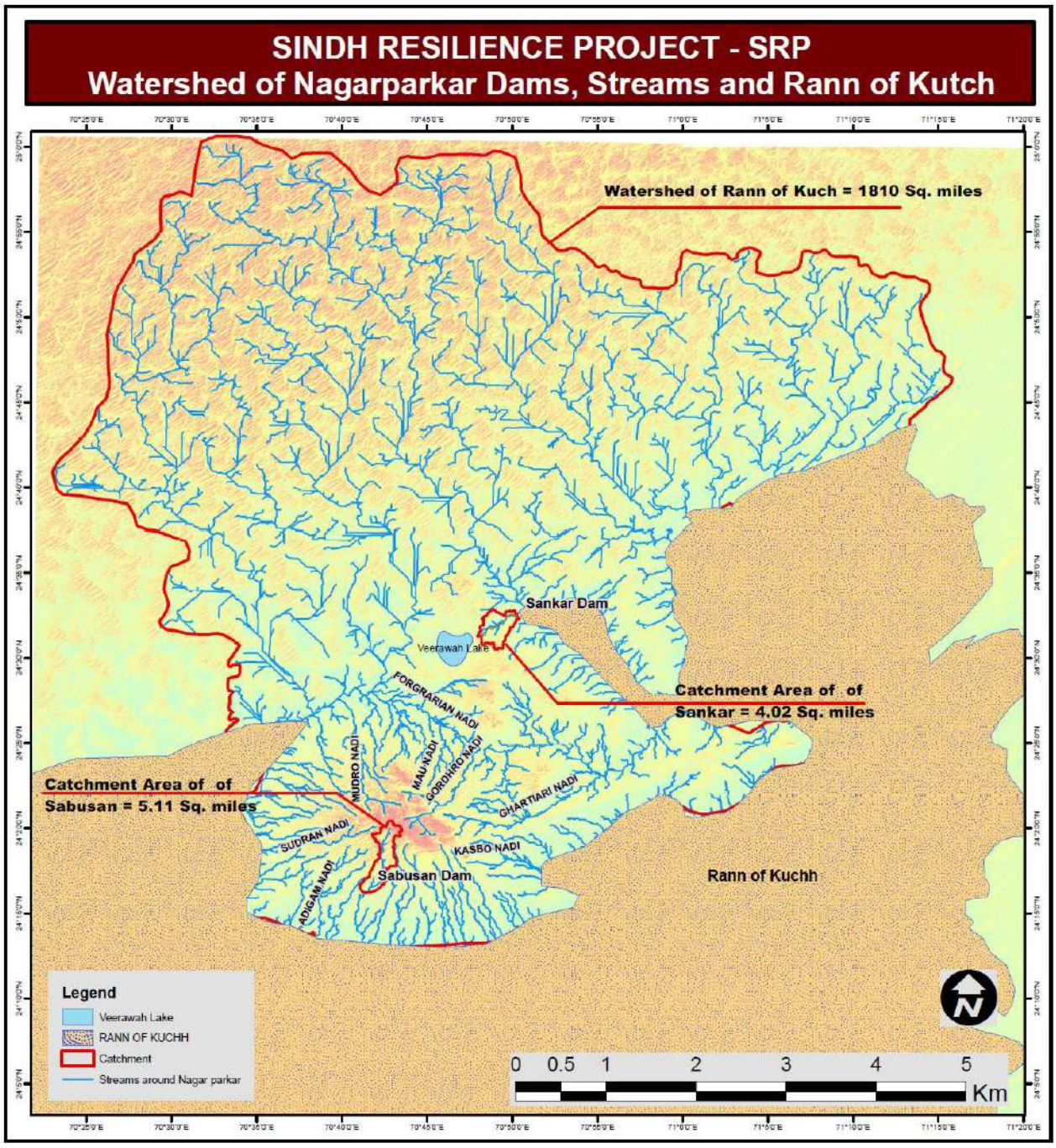

Figure 25: Watershed of Nagarparkar Dams, streams and Rann of Kutch

As the catchment area of dams is only 0.50% of the total watershed area of the marshy lands of Runn of Kutch in project vicinity. These two dams will harvest annually a flows of about 1459 Ac-ft. out of total inflows of 320,000 Ac-ft. which is only 0.45%.

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-projects 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.

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, however, the command area and lower riparian will directly benefit by getting perennial ground water supplies for irrigation and drinking purposes. It will bring revolutionary improvement of the ecosystem in the area creating new croplands and enhancing the yields of the existing crop fields. In addition the livestock of the area would benefit since there would be enough water and food.

6.1.10. Water Related Mitigations

The most important mitigation is to ensure that local drinking water supplies are not in any way worsened during the life of the contract. The local villages will continue getting their drinking water from multiple sources such as dug wells, ponds ditches etc. However, wells are the main source for drinking water in the sub-projects area, so it should not be affected by contractor activities near the dam sites.The Contractor shall make his own arrangements for supply of water for the purposes of Works.

The contractor must provide the following facilities at each camp site: 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 waste water collection facilities
- Collection drains and oil interceptors.
- Regular monitoring of water quality shall be carried out by the PISSC and ESMU of PMT.
- 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.

6.2. 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 a number of directly related positive impacts and benefits as briefed.

6.2.1. Agricultural Improvement and Crop Production

After the successfully completion of the sub-projects with the availability of ground water and irrigation water there will be improvement in the cropping pattern by the increasing intensities/required plant population compared to the present intensities/plant population. The crop production/yield will increase in terms of variety and quantity.

6.2.2. Income and Employment

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

6.2.3. Land and Property Value

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

6.2.4. 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.

6.2.5. 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.

6.2.6. Development of Roads

For the transportation of construction material, equipment and heavy machinery the existing Motorway (M-9) from Karachi to Hyderabad and 15-20 km link roads from Motorway will be used for Karmatiani, Konkar and Aaripir sites. While National Highway (N-5) Karachi to Nagarparkar via Thatta and Badin and from Nagarparkar to dam site in a radius of 7 to 20 Kms will be used for Nagarparkar dam sites. No road therefore required to be constructed for accessibility of the dam-site.

6.2.7. 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.

6.2.8. Biodiversity

A detailed baseline of the main habitats and mammals, reptiles, amphibians and birds present in the project area in given in Chapter-3.

Temporary impacts during the construction of the dams on wildlife (small reptiles and some birds losing their dwellings etc) are envisaged. However, since a number of locations exist in the nearby area where the wildlife can shift, no negative impacts are foreseen. After the creation of reservoirs diverse wildlife including migratory birds may be attracted.

6.2.9. 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 accumulation of silt in the reservoir resulting the effective life of the dams. Proper watershed management is, therefore, required in the catchment area.

6.2.10. 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.

6.2.11. 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.

6.2.12. Water Related Mitigation

The impact on the environment due to the excessive use of water for construction and other purposes will be mitigated by adopting the following measures.

- Proper collection and disposal of water used for construction (to be contractor's responsibility).

- Sewage treatment facilities to be provided to treat the waste water from construction camps and other sanitary appliances (to be contractor's responsibility).
- Diesel, oil and lubricants should be properly stored in accordance with the petroleum regulations. This will be the responsibility of contractor.

6.2.13. 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. 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. Due to their interaction with skilled labor, their skills would be developed for future development activities of this kind and also would be absorbed during operation stage.

iii) Life Style and Culture

During the construction stage considerable cross cultural linkages will be expected to be developed between the local population and the visitors, which would lead to cultural transfusion and learning from each other. During the operation stage due to provision of social amenities like roads, water supply etc. the living standard of the population of the area will be improved.

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, the communities of targeted command area would get perennial flow. It would result in change of cropping pattern and the farming communities will grow cash crops instead of their traditional and uncertain field crops due to unreliable flood flow.

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 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 flood water of the river go waste without its efficient use into the Rann of Kutch.

After the construction of dams the whole target area would get the perennial flow and there would be no issue of conflicts over water use.

7. GRIEVANCE REDRESS MECHANISM (GRM)

It is proposed to establish the following 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.

7.1 Public Complaints Center

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, email address will be disseminated to the people through displays at the respective offices of the DC Malir, Jamshoro, Thatta 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 Malir, Jamshoro, Thatta 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.

7.2 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 Specialist of PMT, Senior Engineer from PMT, Representative of DC office of Malir, Jamshoro 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.

An Environmental and Social Management Unit (ESMU) within PMT will support to Grievance Redress Mechanism (GRM) including Public Complaint Centre (PCC). While, the Project Implementation Consultants (PIC) will also be engaged in the process. The contractor will be responsible for the implementation of the sub-project specific GRM during the construction activities.

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

7.4 Role and Responsibilities of PCC

The responsibilities of the PCC are:

- The PCC will log 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 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.

7.5 GRM Steps and Timeframe

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

- Stage 1: 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;
- Stage 2: If no ad hoc solution can be found, the affected person/s will submit an oral or written complaint to the PCC by themselves or through GRM entry points (the CFP, SDA, 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;
- 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.

7.6 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.

7.7 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 recharging of acquirer.
- Good quality water for drinking thereby elimination of water borne diseases and good health.
- Extra supplies to grow more food crops like bajra, moong dal and vegetables.
- More anticipated income means rise in standard of living.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

8.1 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.

8.2 Institutional Arrangement

8.2.1 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 check lists 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 Environmental and Social Management Plan (ESMP) implementation by 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-26 and described below.

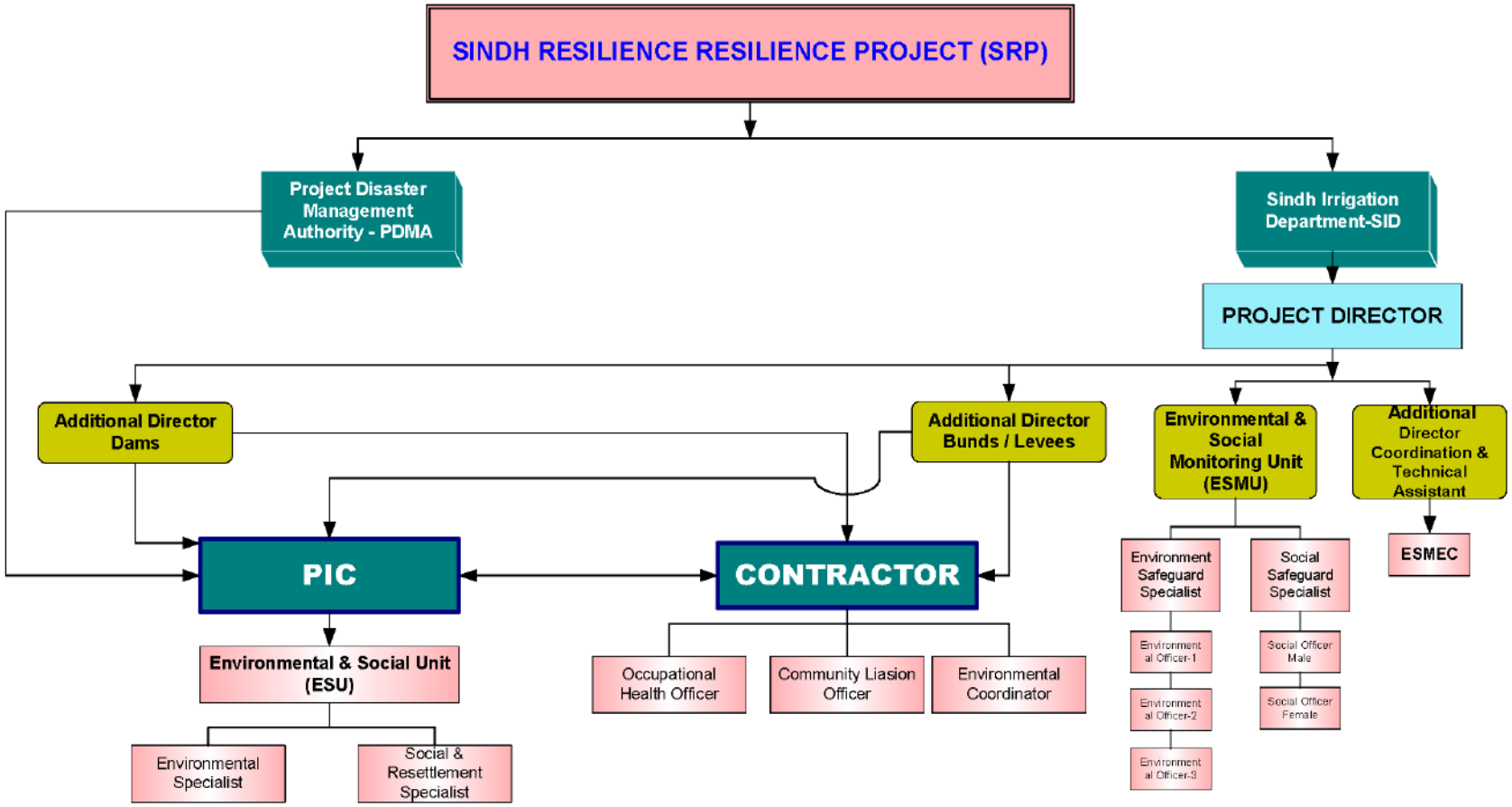

Figure 26: Organizational Chart of Sindh Resilience Project

8.2.2 Project management Team (PMT)

The overall responsibility for the supervision of ESMMP will rest with the Project Management Team (PMT) under Sind 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 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.

8.2.3 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.

8.2.4 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 have environmental and social experts and shall carryout intermittent third party monitoring of the project.

8.2.5 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.

8.3 Environmental Code of Practices

The objective of preparation of the Environmental Code of Practices (ECoP) 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 ECoP will be annexed in the general conditions of all the contracts to be carried out under the SRP project.

8.4 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 camp site 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 **Chapter 6**. Once approved by the Engineer and Environment Specialist of PISSC, these documents will become part of the ESMP for the Contract.

8.4.1 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.

8.4.2 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.

8.4.3 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).

8.4.4 Plan for Handling 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).

8.4.5 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.

8.4.6 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-31 given below.

Table 31: Environmental and Social Awareness Training Plan

Areas of Training	Key Aspects to be Covered	Target Group	Frequency	Budget.
Environment, Social and Resettlement	**a.** Environmental and social awareness; **b.** Key environmental and social issues associated with the project and subprojects ESIAs and ESMPs findings; **c.** Subproject monitoring and reporting; **d.** Occupational Health and Safety Issues associated with Construction. **e.** Involuntary resettlement; **f.** Grievance Redress Mechanism implementation **g.** Gender Based Violence (GBV) **h.** Child Labor	PMU, PIC and Contractor staff as well as relevant communities.	Before project/physical works commencement, during construction and after construction.	Total eight trainings are to be conducted throughout the life of sub- projects. Each training will cost about 150,000 rupees. Total Budget is 1,200,000.

8.4.7 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.)

8.4.8 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 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 after care of the saplings/plantation for one year.

8.5 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 **Chapter 8**. Table 33 presents the mitigation and monitoring plan.

8.6 Compliance and Effects Monitoring

PISSC shall carry out monitoring within the subproject area using the monitoring checklists to be prepared on the basis of this mitigation and monitoring plan provided in Table-33.
To aid the monitoring process, the Contractor will complete the following:

- Submit the plans detailed earlier in this Chapter.
- 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 Implementation of various environmental aspects to visiting national and international agencies and representatives of 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 8.1**. Both approaches will be conducted using the monitoring parameters given in Table 33 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 SEMU of PMT during the project implementation.

Box 8.1

(i) Compliance Monitoring:

- Frequency of anti-dust water sprays during construction period;
- Safety at workplaces and working hours during construction;
- Incidence of child labour and disproportionate wages;
- 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);
- Number of local people recruited on project works.
- 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

(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, diarrhea, respiratory ailments during construction phase
- Noise levels (in dBA), monitored at fixed locations and planed schedule during construction
- Extent and degree of functionality of diversion channels to ensure un-interrupted water supply;

8.7 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 a number of steps, relating to 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 such time as 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 cost 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.

8.8 Communication Reporting and Documentation

The following environmental meetings are proposed:

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

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 PISSCs 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 digital camera of the project area in walk through 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 complaints register at the camp site and work places 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 status of the last month's complaints and will be reviewed by PISSC, ESMEC and ESMU of PMT.

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.

8.9 Environmental and Social Management and Monitoring Cost

It is estimated that 56 trees will be felled for the construction of the above mentioned 6 dams. The replanting of 5 times trees to this number would cost Rs 0.82 million rupees @ the rate of Rs 1000 per tree. Adding the cost of Rs. 44,308,440/- budget for the implementation of the ESMP has been allocated. Details are given in Table-32 below.

Table 32: Cost of Environmental / Social Management and Monitoring

Items	Unit Cost	No of Units	Estimated
A. Karmatiani Dam			
Training (Different trainings for 50 persons)	3000	50	150,000
Generators & Construction Machinery Stack +Noise Monitoring	7000	26	1050,000

Items	Unit Cost	No of Units	Estimated
Drinking Water Quality Monitoring (During Const)	10000	12	720000
Workers Communicable Disease Screening Test	10000	50	500,000
Personal Protective Equipment(for 50 persons approx)	3500	50	175,000
Fire Fighting Equipment purchase and refilling	3000	15	45,000
Health & Hygiene	Lump sum	--	150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27000	12	324000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8400
Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300000	12	3600000
Subtotal	**6,722,400**		
Contingency Cost 10%	**672240**		
Total	**7,394,640**		
B. Konkar Dam			
Items	**Unit Cost**	**No of Units**	**Estimated**
Training (Different trainings for 50 persons)	3000	50	150000
Generators & Construction Machinery Stack + Noise Monitoring	7000	26	1,092,000
Drinking Water Quality Monitoring (During Const)	10000	12	720000
Workers Communicable Disease Screening Test	10000	50	500,000
Personal Protective Equipment(for 50 persons approx)	3500	50	175,000
Fire Fighting Equipment purchase and refilling	3000	15	45,000
Health & Hygiene	Lump sum	--	150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27000	12	324000
Ambient Noise Monitoring (Pre-Const, During Const:) at one construction location.	700	12	8400
Environmental, Social and OHS Officer Salaries (One Lac for each person) three different persons will be deputed on site)	300000	12	3600000
Subtotal	**6764400**		
Contingency Cost 10%	**676440**		
Total	**7440840**		
C. Aripir Dam			
Items	**Unit Cost**	**No of Units**	**Estimated**

Items	Unit Cost	No of Units	Estimated
Training (Different trainings for 50 persons)	3000	50	150000
Generators & Construction Machinery Stack + Noise Monitoring	7,000	28	1176,000
Drinking Water Quality Monitoring (During Const)	10000	12	720000
Workers Communicable Disease Screening Test	10,000	50	500,000
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	Lump sum	--	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
Subtotal	**6,848,400**		
Contingency Cost 10%	**684,840**		
Total	**7,533,240**		
D. Jungshahi Dam			
Items	**Unit Cost**	**No of Units**	**Estimated**
Training (Different trainings for 50 persons)	3,000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring	7,000	28	1,176,000
Drinking Water Quality Monitoring (During Const)	10,000	12	720000
Workers Communicable Disease Screening Test	10,000	50	500,000
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	Lump sum	--	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
Subtotal	**6,848,400**		
Contingency Cost 10%	**674,840**		

Items	Unit Cost	No of Units	Estimated
Total		**7,423,240**	
E. Sabusan Dam			
Items	**Unit Cost**	**No of Units**	**Estimated**
Training (Different trainings for 50 persons)	3,000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring	7,000	28	1,176,000
Drinking Water Quality Monitoring (During Const)	10,000	12	720,000
Workers Communicable Disease Screening Test	10,000	50	500,000
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	Lump sum	--	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
Subtotal		**6,848,400**	
Contingency Cost 10%		**684,840**	
Total		**7,533,240**	
F. Sankar Dam			
Items	**Unit Cost**	**No of Units**	**Estimated**
Training (Different trainings for 50 persons)	3,000	50	150,000
Generators & Construction Machinery Stack + Noise Monitoring	7,000	28	1,176,000
Drinking Water Quality Monitoring (During Const)	10000	12	720000
Workers Communicable Disease Screening Test	10,000	50	500,000
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	Lump sum	--	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	300,000		

Items	Unit Cost	No of Units	Estimated
Lac for each person) three different persons will be deputed on site)			
Subtotal	**6,848,400**		
Contingency Cost 10%	**684,840**		
Total	**7,533,240**		
Total of A+B+C+D+E+F	**44,858,440**		
Compensatory Tree Plantation Cost	**280,000**		
Grand Total	**45,138,440**		

Table 33: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

Activity	Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
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. 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.	Camp shall be established at least 500m away from the nearest community; Local hired workforce; Any complaint from the local community. Presence of National Identity card or relevant document	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Child labor				
	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 fire fighting equipment, safe storage of hazardous material, fencing, provision of first aid facilities etc.; Contingency measures	Approved OHS Plan. Evidence of OHS trainings conducted. Accident/Incident reported.	Daily	Execution by contractor Monitoring by PISSC/PMT

Activity	Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		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.			
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 adjoining area; Appropriate arrangements such as usage of concrete base drip pans to avoid spills during fuelling/oil change.	Any spill observed; Availability of sealed containers for used oils and lubricants;	Daily	Execution by contractor Monitoring by CSC/ PIU/SEMU
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).	Daily	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 waste water disposal	Soil and water contamination	No disposal of sewage into adjoining area; Construction of sewage	Inspection to ensure that sewage system is actually	Monthly	Execution by contractor Monitoring by PISSC/PMT

Activity	Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		treatment arrangement such as lined septic tank and collection chamber/ soaking pit;	operating; Photographic record;		
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 housekeeping practices to minimize waste generation.	Covered disposal containers placed at camp; Designated disposal pit available; Visual inspections.	Weekly	Execution by Contractor Monitoring by PISSC/PMT
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.	Weekly	Execution by contractor Monitoring by PISSC/PMT
Restoration of camp area	Low aesthetic value if camp site 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	Preparation and implementation of OHS Plan and Emergency response procedures. Usage of Personal Protective Equipment (PPE); Provision of first aid facilities; Provision of emergency vehicle	Approved OHS Plan. Evidence of OHS trainings conducted. PPE provided and used; First aid facilities provided; Record of injuries/ illness.	Preparation at the start of execution of civil works and monitoring of its implementation on daily basis.	Execution by contractor Monitoring by PISSC/PMT
	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	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	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

Activity	Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		project			
	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 contactor.	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.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Noise from vehicles, compaction rollers, concrete mixers and construction equipment exceeding 75 dB is harmful for receptors.	gine tuning of machinery/equipment; Avoid night time traffic particularly near communities.	els 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; Maintain liaison with communities; Repair of damaged roads.	Vehicles properly maintained; Designated borrow and quarry areas used; No fall of transported material; Damaged road repaired. Evidence of implementation of Traffic Management Plan.	Daily	Execution by contractor Monitoring by PISSC/PMT
	Soil erosion and contamination	ehicle speeds to 30km/h.; Restriction on repair of vehicles and equipment in the field.	g compliance; Log of vehicle and equipment repairs; Soil erosion observed	y	Execution by contractor Monitoring by PISSC/PMT
	Air pollution	Use of machinery and vehicles with	Route maps of vehicle	Daily	Execution by contractor

Activity	Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		properly tuned to avoid the exhaust emissions; Sprinkling of water on site and on routes near communities.	movement; Log of vehicle maintenance.		Monitoring by PISSC/PMT
	Water pollution	Avoiding washing of vehicles along the pond area.	Monitoring compliance; Water quality testing.	Monthly	Implementation by Contractor Monitoring by PISSC/PMT
	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.	Daily	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	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	Daily	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;	Daily	Execution by contractor Monitoring by PISSC/PMT
	Damage to infrastructure	Restoration/ rehabilitation of damaged infrastructure with entire satisfaction of the affected persons.	Visual inspections; Photographic records; Consultations/Interviews, Infrastructure restoration records.	Monthly	Execution by contractor Monitoring by PISSC/PMT
	Noise pollution	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.	Noise levels measured.	Daily	Execution by construction contractor Monitoring by PISSC/PMT

Activity	Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	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;	Weekly	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.	Waste material removed.	End of the rehabilitation works	Execution by contractor Monitoring by PISSC/PMT
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
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.	Daily	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 trees for the first year, after which trees will be handed over to the client.	Survival of trees	Daily	Executing agency Contractor and SID Monitoring by PISSC/PMT

ANNEX I: DAM SITE PHOTOS

Sankar Dam

A View of Sankar Dam Reservoir Area

Another View of Sankar Dam Reservoir Area

Sabusan Dam

A View of Sabusan Dam Dam Site

Another view of Sabusan Dam Dam Site

	
Trees near the Sabusan Dam site	*A view of Dug well near the Sabusan Dam Site*
Konkar Dam	
	
A View of Konkar Dam Dam Site	*Another view of Konkar Dam Dam Site*

	
A View of Vegetation in Konkar Dam Site	*Another View of Vegetation in Konkar Dam Site*
Karmatiani Dam	
	
A View of Karmatiani Dam Site	*Another view of Karmatiani Dam Site*

	
A View of Karmatiani Dam Site	*Another view of Karmatiani Dam Site*
Aripir Dam	
	
A View of Aaripir Dam Site	*Another view of Aaripir Dam Site*

	
A View of Vegetation in Aaripir Dam Site	*Another View of Vegetation in Aaripir Dam Site*
Jungshahi Dam	
	
A View of Jungshahi Dam Site	*Another view of Jungshahi Dam Site*

	
A view of Dug well near the Jungshahi Dam Site	*Aview of Vegetation in Jungshahi Dam Site*

ANNEX-II: WATER AND SOIL QUALITY RESULT RESULTS OF SUB-PROJECT AREA

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science and Technology
DRAINAGE AND RECLAMATION INSTITUTE OF PAKISTAN
DRIP CAMPUS, TANDO QAISER ROAD, TANDO JAM
Post Code No.70060/Tel. No.022-2765331/Fax No.022-2765728
E-mail: driptandojam@gmail.com

SOILANALYSIS TEST REPORT

Client Sample ID	Sabusan Dam	Lab Entry No.	SS/6605/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	14-04-2016
		Reporting Date	19.04.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	1.36
2	pH		8.2
3	Bicarbonate (HCO_3) Meq/l	"	4.5
4	Chloride (Meq/l)	"	6.08
5	Sulfate (Meq/l)	"	3.00
6	Calcium + Magnesium (Meq/l)	"	5.50
7	Sodium (Meq/l)	"	6.90
8	SAR	"	4.16
9	ESP	"	4.653

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
75.8	23.96	0.24	Loamy Sand

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(Mr. Abdul Jabbar)
Asst. Director /Incharge
Soil& Water Testing Lab
DRIP, Tandojam

(Dr. Ghulam Murtaza)
Sr. Research Officer
Incharge WQLab, Karachi

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science and Technology
DRAINAGE AND RECLAMATION INSTITUTE OF PAKISTAN
DRIP CAMPUS, TANDO QAISER ROAD, TANDO JAM
Post Code No.70060/Tel. No.022-2765331/Fax No.022-2765728
E-mail: driptandojam@gmail.com

SOILANALYSIS TEST REPORT

Client Sample ID	Sankarsar Dam	Lab Entry No.	SS/6607/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	14-04-2016
		Reporting Date	19.04.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	3.45
2	pH		7.6
3	Bicarbonate (HCO_3) Meq/l	"	7.0
4	Chloride (Meq/l)	"	15.0
5	Sulfate (Meq/l)	"	12.15
6	Calcium + Magnesium (Meq/l)	"	15.5
7	Sodium (Meq/l)	"	12.78
8	SAR	"	4.60
9	ESP	"	5.23

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
73.8	17.96	8.24	Sandy Loam

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Asst. Director /Incharge
Soil& Water Testing Lab
DRIP, Tandojam

(Dr. Ghulam Murtaza)
Sr. Research Officer
Incharge WQLab, Karachi

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science and Technology
DRAINAGE AND RECLAMATION INSTITUTE OF PAKISTAN
DRIP CAMPUS, TANDO QAISER ROAD, TANDO JAM
Post Code No.70060/Tel. No.022-2765331/Fax No.022-2765728
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SOILANALYSIS TEST REPORT

Client Sample ID	Karamtani Dam	Lab Entry No.	SS/6583/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.2016
		Reporting Date	14.04.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	1.15
2	pH		8.0
3	Bicarbonate (HCO_3) Meq/l	"	2.5
4	Chloride (Meq/l)	"	6.2
5	Sulfate (Meq/l)	"	2.76
6	Calcium + Magnesium (Meq/l)	"	3.6
7	Sodium (Meq/l)	"	6.54
8	SAR	"	4.87
9	ESP	"	5.59

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
84.4	4.0	11.6	Loamy Sand

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Asst. Director /Incharge
Soil& Water Testing Lab
DRIP, Tandojam

(Dr. Ghulam Murtaza)
Sr. Research Officer
Incharge WQLab, Karachi

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science and Technology
DRAINAGE AND RECLAMATION INSTITUTE OF PAKISTAN
DRIP CAMPUS, TANDO QAISER ROAD, TANDO JAM
Post Code No.70060/Tel. No.022-2765331/Fax No.022-2765728
E-mail: driptandojam@gmail.com

SOIL ANALYSIS TEST REPORT

Client Sample ID	Jungshahi Dam	Lab Entry No.	SS/6584/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.2016
		Reporting Date	14.04.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	0.82
2	pH		7.8
3	Bicarbonate (HCO_3) Meq/l	"	2.0
4	Chloride (Meq/l)	"	5.07
5	Sulfate (Meq/l)	"	1.10
6	Calcium + Magnesium (Meq/l)	"	2.8
7	Sodium (Meq/l)	"	4.65
8	SAR	"	3.93
9	ESP	"	4.34

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
86.4	8.0	5.6	Sandy

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Asst. Director /Incharge
Soil& Water Testing Lab
DRIP, Tandojam

(Dr. Ghulam Murtaza)
Sr. Research Officer
Incharge WQLab, Karachi

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science and Technology
DRAINAGE AND RECLAMATION INSTITUTE OF PAKISTAN
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Post Code No.70060/Tel. No.022-2765331/Fax No.022-2765728
E-mail: driptandojam@gmail.com

SOIL ANALYSIS TEST REPORT

Client Sample ID	Konkar Dam	Lab Entry No.	SS/6586/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.2016
		Reporting Date	14.04.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	3.20
2	pH		7.6
3	Bicarbonate (HCO_3) Meq/l	"	5.0
4	Chloride (Meq/l)	"	15.05
5	Sulfate (Meq/l)	"	11.41
6	Calcium + Magnesium (Meq/l)	"	9.9
7	Sodium (Meq/l)	"	19.98
8	SAR	"	8.98
9	ESP	"	10.0

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
76.4	8.0	15.6	Sandy Loam

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Asst. Director /Incharge
Soil& Water Testing Lab
DRIP, Tandojam

(Dr. Ghulam Murtaza)
Sr. Research Officer
Incharge WQLab, Karachi

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science and Technology
DRAINAGE AND RECLAMATION INSTITUTE OF PAKISTAN
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Post Code No.70060/Tel. No.022-2765331/Fax No.022-2765728
E-mail: driptandojam@gmail.com

SOIL ANALYSIS TEST REPORT

Client Sample ID	Ari Pir Dam	Lab Entry No.	SS/6588/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.2016
		Reporting Date	14.04.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	1.35
2	pH		7.4
3	Bicarbonate (HCO_3) Meq/l	"	6.3
4	Chloride (Meq/l)	"	5.0
5	Sulfate (Meq/l)	"	2.05
6	Calcium + Magnesium (Meq/l)	"	7.0
7	Sodium (Meq/l)	"	5.0
8	SAR	"	2.67
9	ESP	"	2.60

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
72.4	20.0	7.6	Sandy Loam

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Asst. Director/Incharge
Soil& Water Testing Lab
DRIP, Tandojam

(Dr. Ghulam Murtaza)
Sr. Research Officer
Incharge WQLab, Karachi

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT

Client Sample ID	Sankarsar Dam, Sankarsar Village	Lab Entry No.	WQL/KHI/5255		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	12.04.16	Reporting Date	19-04-16

Physical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1.	Color	Sensory evaluation	Colorless	Colorless
2.	Odor	Sensory evaluation	Un-objectionable	Un-Objectionable
3.	Taste	Sensory evaluation	Un-objectionable	Objectionable
4.	Conductivity (micro-S/cm)	APHA	NGVS	14390
5.	pH	APHA	6.5-8.5 (WHO)	7.18

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	940
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	144
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	1320
5	Potassium (mg/1)	APHA	12 (EC)	16.7
6	TDS (mg/1)	APHA	1000 (WHO)	9210
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	1.566
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.301
9	Phosphate (PO_4)	APHA	NGVS	0.93
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	0

Waste Water Quality Parameters:

Sr. #	Water Quality Parameter	Unit	Ref. Method	Permissible Limits	Results
1	Dissolved Oxygen (DO)	mg/l	APHA, 20th Edition	No Limit Listed	4.2
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	20
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	170

NGVS No Guideline Value Set **WHO** World Health Organization **APHA** American Public Health Association
EC European Community **PSQCA** Pakistan Standards & Quality Control Authority,**PSI** Pakistan Standards Institution

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Analyst: (Ms. Nazia Sattar)
Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Sankarsar Dam, Sankarsar Village	Lab Entry No.	WQL/KHI/5255		
Client Name & Address	M/S Sindh Resilience Project (SRP)	Receiving Date	12.04.16	Reporting Date	19-04-16

1. Coliforms/ Fecal Coliforms

Parameter	Standard	Media used and Temp.	No. of +ve tubes			Permissible Limits (MPN/100ml)	Results (MPN/100ml)
			0.1	1	10		
Presumptive Coliforms/ 100ml	APHA, 9221, 9222	LTB at 35±0.5 °C	1	4	5	0/100ml	170
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2 °C	0	0	0	0/100ml	0

2. E-Coli

Parameter	Standard	Media used and Temp.	Recommended Value (cfu/100ml)	Results (cfu/100ml)
E- Coli	APHA, 9221B	M-FC at 44.5 °C	0/100ml	0

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Lab. Incharge: (Dr. Ghulam Murtaza)
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PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
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Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT

Client Sample ID	Sabusan Dam, Sabusan Village	Lab Entry No.	WQL/KHI/5252		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	12.04.16	Reporting Date	19-04-16

Physical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1.	Color	Sensory evaluation	Colorless	Colorless
2.	Odor	Sensory evaluation	Un-objectionable	Un-Objectionable
3.	Taste	Sensory evaluation	Un-objectionable	Un-Objectionable
4.	Conductivity (micro-S/cm)	APHA	NGVS	**2290**
5.	pH	APHA	6.5-8.5 (WHO)	**6.94**

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	**350**
2	Carbonate (mg/1)	APHA	NGVS	**Nil**
3	Calcium (mg/1)	APHA	75 (PSI)	**104**
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	**500**
5	Potassium (mg/1)	APHA	12 (EC)	**9.8**
6	TDS (mg/1)	APHA	1000 (WHO)	**1466**
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	**2.366**
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	**0.153**
9	Phosphate (PO_4)	APHA	NGVS	**0.58**
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	**0**

Waste Water Quality Parameters:

Sr. #	Water Quality Parameter	Unit	Ref. Method	Permissible Limits	Results
1	Dissolved Oxygen (DO)	mg/l	APHA, 20th Edition	No Limit Listed	**4.1**
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	**0**
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	**34**

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Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Sabusan Dam, Sabusan Village	Lab Entry No.	WQL/KHI/5252		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	12.04.16	Reporting Date	19-04-16

1. Coliforms/ Fecal Coliforms

Parameter	Standard	Media used and Temp.	No. of +ve tubes			Permissible Limits (MPN/100ml)	Results (MPN/100ml)
			0.1	1	10		
Presumptive Coliforms/ 100ml	APHA, 9221, 9222	LTB at 35 ± 0.5 °C	4	5	5	0/100ml	1600
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44 ± 0.2 °C	2	5	5	0/100ml	500

2. E-Coli

Parameter	Standard	Media used and Temp.	Recommended Value (cfu/100ml)	Results (cfu/100ml)
E- Coli	APHA, 9221B	M-FC at 44.5 °C	0/100ml	80

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Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT

Client Sample ID	Sabusan Dam, Near Dam site	Lab Entry No.	WQL/KHI/5251		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	12.04.16	Reporting Date	19-04-16

Physical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1.	Color	Sensory evaluation	Colorless	Colorless
2.	Odor	Sensory evaluation	Un-objectionable	Un-Objectionable
3.	Taste	Sensory evaluation	Un-objectionable	Un-Objectionable
4.	Conductivity (micro-S/cm)	APHA	NGVS	**1670**
5.	pH	APHA	6.5-8.5 (WHO)	**7.23**

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	**280**
2	Carbonate (mg/1)	APHA	NGVS	**Nil**
3	Calcium (mg/1)	APHA	75 (PSI)	**64**
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	**310**
5	Potassium (mg/1)	APHA	12 (EC)	**4.3**
6	TDS (mg/1)	APHA	1000 (WHO)	**1069**
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	**2.431**
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	**0.016**
9	Phosphate (PO_4)	APHA	NGVS	**0.69**
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	**0**

Waste Water Quality Parameters:

Sr. #	Water Quality Parameter	Unit	Ref. Method	Permissible Limits	Results
1	Dissolved Oxygen (DO)	mg/l	APHA, 20th Edition	No Limit Listed	**3.6**
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	**0**
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	**64**

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Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Sabusan Dam, Near Dam site	Lab Entry No.	WQL/KHI/5251		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	12.04.16	Reporting Date	12.04.16

1. Coliforms/ Fecal Coliforms

Parameter	Standard	Media used and Temp.	No. of +ve tubes			Permissible Limits (MPN/100ml)	Results (MPN/100ml)
			0.1	1	10		
Presumptive Coliforms/ 100ml	APHA, 9221, 9222	LTB at 35±0.5 °C	2	5	5	0/100ml	500
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2 °C	0	2	5	0/100ml	50

2. E-Coli

Parameter	Standard	Media used and Temp.	Recommended Value (cfu/100ml)	Results (cfu/100ml)
E- Coli	APHA, 9221B	M-FC at 44.5 °C	0/100ml	0

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Asst. Sci. Officer

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Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT

Client Sample ID	Konkar Dam, Village Konkar	Lab Entry No.	WQL/KHI/5246		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	14-04-16

Physical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1.	Color	Sensory evaluation	Colorless	Colorless
2.	Odor	Sensory evaluation	Un-objectionable	Un-Objectionable
3.	Taste	Sensory evaluation	Un-objectionable	Un-Objectionable
4.	Conductivity (micro-S/cm)	APHA	NGVS	3230
5.	pH	APHA	6.5-8.5 (WHO)	7.54

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	380
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	80
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	490
5	Potassium (mg/1)	APHA	12 (EC)	6.3
6	TDS (mg/1)	APHA	1000 (WHO)	2067
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	0.881
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.026
9	Phosphate (PO_4)	APHA	NGVS	0.77
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	0

Waste Water Quality Parameters:

Sr. #	Water Quality Parameter	Unit	Ref. Method	Permissible Limits	Results
1	Dissolved Oxygen (DO)	mg/l	APHA, 20th Edition	No Limit Listed	3.7
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	0
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	309

NGVS No Guideline Value Set **WHO** World Health Organization **APHA** American Public Health Association
EC European Community **PSQCA** Pakistan Standards & Quality Control Authority,**PSI** Pakistan Standards Institution

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Analyst: (Ms. NaziaSattar)
Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Konkar Dam, Village Konkar	Lab Entry No.	WQL/KHI/5246		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	-04-16

1. Coliforms/ Fecal Coliforms

Parameter	Standard	Media used and Temp.	No. of +ve tubes			Permissible Limits (MPN/100ml)	Results (MPN/100ml)
			0.1	1	10		
Presumptive Coliforms/ 100ml	APHA, 9221, 9222	LTB at 35±0.5°C	3	3	5	0/100ml	170
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2°C	0	1	3	0/100ml	11

2. E-Coli

Parameter	Standard	Media used and Temp.	Recommended Value (cfu/100ml)	Results (cfu/100ml)
E- Coli	APHA, 9221B	M-FC at 44.5°C	0/100ml	0

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Analyst: (Ms. NazjaSattar)
Asst. Sci. Officer

Lab. Incharge: ((Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT

Client Sample ID	Karamtani Dam, Village Haji Malang	Lab Entry No.	WQL/KHI/5245		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	14-04-16

Physical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1.	Color	Sensory evaluation	Colorless	Colorless
2.	Odor	Sensory evaluation	Un-objectionable	Un-Objectionable
3.	Taste	Sensory evaluation	Un-objectionable	Un-Objectionable
4.	Conductivity (micro-S/cm)	APHA	NGVS	2360
5.	pH	APHA	6.5-8.5 (WHO)	6.96

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	250
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	148
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	760
5	Potassium (mg/1)	APHA	12 (EC)	4.5
6	TDS (mg/1)	APHA	1000 (WHO)	1510
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	6.691
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.034
9	Phosphate (PO_4)	APHA	NGVS	0.58
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	0

Waste Water Quality Parameters:

Sr. #	Water Quality Parameter	Unit	Ref. Method	Permissible Limits	Results
1	Dissolved Oxygen (DO)	mg/l	APHA, 20th Edition	No Limit Listed	3.9
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	0
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	152

NGVS No Guideline Value Set **WHO** World Health Organization **APHA** American Public Health Association
EC European Community **PSQCA** Pakistan Standards & Quality Control Authority,**PSI** Pakistan Standards Institution

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Analyst: (Ms. NazlaSattar)
Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Karamtani Dam Village Haji Malang	Lab Entry No.	WQL/KHI/5245		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	14-04-16

1. Coliforms/ Fecal Coliforms

Parameter	Standard	Media used and Temp.	No. of +ve tubes			Permissible Limits (MPN/100ml)	Results (MPN/100ml)
			0.1	1	10		
Presumptive Coliforms/ 100ml	APHA, 9221, 9222	LTB at 35±0.5 °C	2	2	5	0/100ml	90
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2 °C	0	0	0	0/100ml	0

2. E-Coli

Parameter	Standard	Media used and Temp.	Recommended Value (cfu/100ml)	Results (cfu/100ml)
E- Coli	APHA, 9221B	M-FC at 44.5 °C	0/100ml	0

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Analyst: (Ms. NaziaSattar)
Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT

Client Sample ID	Jungshahi Dam, Haji Rohdeen Goth	Lab Entry No.	WQL/KHI/5249		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	-04-16

Physical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1.	Color	Sensory evaluation	Colorless	Colored
2.	Odor	Sensory evaluation	Un-objectionable	Un-Objectionable
3.	Taste	Sensory evaluation	Un-objectionable	Un-Objectionable
4.	Conductivity (micro-S/cm)	APHA	NGVS	457
5.	pH	APHA	6.5-8.5 (WHO)	7.45

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	160
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	40
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	180
5	Potassium (mg/1)	APHA	12 (EC)	4.3
6	TDS (mg/1)	APHA	1000 (WHO)	292
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	1.476
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.024
9	Phosphate (PO_4)	APHA	NGVS	0.26
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	0

Waste Water Quality Parameters:

Sr. #	Water Quality Parameter	Unit	Ref. Method	Permissible Limits	Results
1	Dissolved Oxygen (DO)	mg/l	APHA, 20th Edition	No Limit Listed	4.2
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	0
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	407

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Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Jungshahi Dam, Haji Rohdeen Goth	Lab Entry No.	WQL/KHI/5249		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	-04-16

1. Coliforms/ Fecal Coliforms

Parameter	Standard	Media used and Temp.	No. of +ve tubes			Permissible Limits (MPN/100ml)	Results (MPN/100ml)
			0.1	1	10		
Presumptive Coliforms/ 100ml	APHA, 9221, 9222	LTB at 35±0.5°C	4	4	5	0/100ml	350
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2°C	1	2	5	0/100ml	70

2. E-Coli

Parameter	Standard	Media used and Temp.	Recommended Value (cfu/100ml)	Results (cfu/100ml)
E- Coli	APHA, 9221B	M-FC at 44.5°C	0/100ml	0

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Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
Sr. Research Officer

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES
Ministry of Science & Technology
Water Quality Laboratory,
Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT

Client Sample ID	Ari Pir Dam, Village Mubarak	Lab Entry No.	WQL/KHI/5247		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	-04-16

Physical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1.	Color	Sensory evaluation	Colorless	Colorless
2.	Odor	Sensory evaluation	Un-objectionable	Un-Objectionable
3.	Taste	Sensory evaluation	Un-objectionable	Un-Objectionable
4.	Conductivity (micro-S/cm)	APHA	NGVS	1240
5.	pH	APHA	6.5-8.5 (WHO)	7.42

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	240
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	88
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	470
5	Potassium (mg/1)	APHA	12 (EC)	4.4
6	TDS (mg/1)	APHA	1000 (WHO)	794
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	1.441
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.056
9	Phosphate (PO_4)	APHA	NGVS	0.58
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	0

Waste Water Quality Parameters:

Sr. #	Water Quality Parameter	Unit	Ref. Method	Permissible Limits	Results
1	Dissolved Oxygen (DO)	mg/l	APHA, 20th Edition	No Limit Listed	4.0
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	0
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	261

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Sr. Research Officer

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Ministry of Science & Technology
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Main University Road, Near KW&SB Reservoir, Gulistan-e-Johar,Block-1 Karachi.
Tel # 021-34028062, E-mail: pcrwr.karachi@gmail.com

WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Ari Pir Dam, Village Mubarak	Lab Entry No.	WQL/KHI/5247		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	29.03.16	Reporting Date	-04-16

1. Coliforms/ Fecal Coliforms

Parameter	Standard	Media used and Temp.	No. of +ve tubes			Permissible Limits (MPN/100ml)	Results (MPN/100ml)
			0.1	1	10		
Presumptive Coliforms/ 100ml	APHA, 9221, 9222	LTB at 35 ± 0.5 °C	0	0	0	0/100ml	0
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44 ± 0.2 °C	0	0	0	0/100ml	0

2. E-Coli

Parameter	Standard	Media used and Temp.	Recommended Value (cfu/100ml)	Results (cfu/100ml)
E- Coli	APHA, 9221B	M-FC at 44.5 °C	0/100ml	0

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Asst. Sci. Officer

Lab. Incharge (Dr. Ghulam Murtaza)
Sr. Research Officer

ANNEX-III: ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT QUESTIONNAIRES

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		