ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

DHALL DHORO, GABOL, NAING-II, NALI, QASIM TOK, SURESHI, TIKHO-II, UPPER MOLE-II AND BHANSAR RATHI SMALL DAMS

SINDH RESILIENCE PROJECT (IRRIGATION COMPONENT)

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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 six dams were taken up. In the second year the Govt. of Sindh is planning to construct the nine small rainwater recharge dams. Bhansar Rathi Dam is located in Nagarparkar area of district Tharparkar; while Nali and Qasim Tok are located in Dadu. Furthermore, Dhall Dhoro, Gabol, Naing-II, Sureshi, Tikho-II and Upper Mole-II dams are located in district Jamshoro.

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, fall 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 second phase 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, up to certain acceptable level.

The sub-project areas are located in (i) Kohistan and (ii) Nagarparkar 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 (June-August) and show their capability to be used for crop cultivation. There are hundreds of small catchments and streams emanating from Kohistan hills and drain 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 groundwater for irrigation. The groundwater depth 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 groundwater recharge 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 polls and local human settlements. In Kohistan sub-project area 8 small dams are proposed Upper Mole-II, Sureshi, Tikho-II, Gabol, Dhall Dhoro, Naing-II, Qasim Tok and Nali Dams in Districts Jamshoro and Dadu. In Kohistan region total number of 289 households with 5204 male and female population will be benefited with project intervention.

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

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

The distance travelled by women to fetch water varies from area to area i.e. Tharparkar and Kohistan. For instance in Tharparkar area men and women travel about eight to ten kilometres distance per trip. In Kohistan, they travel about two to three kilometres distance per trip.

The drought of 1998-2002 was the worst drought to hit Pakistan since its existence. In Sindh, Tharparkar was the most affected district. Thousands of acres of crops destroyed and livestock killed. This drought was estimated to have affected about a total of 3.3 million people; hundreds of which died of thirst and starvation and thousands were left homeless. It was also reported that about 30 million livestock were affected, that included approximately 2 million deaths. The availability of milk products and meat either totally vanished or reduced significantly which resulted in malnutrition and poor physical health, especially among children. The prices of livestock and related products also rose sharply because of the limited availability of stock in the area. There was loss of jobs for many people related to farming. The diet patterns of people also changed to one meal a day instead of two. (Source: Analysis of drought coping strategies in strategies in Baluchistan and Sindh provinces, IWMI)

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 are not financing the construction of any water supply channels / and tube wells. The main objectives of construction of small dams is to recharge ground water and is not deliberately designated to promote agriculture activities.

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

The Nagarparkar 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 trees and bushes found in the area. The major water

resource in the area is seasonal precipitation that enables the groundwater recharge and increases the vegetation covers on the top surface and produces wild grass for animal feed. In some parts of the area direct rainfall moisture is utilized for local crop production. The rainfall water drains in different Nais (streams) that ultimately ends up either in sea or further drains to Rann of Kutch area. The major sources of drinking water are the dug wells, and its depth ranges varies from 70 to 80ft in different parts of the Nagarparkar region. The other seasonal source of water is traditional manmade earthen ponds that are made by digging 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 groundwater aquifer. The women folks use to fetch water from an average distance ranging from 8-10 km from their villages from the existing earthen ponds. In the Nagarparkar region 1 small dam Bhansar Rathi is proposed in phase-II of small dams under SRP. This dam is in village Pir Bux Samoon, 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. Due to construction of Bhansar Rathi Dam total number of 460 households with 3,860 male and female population will be benefited with project intervention.

The absence of significant rainfall in the last two to three seasons have triggered drought emergency in the Tharparkar and other arid parts of Sindh Province. As per Sindh drought assessment conducted by FAO and EU in 2017, 100% of the area of Tharparkar was facing severe water scarcity. As of 2018, the situation has become worse due to continuing lack of rainfall in the monsoon season. The national average for rainfall has been -24.4% below average with the Sindh region suffering most, receiving rainfall -69.5% below average. This situation is leading to adverse effects on agricultural and domestic needs of the local communities in the area, further exacerbating the prevalent problems of poverty and child malnutrition. In the district of Tharparkar alone, nine infants have been reported dead during the month of August 2018, while a total of 375 children have died due to malnutrition in 2018. Due to protracted low crop production, the food insecurity and malnutrition issue has further worsened as families are forced to sell the goods that they otherwise would have consumed themselves. Access to clean water has also severely been limited causing water-borne diseases and compromising the health of the residents.
The Pakistan Met Department has predicted no adequate rainfall in the near future meaning that the situation will only worsen with diminishing resources. Crop production will continue to drop while the death of livestock will rise. The health of the community will continue to suffer more as the water and food supplies decline. (Source: http://www.actalliance.org)

No acquisition of any private land is required for these subprojects because nais and nalas (Rainwater Rivers) are the state owned properties. Also no demolition of structures will be involved and no one will be required to be resettled; as subproject areas are lying in the less populated areas and 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 small dam sub-projects involve construction of 10 to 15ft high earthen embankments and concrete structures of spillways. The construction-related impacts such as air pollution, noise and use of community resources can be well mitigated through the proper implementation of the mitigation measures. Moreover, the construction of dam sub projects is not going to change adversely ecological conditions of flora and fauna in the sub project areas significantly. Rather in the long run it would improve ecological conditions. However, mitigation measures recommended in the report would need to be strictly ensured by the contractor during construction period.

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

E&S Safeguard monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be carried out at three levels. At the PMT level, the environment and social specialists will carry out safeguard monitoring to ensure that the mitigation plans are being effectively implemented, and will conduct field visits 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 74 trees will be felled for the construction of the above mentioned 9 dams. The replanting of 5 times trees against the number of cut down trees would cost Rs 370,000 considering the rate of Rs 1,000/- per tree. A separate budget of **Rs. 67,828,160**/- has been allocated for the implementation of the ESMP.

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 Irrigation Component of SRP include: i) rehabilitation / improvement of existing protective earthen embankments along River Indus and ii) construction of small rainwater recharge/storage dams in the water-scarce areas of the province. Six such dams were taken up during the first year of the SRP implementation, while during the second year of the SRP implementation, Govt. of Sindh has planned to construct nine small dams in water scarce districts of the Sindh province which are subject of present document.

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

Dhall Dhoro, Gabol, Naing-II, Nali, Qasim Tok, Sureshi, Tikho-II, and Upper Mole-II Dams are located in Kohistan area of districts Jamshoro and Dadu. While proposed dam of Nagarparkar region is Bhansar Rathi which is located in Taluka Nagarparkar, District Tharparkar.

One Dam in Nagarparkar area will be storage dam, whereas the eight dams in Kohistan area will be ground water recharge dams. The height of these all dams is ranges between 14 to 21 ft. The water from storage dams will be taken directly from reservoirs for drinking and domestic use and drinking of livestock and wild animals. The recharge dams in 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. These dams are not deliberately designated to promote agriculture needs. There will be no temporary or permanent road construction during the project activities to access the site.

The main purpose of the components of each sub-project are 10-15ft high earthen embankments, concrete structures of spillways and construction of a one room building for dam supervision staff. Main activities involved in the construction works include concrete works, obtaining soil from borrow areas and transporting it to the dam site, soil compaction, stone pitching on slopes of embankments and stone riprap apron on upstream and downstream of spillways. The Contractor will also need to establish some temporary facilities as well, including material yard and construction camp for workforce.

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) out of nine proposed dam sites, three sites are falling in Khirthar 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 heat wave in June-July 2015 which caused more than 1200 fatalities from heatstroke and dehydration, mostly in Karachi (the provincial capital).[1]

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

Therefore, Kohistan and Nagarparkar regions are main potential sites in Sindh Province, to construct, small dams, delay action dams, and weirs to retain the runoff generated from storm rainfall.

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

1.4. Sub-Project Categorization

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

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

1.5. Sub project Screening Procedure

The sub-projects screening was performed through a set of checklist in which major environmental issues, storage volume and surface area of the reservoir during surveys, individual checklist were filled and summary of environmental concerns noted during surveys is given below. Checklist of Nine dams is attached as Annexure -

- Total 74 number of trees would be felled by due to all 9 dam construction
- Three dams out of nine dams are located in Khirthar National Park
- No any archaeological site observed near the dam and no any physical cultural resources at or near the proposed dam site is observed which may likely to be affected by construction activities
- No any settlement observed near the all 9 dams proposed sites
- During construction of dams some natural habitats might be disturbed, with negligible impact
- No any forests observed near all dam sites.
- Ambient Air quality, Ambient noise level are within acceptable limits of SEPA standards

1.6. Sub-Project Duration

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

1.7. 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.

1.7.1. 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 was passed by the Provincial Assembly of Sindh on 24th February, 2014 and assented to by the Governor of Sindh on 19th March, 2014 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 are categorized on the basis of storage volume and surface area of the reservoir mentioned in Schedule-I, section - G, subsection-I “Dams and Reservoirs with Storage volume less than 25 million cubic meters of surface area less than 4 sq.-km”. Therefore, all sub-project dams are within limits given in Schedule-I of IEE and EIA Regulations, 2014, so this sub-projects fall under Schedule “I” so it will require an IEE/ESMP. However, an ESMP has been prepared to satisfy the requirements of the World Bank for such type of projects.

Sindh Wildlife Protection Ordinance, 2001

Sindh Wildlife Protection Ordinance 2001, provides for the Preservation, Protection, and Conservation of wildlife resources directly and specifies restrictions on hunting/poaching of wild fauna. As three Dam sites (Upper Mole-II, Sureshi and Tikho-II) are located within Khirthar National Park, for which NOC has been obtained from Sindh Wildlife Department. Copy of NOC is attached as Annexure – V. 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 location map showing three dams in boundary of the Khirthar National Park is attached below;

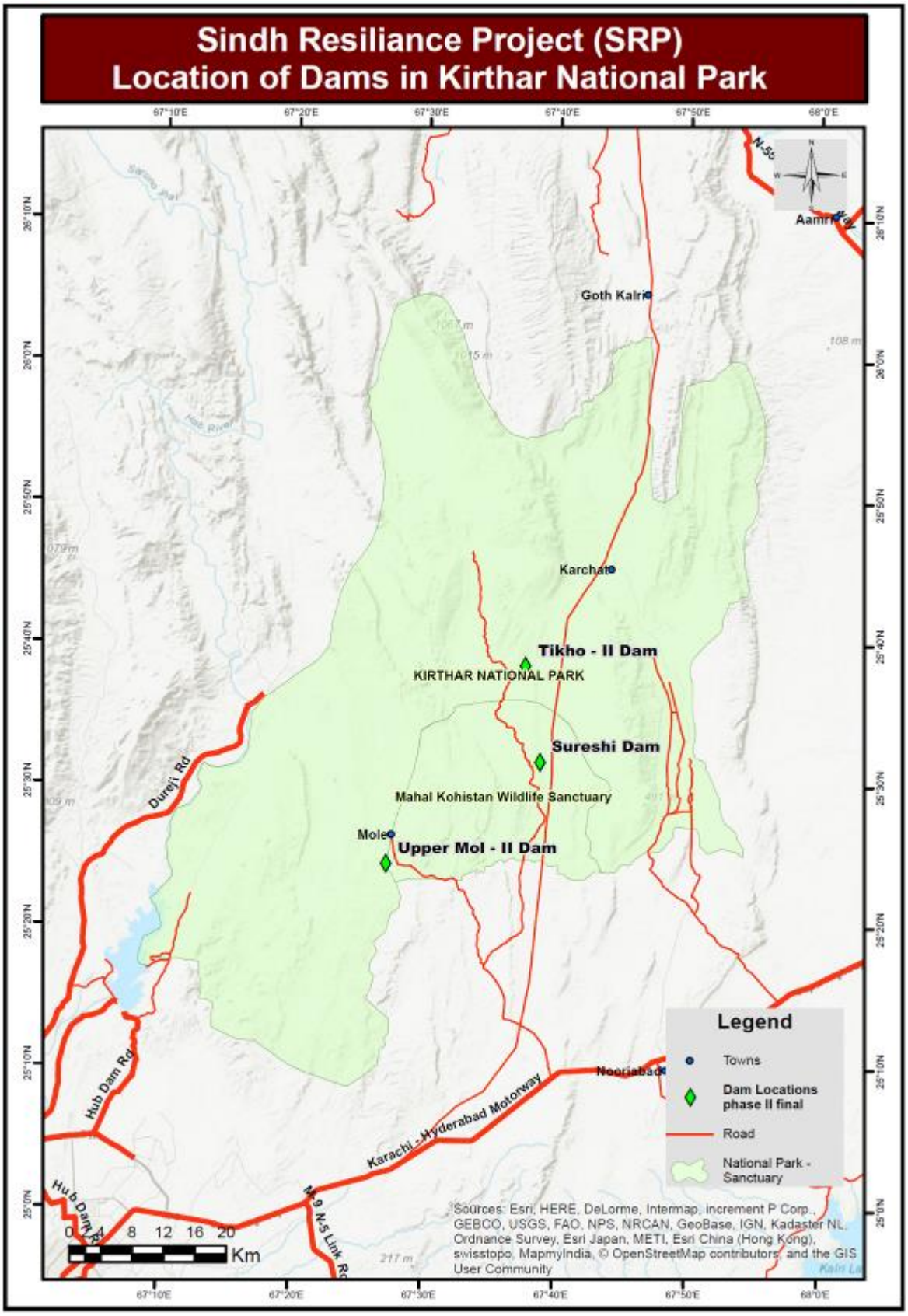


Figure 1: Map showing three dam site within Khirthar National Park boundary

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, 1975

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

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

1.7.2. The World Bank Operational Policies

The World Bank OP 4.01 Environmental Assessment EA. This policy defines the Environmental Assessment (EA) process and various types of 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. However, this OP 4.12 is triggered on overall project and Resettlement Policy Framework (RPF) has been prepared as part of the overall project instruments.

Safety of Dams (OP 4.37): This Policy relates to dam safety, but is equally applicable to reservoirs and ponds. The selected sub-projects are falling under the definition of Small Dams as specified in 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 triggered.
2	Natural Habitats	OP/BP 4.04	✔		The ESMP includes a screening process for the subprojects, some interventions are likely to be carried out within or near important habitats. Therefore; this OP 4.04 is triggered.
3	Involuntary resettlement	OP/BP 4.12	✔		There is no 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 owned land. Therefore; this OP 4.12 is triggered on overall 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/ countries Therefore; this OP 7.50 is triggered on overall project.
5	Safety of Dams	OP/BP 4.37	✔		The selected sub-projects are falling under the definition of Small Dams as specified in the OP 4.37. As part of due diligence and considering that Bank's OP 4.37 applicability, Dam Safety Expert has been engaged by the World Bank to undertake a technical review of sites.

1.8. Compliance with ESMP

This ESMP forms part of the Bid Documents and its compliance is mandatory. The contractor may request amendments in ESMP for aligning it with ground realities and requirements for each 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 Section 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.

1.9. Study Team

This report has utilised the baseline data collected for environmental and social impact assessment carried out under Disaster and Climate Resilience Enhancement Project (DACREP) executed by Irrigation department Government of Sindh (GoS) during 2016. Supplementary field surveys have also been conducted during month of December 2017 and June, 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-PROJECTS

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 height of these all dams is ranges between 14 to 21 ft. One dam in Nagarparkar area will be storage dam, whereas the eight dams in Kohistan area will be groundwater recharge dams. The water from storage dams will be taken directly from reservoirs for drinking and domestic use and drinking of livestock and wild animals The recharge dams in 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 are 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 3,305 of persons from hill torrents and flash flooding. There will be no temporary or permanent road construction during the project activities to access the site

2.2. Location of Sub-projects

The sub-projects are scattered in Tharparkar, Dadu 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, and Dadu Districts. Description of each sub-project is given below.

I. Dhall Dhoro Dam

The Dhall Dhoro Dam is located near village Khairuddin Taluka Sehwan, Ditsrict Jamshoro. The site is approachable by Indus Highway (N-55) up to Sehwan, then Sehwan - Jhangara road. Dhall is about 27km ahead of Jhangara, Sehwan city, District Jamshoro. No any temporary / permanent road would be constructed for approach to

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

dam site. The dam is at the tributary of the Gabol Nai. The coordinates of the site are: 26° 05' 06.84" N, 67° 45' 56.46" E.

II. Gabol Dam

The Gabol Dam is situated near village Khairuddin Gabol, Deh Chorlo. The dam site can be accessed through Indus Highway (N-55) and then Jhangara to Bajara link road. Proposed dam site is about 20 km from Jhangara, U.C Bajara and about 45 km from Sehwan city located in District Jamshoro. No any temporary / permanent road would be constructed for approach to dam site. The dam site is located at co-ordinate 26°04' 47.71" N, 67°45' 17.07" E

III. Naing-II Dam

The Naing-II Dam is situated at village Jalal Noohani. The proposed dam site can be accessed through Indus Highway (N-55) then Jhangara to Bajara link road up to Naing village. The site is about 26km away from Jhangara, and about 44 km from Sehwan city. No any temporary / permanent road would be constructed for approach to dam site. The coordinates of the site are: 26° 14' 31.66" N, 67° 30' 37.96" E.

IV. Nali Dam

The Nali Dam is situated at village Mohammad Ali Jamali. Near U.C Wahi Pandhi. It is approachable from Indus Highway (N-55), from Dadu to Johi main road then through a road connecting Nali at 7 km from Johi. No any temporary / permanent road would be constructed for approach to dam site. The coordinates of the site are: 26°36' 52.29" N, 67° 23' 41.13" E.

V. Qasim Tok Dam

The Qasim Tok Dam is situated at village Muhammad Khan Jamali. It is approachable through Indus Highway (N-55) from Dadu, then Dadu to Johi and Wahi Pandhi main road connecting Qasim Tok at 10 km towards South. No any temporary / permanent road would be constructed for approach to dam site. The coordinates of the site are: 26° 33' 55.20" N, 67° 21' 43.80" E.

VI. Sureshi Dam

Sureshi dam site is located near Goth Nabi Bux Barejo, Tehsil Thano Bula Khan and District Jamshoro. The dam site is about 125 km away Karachi in North. It is approachable through M-9 motorway from Thana Bulla Khan Interchange to Thana Bula Khan main road. It is about 40 Km away from M-9 Motorway in the North-West. No any temporary / permanent road would be constructed for approach to dam site. The dam site is located at co-ordinates: 25º 31' 44.29" N, 67 º 38' 48.39"E.

VII. Tikho-II Dam

Tikho-II dam site is located at 38 km from Esar village and about 147 km away from Karachi in North. It is approachable through M-9 motorway from Thana Bulla Khan

Interchange to Thana Bula Khan main road. It is about 67 Km away from M-9 Motorway in the North-West. No any temporary / permanent road would be constructed for approach to dam site. The dam site is located at co-ordinates: 25° 38' 27.61" N, 67° 37' 36.65"E.

VIII. Upper Mole-II Dam

Upper Mole-II is proposed to be constructed across a non-perennial dry stream - Mole Nai. The dam site is about 80 km away Karachi in North. It is approachable through M-9 motorway from Moll – Sarri Interchange to Moll Link road. It is about 25 Km away from M-9 Motorway in the West. No any temporary / permanent road would be constructed for approach to dam site. The dam site is located at co-ordinates: 25° 25' 19.97" N, 67° 27' 21.64"E.

IX. Bhansar Rathi Dam

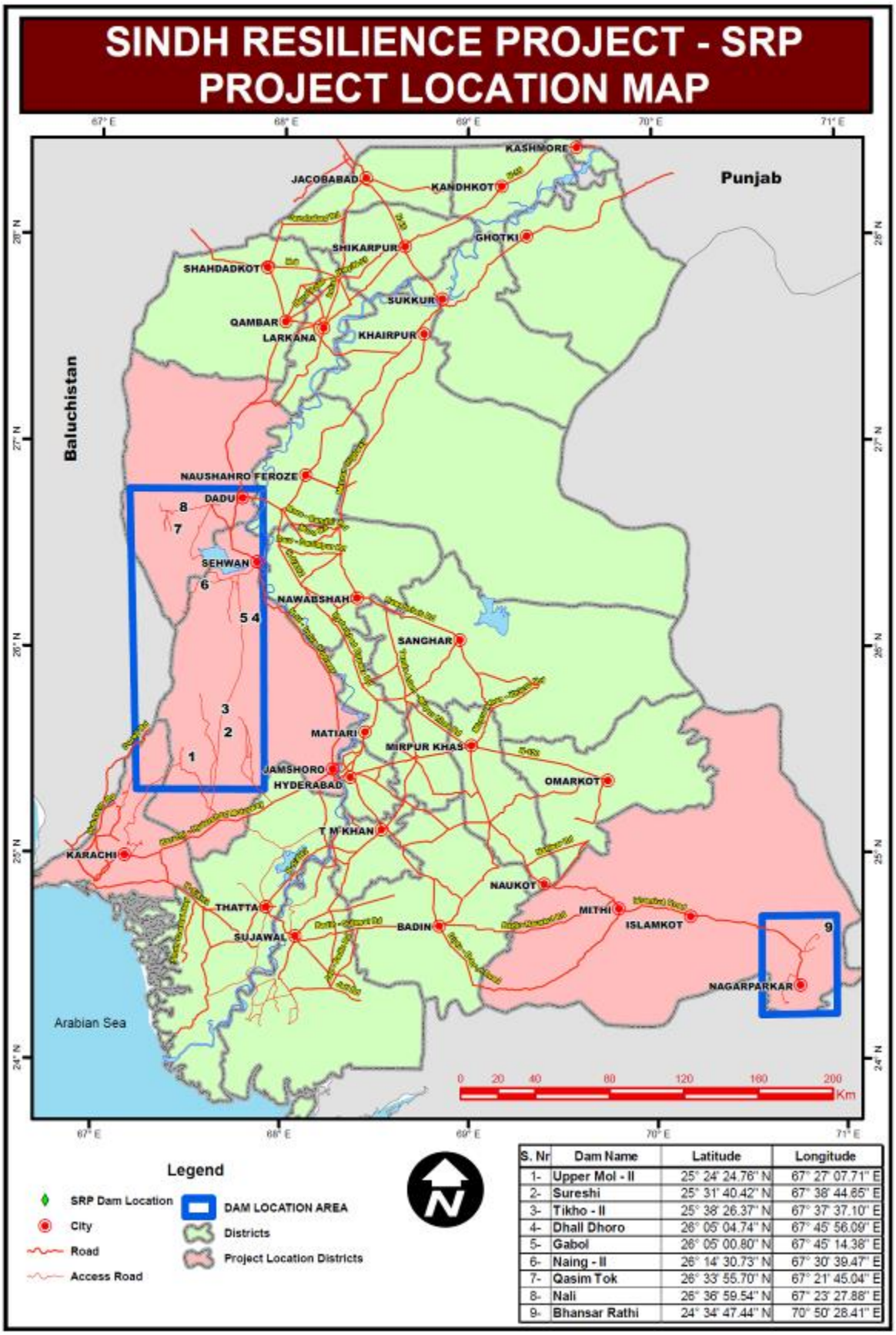
The Dam site can be accessed from Karachi through National Highway (N-5) via Thatta to Nagarparkar main road towards Islamkot. The dam site is about 100 km from Islamkot and 8 km away from Vira wah town. No any temporary / permanent road would be constructed for approach to dam site. The coordinates of the site are: 24° 34' 46.24" N, 70° 50' 29.30" E.

Further details of sub-project area are provided in Table 3 given below.

Table 3: Details of Sub-projects

S.No	Sub-project Name	Village	U.C	Taluka	District
1	Upper Mole-II Dam	Motal Khan	Mole	Nooriabad	Jamshoro
2	Sureshi Dam	Nabi Bux Barejo	Sari	Thana Bola Khan	Jamshoro
3	Tikho-II Dam	Yaqoob Khan	Sari	Thana Bola Khan	Jamshoro
4	Gabol Dam	Gabol	Bajara	Sehwan	Jamshoro
5	Dhall Dhoro Dam	Dhal	Bajara	Sehwan	Jamshoro
6	Naing-II Dam	Nagawal	Bajara	Sehwan	Jamshoro
7	Nali Dam	Mohammad Ali Jamali		Johi	Dadu
8	Qasim Tok Dam	Mureed Jamali		Johi	Dadu
9	Bhansar Rathi Dam	Pir Bux Samoon	Pithapur	Nagarparkar	Tharparkar

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 300 feet up to 35-55 feet. The Sub-project areas are shown in the Figure 2 to 4 given below.



S. Nr	Dam Name	Latitude	Longitude
1-	Upper Mol - II	25° 24' 24.76" N	67° 27' 07.71" E
2-	Sureshi	25° 31' 40.42" N	67° 38' 44.65" E
3-	Tikho - II	25° 38' 26.37" N	67° 37' 37.10" E
4-	Dhall Dhoro	26° 05' 04.74" N	67° 45' 56.09" E
5-	Gabol	26° 05' 00.80" N	67° 45' 14.38" E
6-	Naing - II	26° 14' 30.73" N	67° 30' 39.47" E
7-	Qasim Tok	26° 33' 55.70" N	67° 21' 45.04" E
8-	Nali	26° 36' 59.54" N	67° 23' 27.88" E
9-	Bhansar Rathi	24° 34' 47.44" N	70° 50' 28.41" E

Figure 2: Location of the SRP Project Area

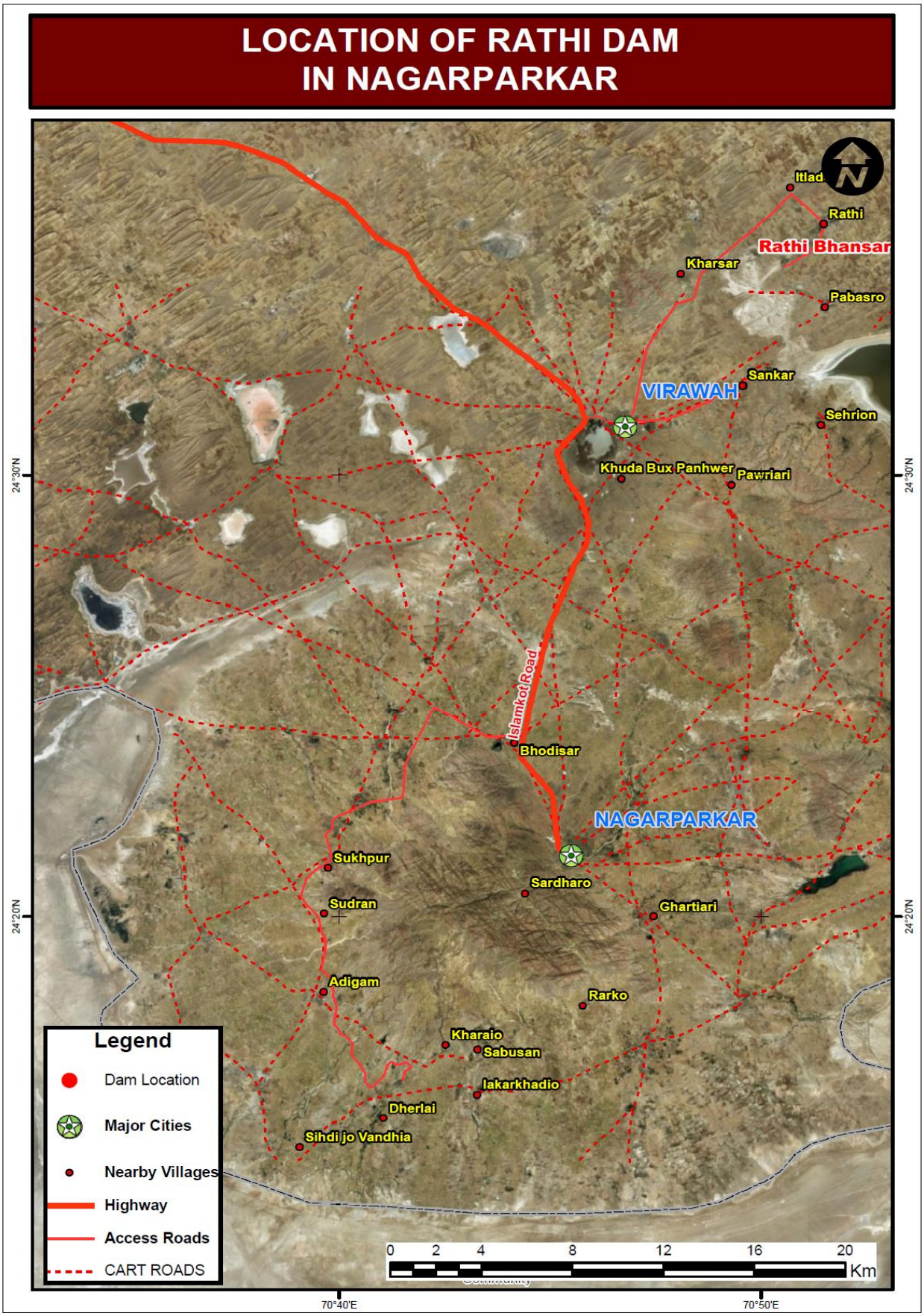


Figure 3: Location Plan of Bhansar Rathi Dam in Tharparkar Region

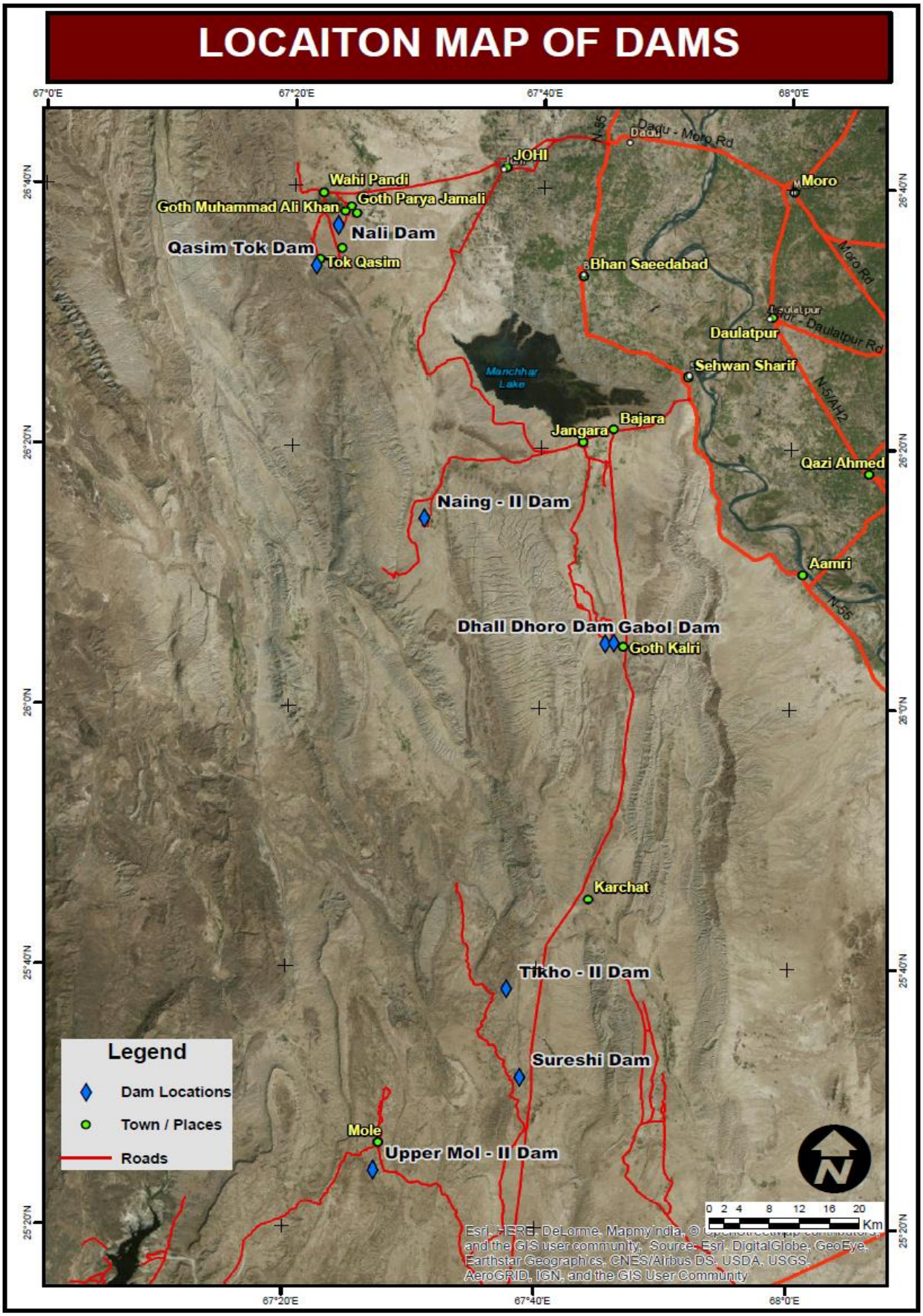


Figure 4: Location Plan of Sub-project of Kohistan Dams

2.3. Sub project Salient Features and Key Statistics

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 one dam in Nagarparkar area will be storage dam, whereas the eight dams in Kohistan area will be groundwater recharge dams. The main objectives of construction of small dams and weirs is to recharge ground water and is not deliberately designated to promote agriculture activities. Salient features of sub projects are given in table-4 below.

Table 4: Salient Features of the Sub-projects

Description		Kohistan Region								Tharparkar Region
		Upper Mole-II Dam	Sureshi Dam	Tikho-II Dam	Dhall Dhoro Dam	Gabol Dam	Naing-II Dam	Nali Dam	Qasim Tok Dam	Bhansar Rathi Dam
Catchment Area (sq.mile)		90.12	7.25	78.66	9.13	69.87	238.84	98.06	4.48	8.46
Design Flood (cfs)		5125	1560	4860	2000	7765	17040	8500	1300	2789
El.of River Bed (ft)		1073	864	785.5	440	438	321	157	176.5	46.5
El.of Spillway Crest (ft)		1083	876	797.5	454	450	335	164	188.5	59.5
Spillway Width (ft)		250	110	240	120	380	540	400	100	140
Head Over Crest (ft)		3	2.34	2.97	2.61	2.99	4	3.07	2.21	2.94
Highest Flood Level (ft)		1086	878.34	800.47	456.61	452.99	339	168.07	190.71	62.44
El.of Dam Crest (ft)		1089	881.4	803.05	159.7	456	342	170.1	194.5	65.5
Dam Height above Riverbed (ft)		16	17.4	18	19.7	18	21	14.1	18	19
Weir height above river bed (ft)		10	12	12	14	12	14	7	12	13
Reservoir area at normal pool level (Acre)		33	30	22	21.2	31.3	45.0	59.1	25.08	410.05
Reservoir Area (Sq.-Km)		0.13	0.12	0.08	0.08	0.12	0.18	0.23	0.10	1.65
Reservoir Area at 100 year flood surcharge level (Acre)		45	42	30	26.3	49.3	90	112.2	357.7	484.07
Reservoir Capacity (Ac-ft)		139	126	116	87	110	226	113	1107	2416
Storage Volume (m-c-m)		0.171	0.15	0.14	0.10	0.13	0.32	0.13	1.36	2.98
Estimated Population to be Affected (In case of Dam Break)	Case 1: Dam Breach only	836	1,887	462	125	28	66	28	3,692	134
	Case 2: Design (100-year) Flood only	64,587	1,799	3,599	3,950	11,120	14,910	13,020	950	122
	Case 3: Combined : Dam Breach + 100 year Flood	65,746	1,997	3,828	4,062	11,136	14,966	13,040	3,942	148
Area to be inundated (In case of Dam Break)	Case 1: Dam Breach only	1.88	2.96	2.11	1.75	0.23	0.20	0.10	5.05	1.27
	Case 2: Design (100-year) Flood only	31.99	2.82	30.76	3.13	16.47	47.37	11.76	1.54	1.12
	Case 3: Combined : Dam Breach + 100 year Flood	33.03	3.91	32.22	4.69	20.91	48.51	13.30	5.54	1.67

Some photos of dam site are shown in Annex-1.

The water from storage dam (Bhansar Rathi dam in Nagarparkar) will be taken directly from reservoir for drinking and domestic use and drinking of livestock and wild animals. The treatment and supply system for villages may be constructed by local government at 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 and livestock 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 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, earth fill embankments and one room building for dam O&M staff. The major activities are briefed below:

i. Contractor's mobilization: After awarding the contract the selected Contractor shall be mobilized in the field and arrange the camp for their staff and labor. The machinery and other necessary equipment shall be shifted.
ii. The concrete structures will be constructed with contraction joints. PVC water stopper shall be provided at these joints.
iii. The borrow areas will be excavated as per specifications. The borrow material will be loaded and transported by tractor trolleys through 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) Fine and coarse filters
c) Toe drain stones
d) Gravel bedding
e) Riprap stones
f) Cement
g) Fine and coarse aggregates

h) Reinforcement
i) Water
j) PVC water stops

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

Table 5: Estimated Quantities of Construction Materials

Dams	Earth work (Cft)		Cement Concrete	Reinforcement	Stones Protection	Filter		PVC Waterstop	Water for Concrete and Earth fill
	Excavation	Fill	(Cft)	(Kg)	(Cft)	Fine (Cft)	Coarse (Cft)	(Rft)	(Cft)
Naing-II	2,288,644	628,676	767,336	477,750	223,131	61,407	47,465	3,486	342,945
Gabol	936,556	427,851	410,728	312,900	225,321	99,106	89,567	2,574	192,701
Nali	1,545,871	416,229	327,286	268,200	213,552	73,279	82,917	2,619	161,082
Qasim Tok	466,797	1,550,927	145,924	129,243	687,027	294,351	190,309	1,188	208,355
Dhall Dhoro	684,896	280,321	187,554	165,470	74,554	37,662	26,980	1,326	96,489
Upper Mole-II	501,233	424,224	259,644	210,504	179,093	154,747	65,247	1,899	137,192
Sureshi	467,783	247,780	154,166	133,240	116,087	68,834	49,436	1,226	81,049
Tikho-II	675,689	187,390	246,274	210,000	77,422	14,202	10,856	1,880	108,629
Bhansar Rathi	1,235,766	3,762,029	227,386	200,204	871,041	612,357	341,613	1,045	459,199
Total	**8,803,235**	**7,925,426**	**2,726,299**	**2,107,510**	**2,667,230**	**1,415,945**	**904,389**	**17,244**	**1,787,642**

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, Dadu and Islamkot. 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 be brought from Karachi.

2.6. Contractor's Camps

For the construction of dams and appurtenant works, camps will be established on the government or private land near the dam sites but must be minimum 500 m away from settlements. In case of private land, a rent agreement will be made between Contractor and Landowner along with 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 6.

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

S.No	Sub-project Name	Co ordinates		Away from Dam site	Land Required
		Northing	Easting		
1	Upper Mole-II	25°25'35.0125"	67°27'34.2739"	1000 Meters right side of dam site.	4 Acers
2	Sureshi	25°31'32.7664"	67°38'51.4971"	300 Meters left side of proposed dam.	4 Acers
3	Tikho-II	25°38'22.1474"	67°37'45.4394"	200 Meters left side downstream proposed dam.	5 Acers
4	Dhall Dhoro	26°05'01.5453"	67°46'00.2339"	800 Meters upstream of dam on right side	4 Acers
5	Gabol	26°04'45.0429"	67°45'06.1327"	150 Meters downstream of dam on right side	3 Acers
6	Naing-II	26°14'40.2334"	67°30'19.0599"	200 Meters upstream of dam site on right side.	4 Acers
7	Nali	26°36'36.3135"	67°22'24.7824"	150 Meters downstream of dam on right side	4 Acers
8	Qasim Tok	26°34'10.0077"	67°21'50.8029"	250 Meters downstream of dam on left side	4 Acers
9	Bhansar Rathi	24°34'19.5281"	70°50'24.1317"	800 Meters downstream of dam on left side	3 Acers

Prospective camp sites location are also shown in below given Figures 5 to 11.

Figure 5: Camp Site and Borrow Area location of Upper Mole-II

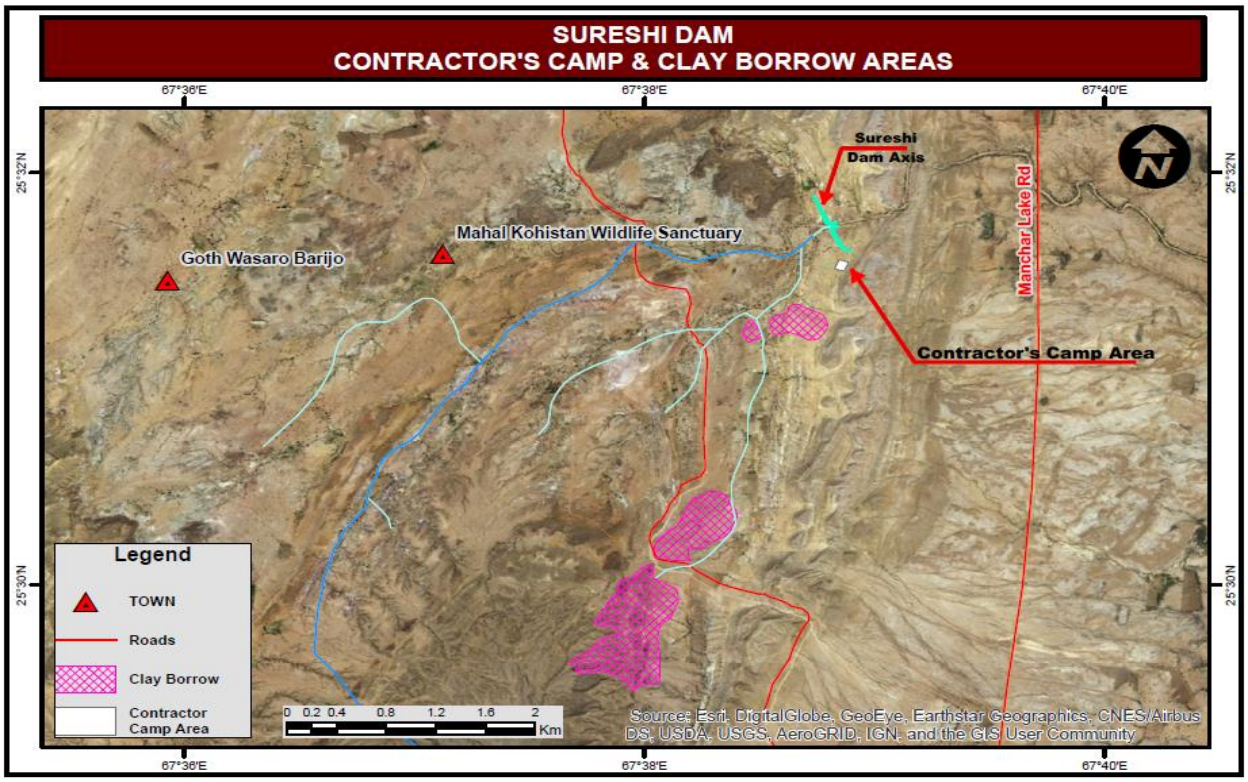


Figure 6: Camp Site and Borrow Area location of Sureshi Dam

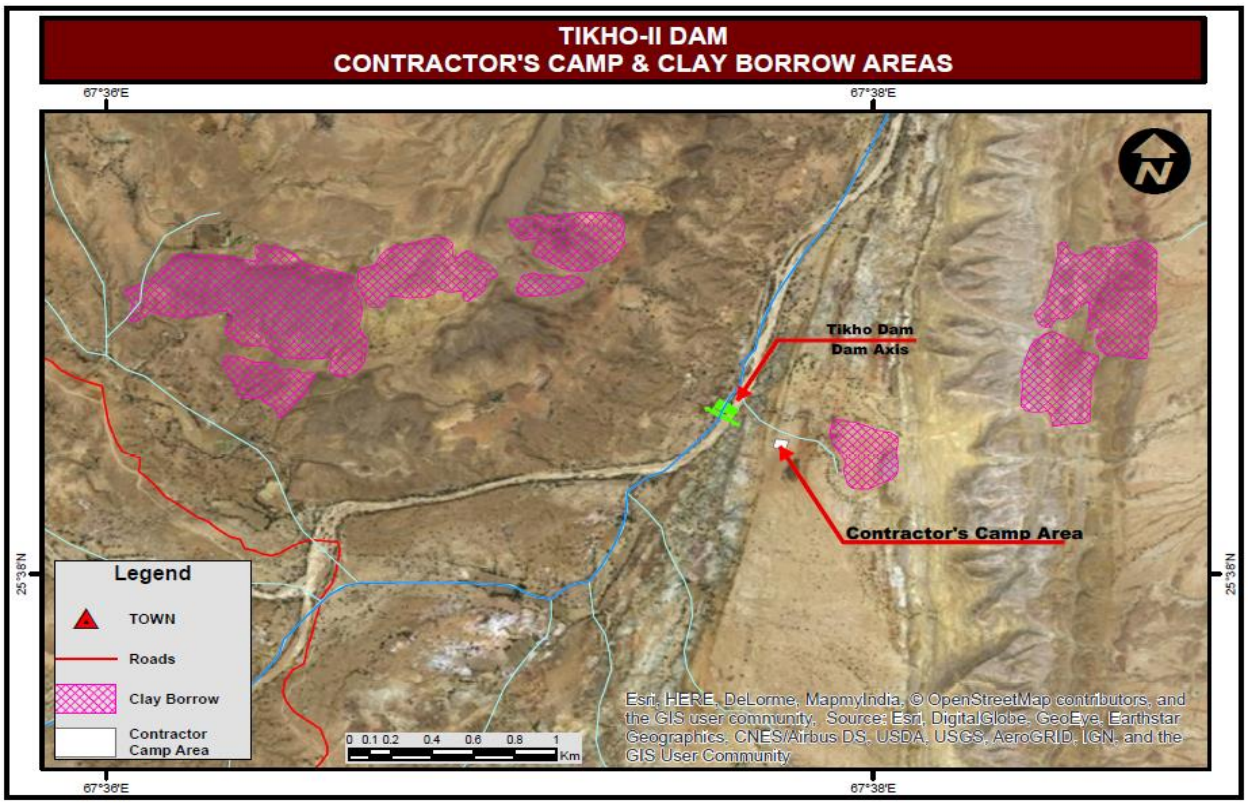


Figure 7: Camp Site and Borrow Area location of Tikho-II Dam.

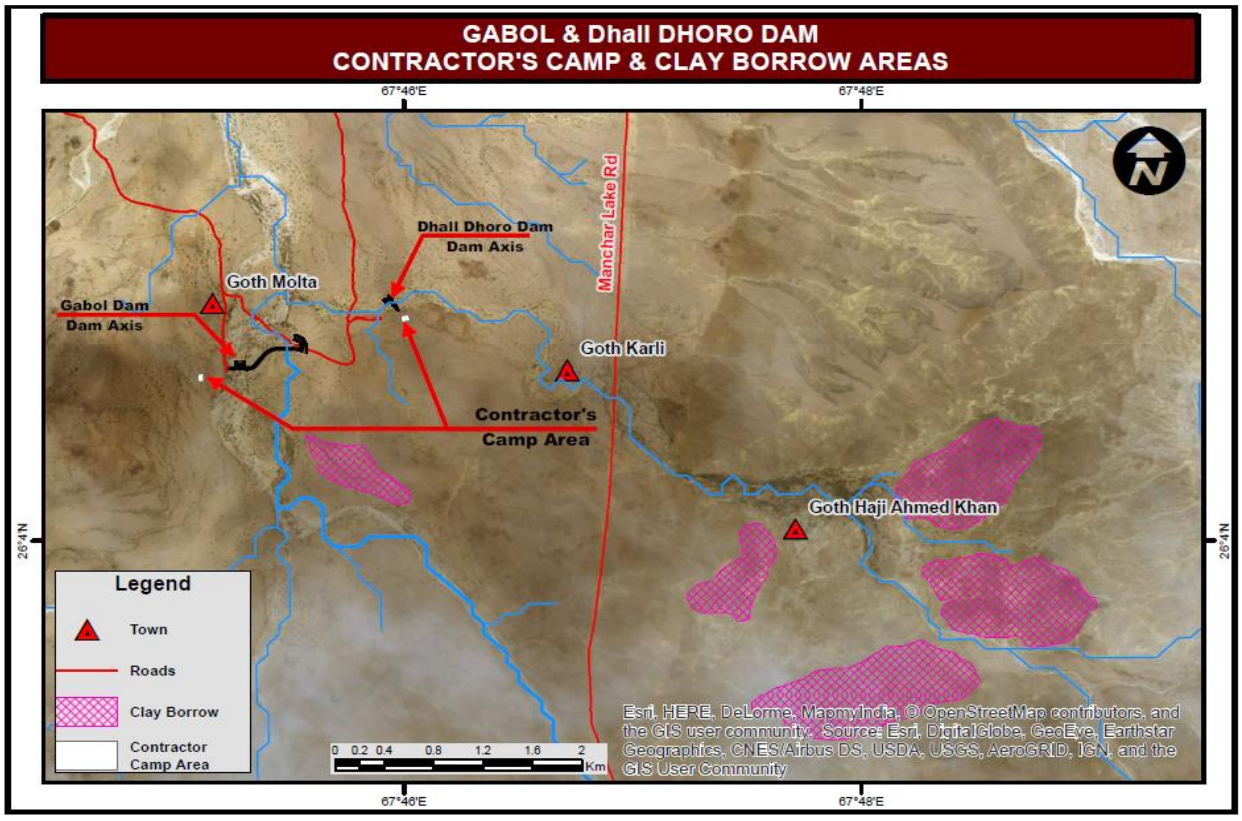


Figure 8: Camp Site and Borrow Area location of Gabol Dams & Dhall Dhoro

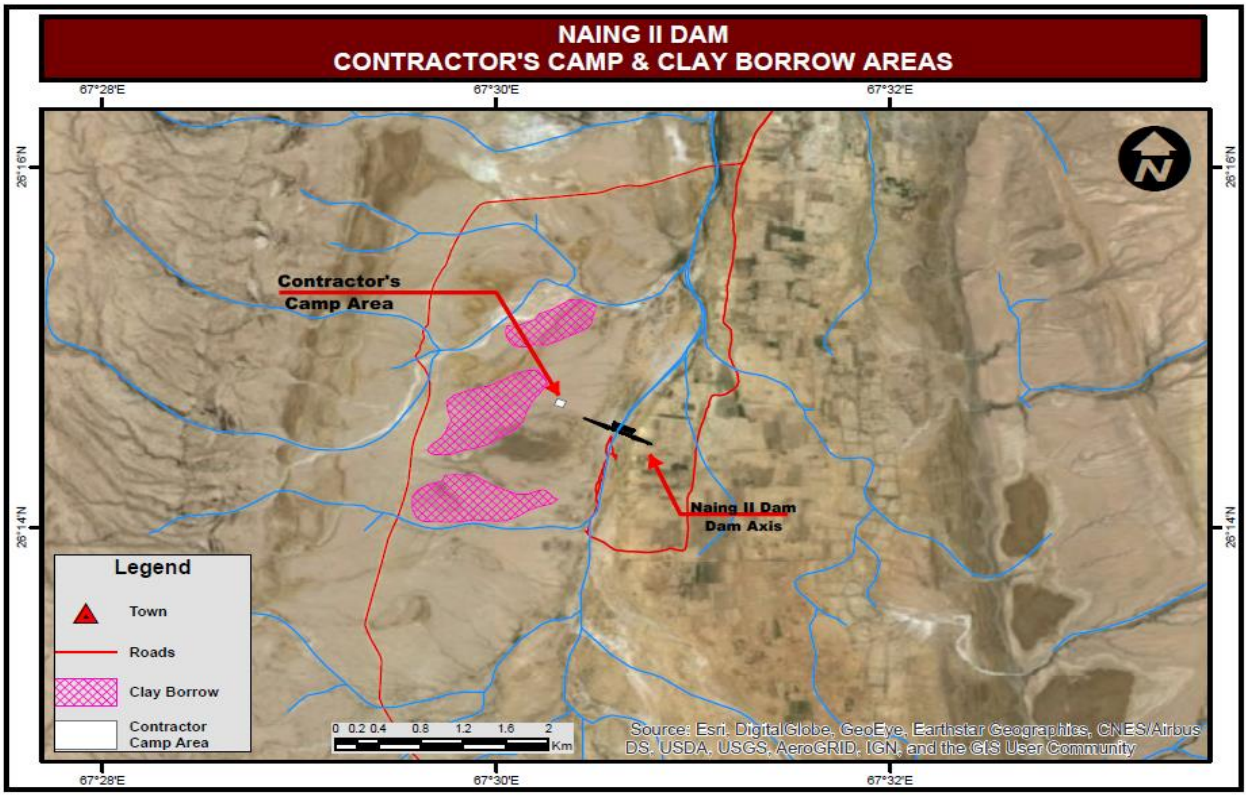


Figure 9: Camp Site and Borrow Area location of Naing-II Dam.

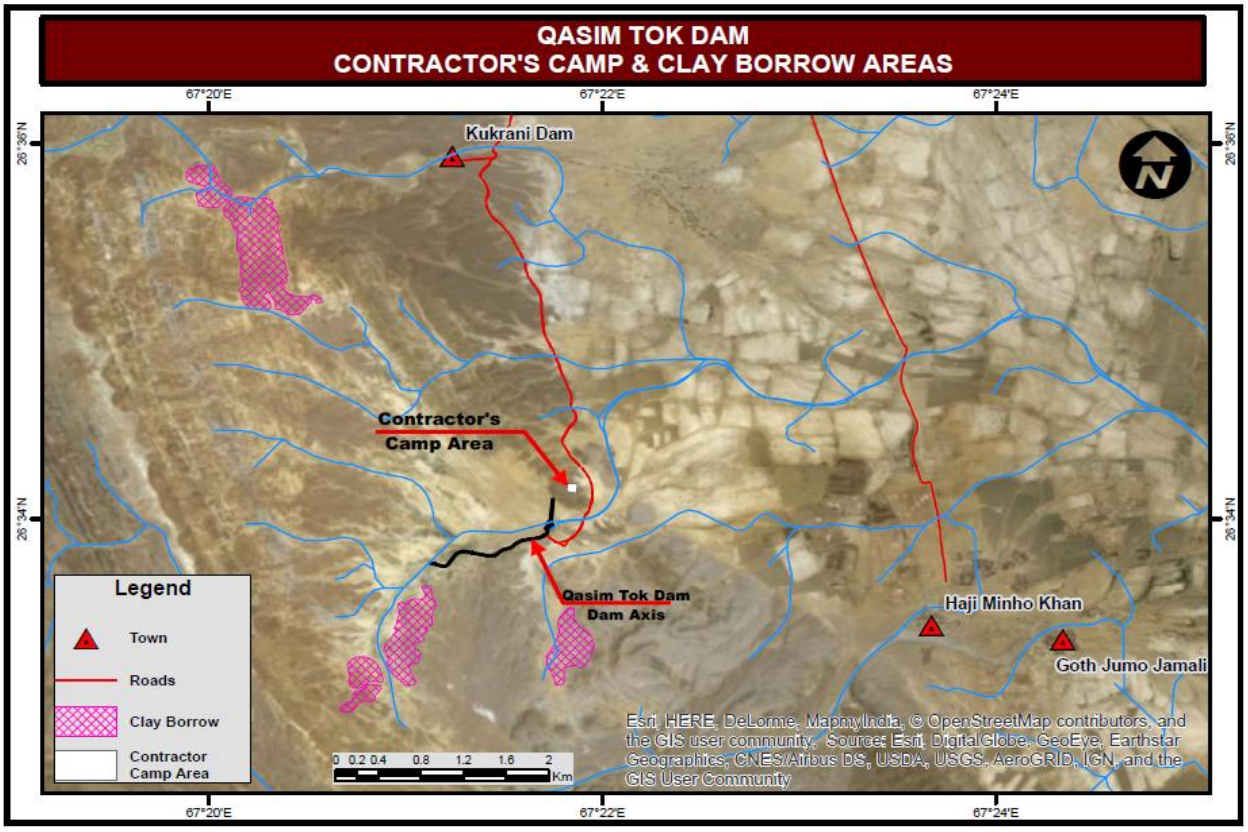


Figure 10: Camp Site and Borrow Area location of Qasim Tok Dam

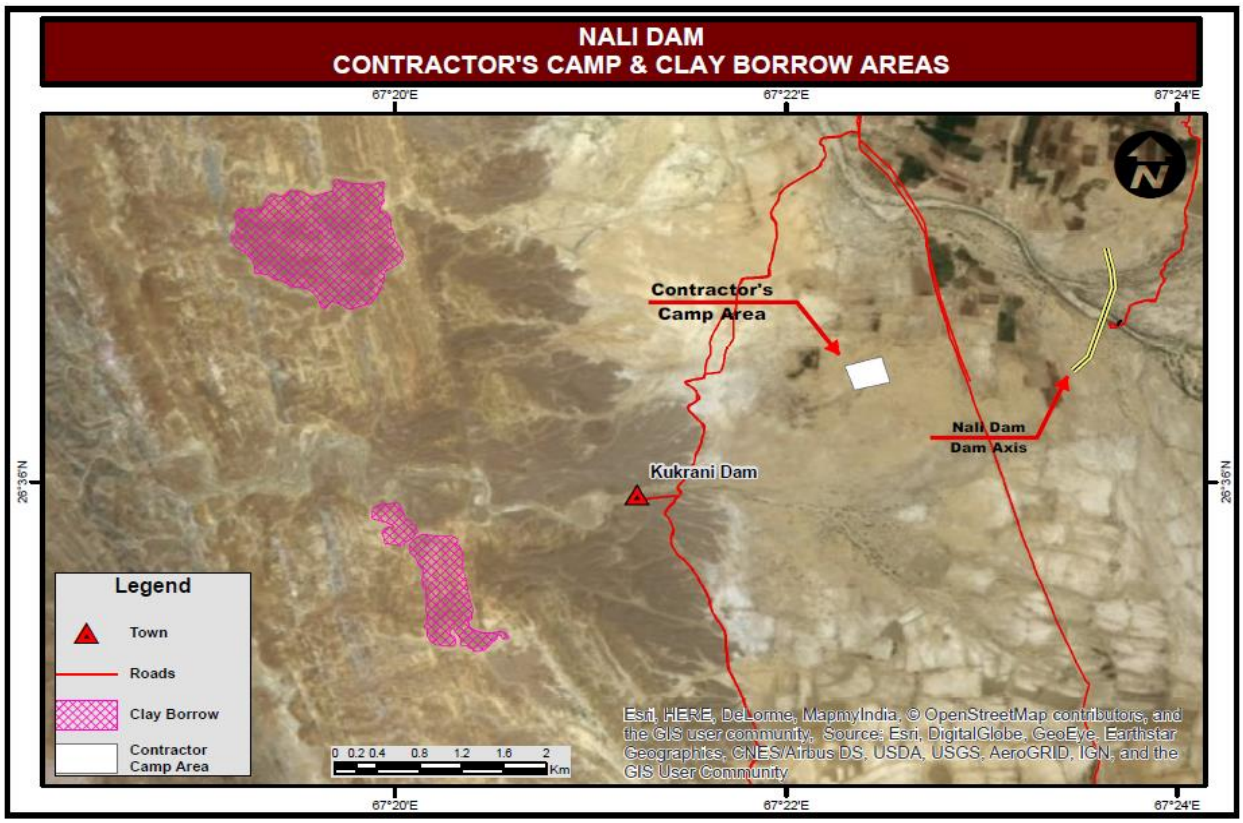


Figure 11: Camp Site and Borrow Area location of Nali Dam

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 5 to 11 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, transit mixtures etc. the concrete works will involve medium size batching plant and concrete placing equipment. All these equipment will be directly managed by the contractors. The estimated machinery and equipment required is given in Table-7. However, the actual number of equipment required on the site will be determined by the contractor to carry out the strengthening work.

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

S.No	Machinery/Equipment	No of Machinery on each Sub-project									Total
		Upper Mole-II	Sureshi	Tikho-II	Gabol	Dhall Dhoro	Naing-II	Nali	Qasim Tok	Bhansar Rathi	
1	Loader	3	4	4	4	4	3	3	3	5	33
2	Tractor Trolley dumper	10	10	10	10	10	10	10	10	12	92
3	Earth leveler machine	2	2	2	2	2	2	2	2	3	19
4	Excavator	4	4	5	4	4	4	4	4	5	38
5	Transit Mixtures	5	4	5	5	5	5	4	4	5	42
6	Batch Plant	1	1	1	1	1	1	1	1	1	9

2.9. Manpower Requirement

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

Table 8: Required Manpower

S.No	Type of Manpower	No of Manpower on each Sub-project								
		Upper Mole-II	Sureshi	Tikho-II	Gabol	Dhall Dhoro	Naing-II	Nali	Qasim Tok	Bhansar Rathi
1	Construction Supervisor	1	1	1	1	1	1	1	1	1
2	Environment and Social Safeguard Staff	4	4	4	4	4	4	4	4	4
3	Surveyor	3	3	3	3	3	3	3	3	4
4	Skilled laborer	4	4	4	4	4	4	4	5	6
5	Semi-skilled laborer	5	5	6	6	6	5	5	6	7
6	Unskilled laborer	15	15	15	15	15	15	15	17	20
7	Drivers/operators	30	30	30	30	30	30	30	25	35

2.10. Project Area of Influence

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

1) Primary Impact Zone

Primary impact zone is considered as the area that will be impacted negatively in the form of dam failure, development of access routes, borrow areas, contractor's camps, disposal areas.

2) Secondary Impact Zone

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

3. DESCRIPTION OF ENVIRONMENT

3.1. Introduction

This Section 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 Section also identifies archaeological sites, protected areas, sensitive flora and fauna receptors in the project area. The potential impacts of the project and associated mitigation measures to address these impacts have also been discussed in this Section.

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-12.

Out of nine proposed dams, eight are located in Kohistan area and one dam in Nagarparkar region of south east of Thar Desert. The geography features of these areas are described below.

i) Nagarparkar Region

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

Small nala/nadi and rivers originates form Karoonjhar hills and drain towards the Rann-of Kutch. None of the rivers is perennial and as such there is no base flow. Only flood flow keeps on flowing for few hours to couple of days after each sizeable rainfall event. Gordhro, Bhatiani, Jinjo, Adigoan, Surachand, Surdran, Kasbo, Mue and Mudro are main nais of Nagarparkar which originate from Karoonjhar hills and fan out in the plains of Nagar and in case of very high rainfall the water reaches to Rann-of-Kutch.

Bhansar Rathi dam shall be located on a runoff stream which flows towards Rann of Kutch.

ii) Kohistan Region

The proposed project areas lie in Western Sindh, Tehsil Johi District Dadu, Tehsile Sewan Sharif and Jamshoro of District Jamshoro between the Western hills of Kirthar range and the right bank

Command area of Sukkur barrage. It is a strip of land which, during the monsoon period, is irrigated by rain/flood waters but when the flood waters recedes in the Nai, this again becomes dry and barren. If water is provided by conservation of flood water of nai, the conditions could be improved to a great extent. The rim of the cup shaped mountainous range around Manchhar Lake forms the upper or Northern part where the Nais water enters the Lake. The South - Eastern part lies on the other side of South Eastern loop which extend up to the river Indus. The foot hill of lower part mountain fans slope southward and eastward. Lakhi Range is also situated in the lower part of the Central Zone, and touches the River Indus near Sehwan and has high altitude. The Nais of the Northern side after flowing in the North direction discharges surplus water in to the Manchhar Lake.

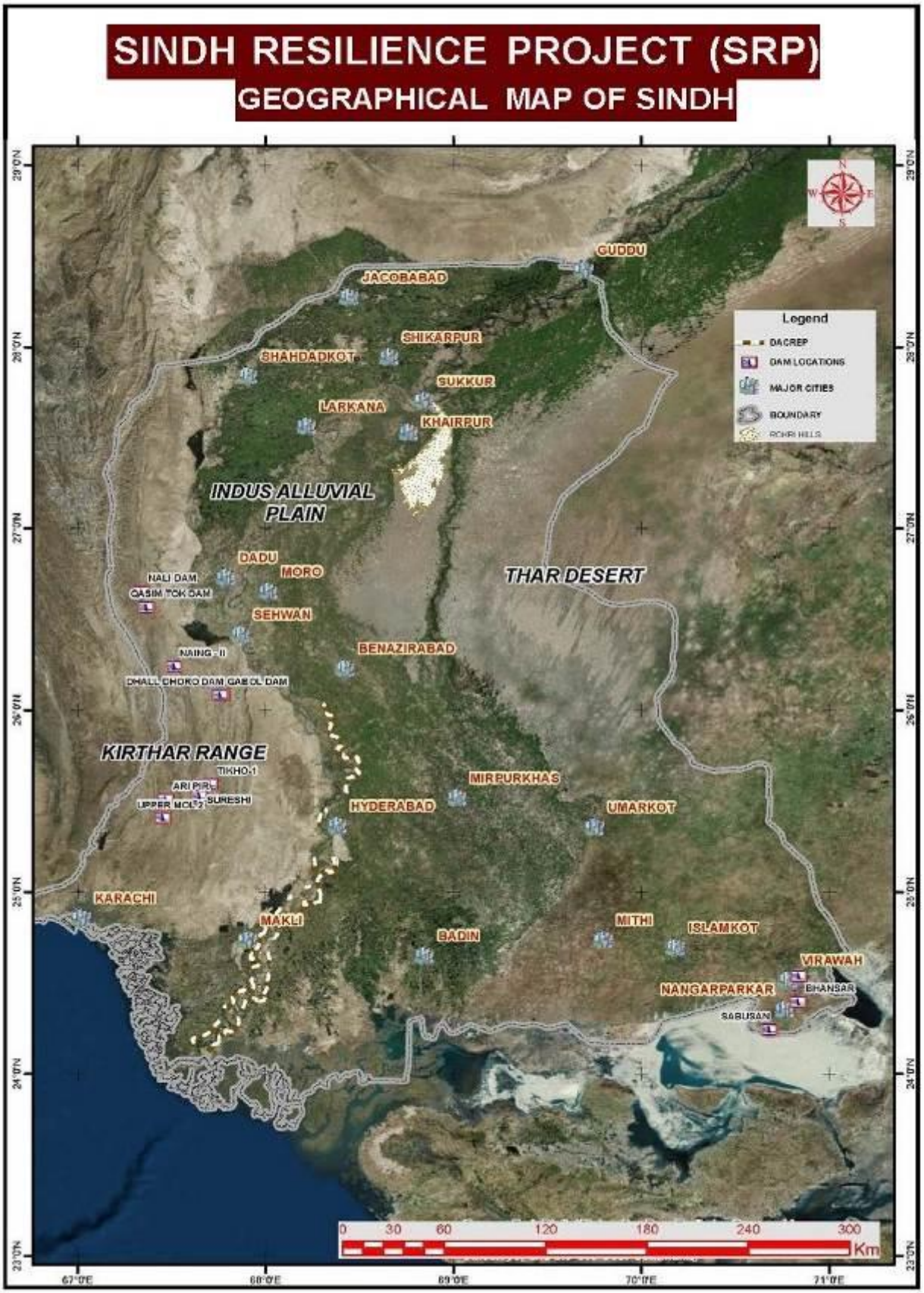


Figure 12: Geographical Map of Sindh

3.3. Geology

The geology of Sindh is divisible in three main regions, the mountain ranges of Khirthar, containing a chain of minor hills in the west and in east it is covered by the Thar Desert and part of Indian Platform where the main exposure is of Karunjhar Mountains, which is famous for Nagar Parkar Granite. In the north Sindh is enquired by rocks of Laki range extending to Suleiman range and its 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-13).

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-14 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 Khirthar Ranges which are technically disturbed having parallel anticlines and synclines running almost north south (Figure-14).

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 Manchhar 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.

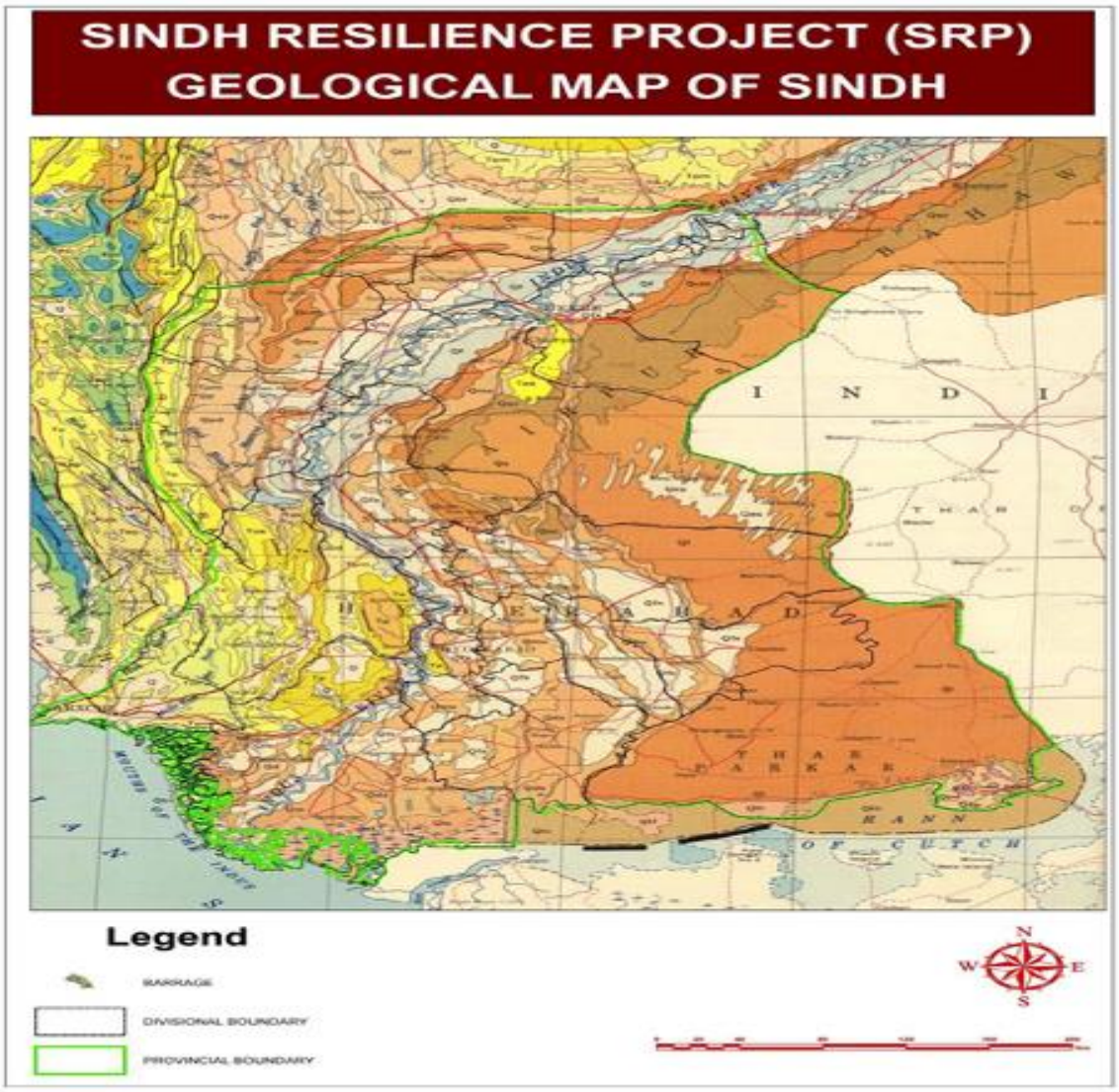


Figure 13: Geological Map of Sindh
(Source: Geological Survey of Pakistan – GSP)

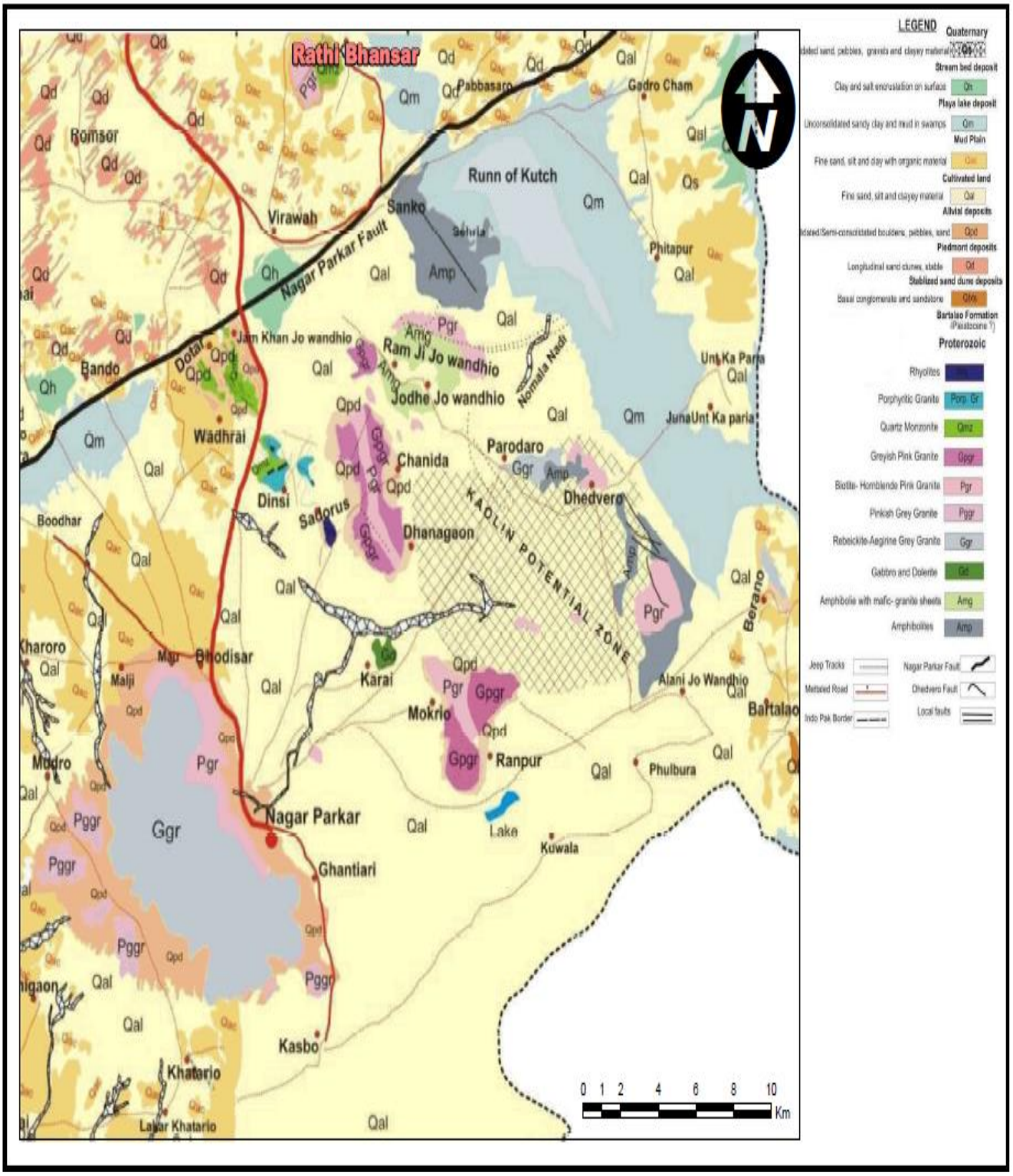


Figure 14: Regional Geological Map of Nagarparkar

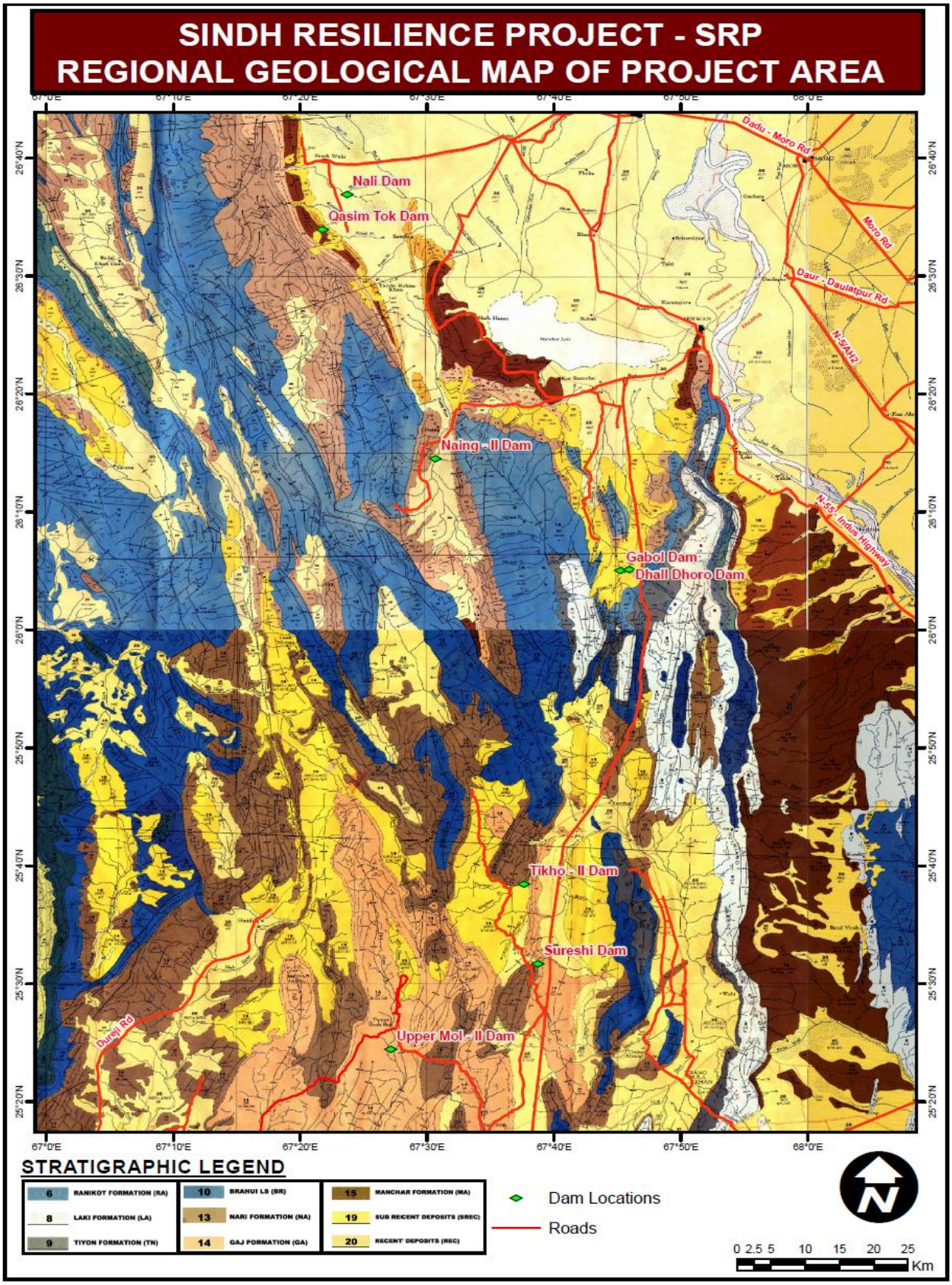


Figure 15: Regional Geological Map of Kohistan

Seismicity

The map shown as Figure 13 & 15 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. All dam site structures have been designed with the consideration of building codes of Pakistan.

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

Moreover, all structure designs are reviewed by World Bank dam expert, Mr. Alessandro Palmieri. Details of seismic data of each dam site is given in Table 9 and Figure 16 below:

Table 9: Seismic Data of Dam Site

S.Nr.	Dam	Zone	Magnitude
1	Naing-II	2 B	0.16g to 0.24g
2	Gabol	2 A	0.08g to 0.16g
3	Nali	2 B	0.16g to 0.24g
4	Qasim Tok	2 B	0.16g to 0.24g
5	Dhall Dhoro	2 A	0.08g to 0.16g
6	Upper Mole-II	2 A	0.08g to 0.16g
7	Sureshi	2 A	0.08g to 0.16g
8	Tikho-II	2 A	0.08g to 0.16g
9	Bhansar Rathi	2 B	0.16g to 0.24g

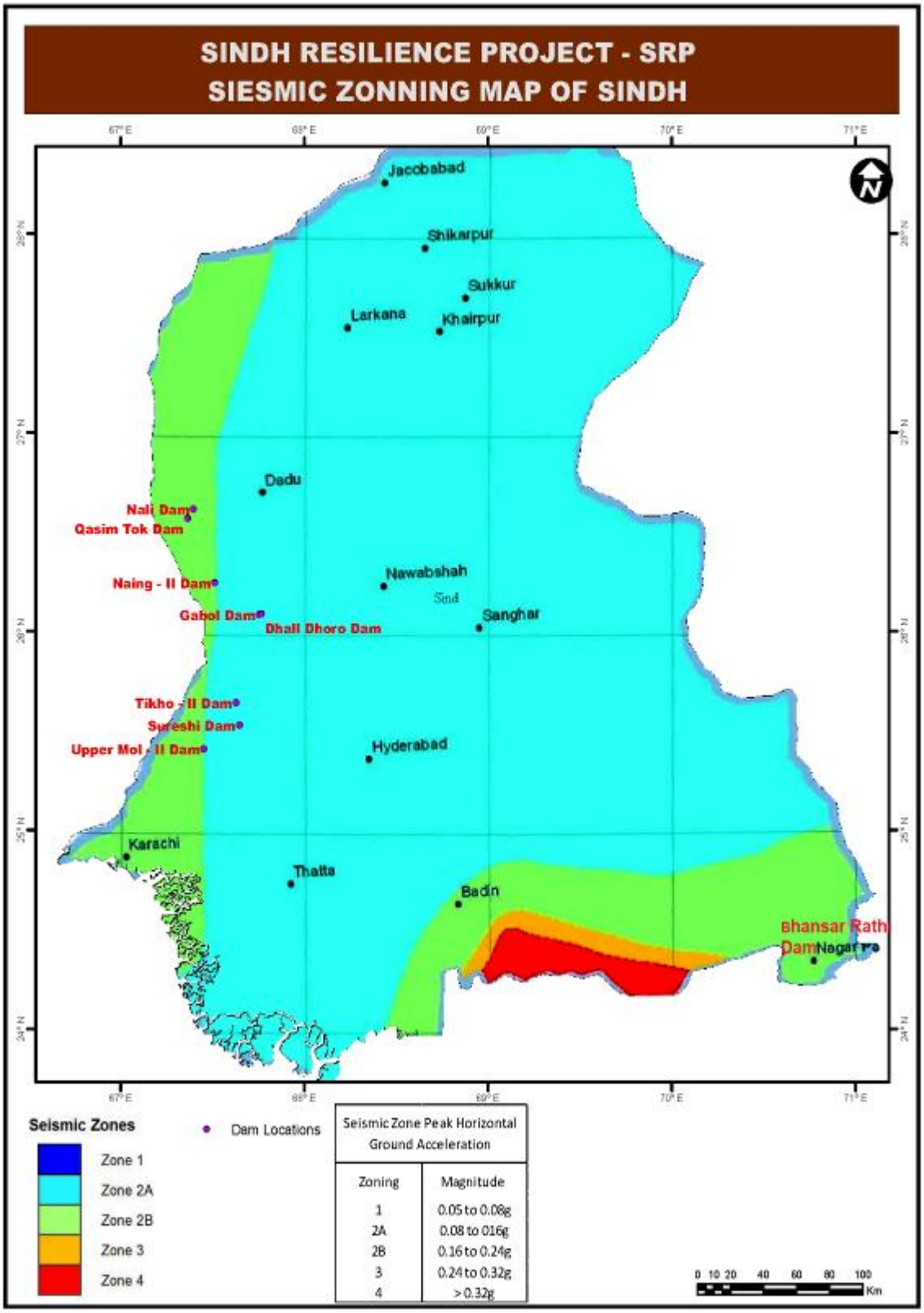


Figure 16: Seismic Zones of the Project Area

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

i) Soil Morphology

In Nagarparkar 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,sub-project sites receive a maximum rainfall of 135-230 mm (Figure-17).

The climatological conditions of dam sites are represented by following meteorological station (Table 10).

Table 10: Nearest Meteorological Stations

Name of Dams	Meteorological Station
Upper Mole-II Dam	Karachi
Tikho-II and Sureshi Dams	Hyderabad
Dhall Dhoro, Gabol, Naing-II, Nali, Qasim Tok Dams	Jubble near Nai Gaj Dam
Bhansar Rathi Dam	Nagarparkar

The mean monthly temperatures, rainfall and evaporation at these stations are shown in Figures 18 to 29. The mean monthly maximum and minimum limits of climatological data are given in Table 11.

Table 11: Climatological Data of Sub-project Areas

Meteorological Stations	Rainfall (inch)		Temperature (°C)		Evaporation (inch)	
	Min.	Max.	Min.	Max.	Min.	Max.
Karachi	0.03	3.04	4.50	37.60	6.82	15.82
Hyderabad	0.10	2.80	18.10	34.10	0.69	3.01
Gaj Rest House, Dadu	0.10	0.84	11.00	32.00	1.10	4.00
Nagarparkar	0.04	5.63	17.80	34.00	2.48	11.83

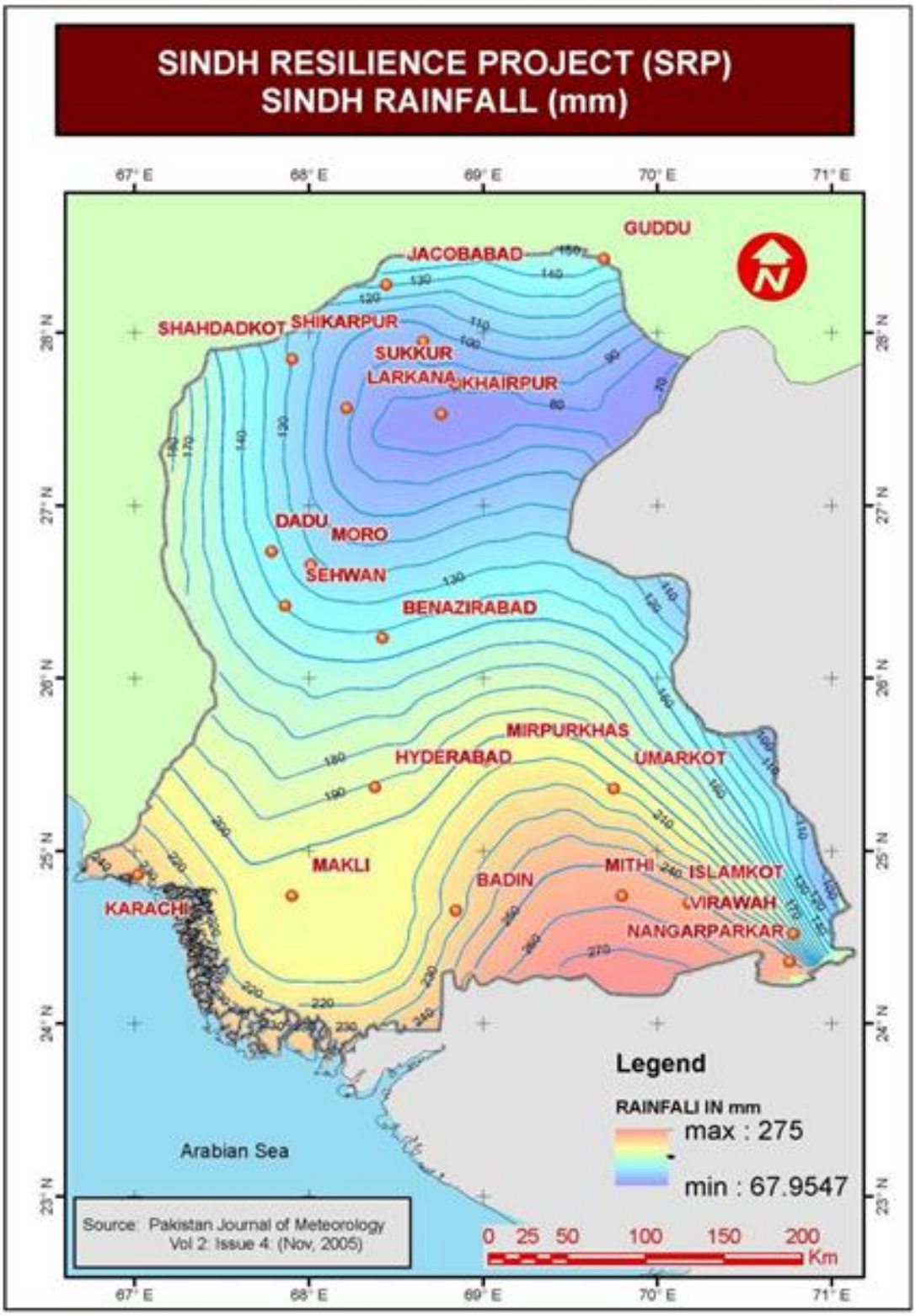


Figure 17: Annual Rainfall in Project Area

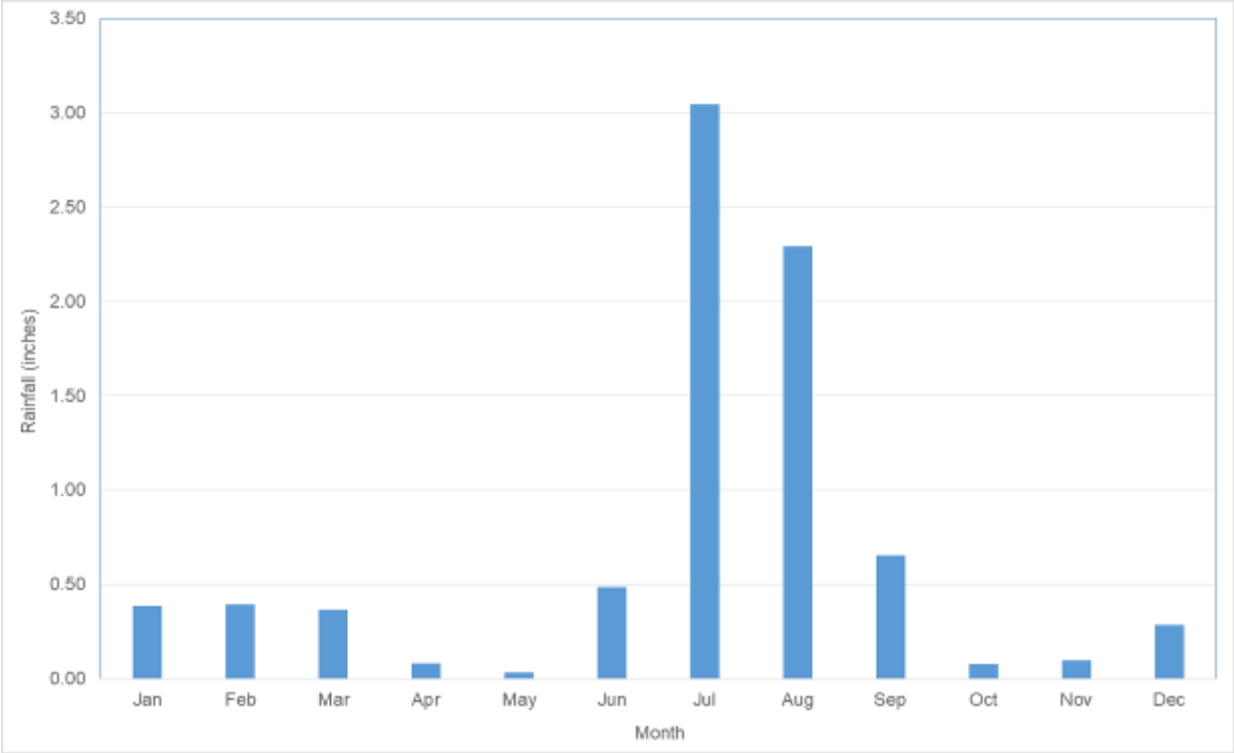


Figure 18: Monthly Average Rainfall at Karachi.

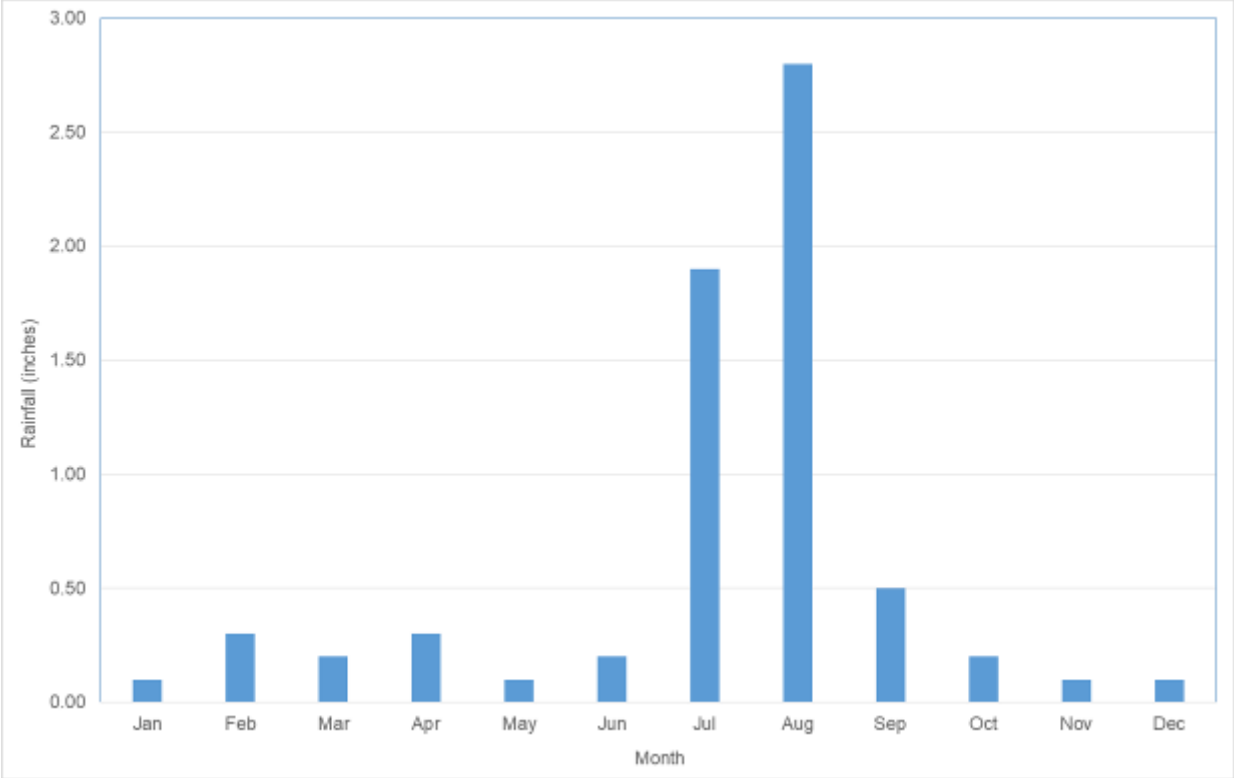


Figure 19: Monthly Average Rainfall at Hyderabad.

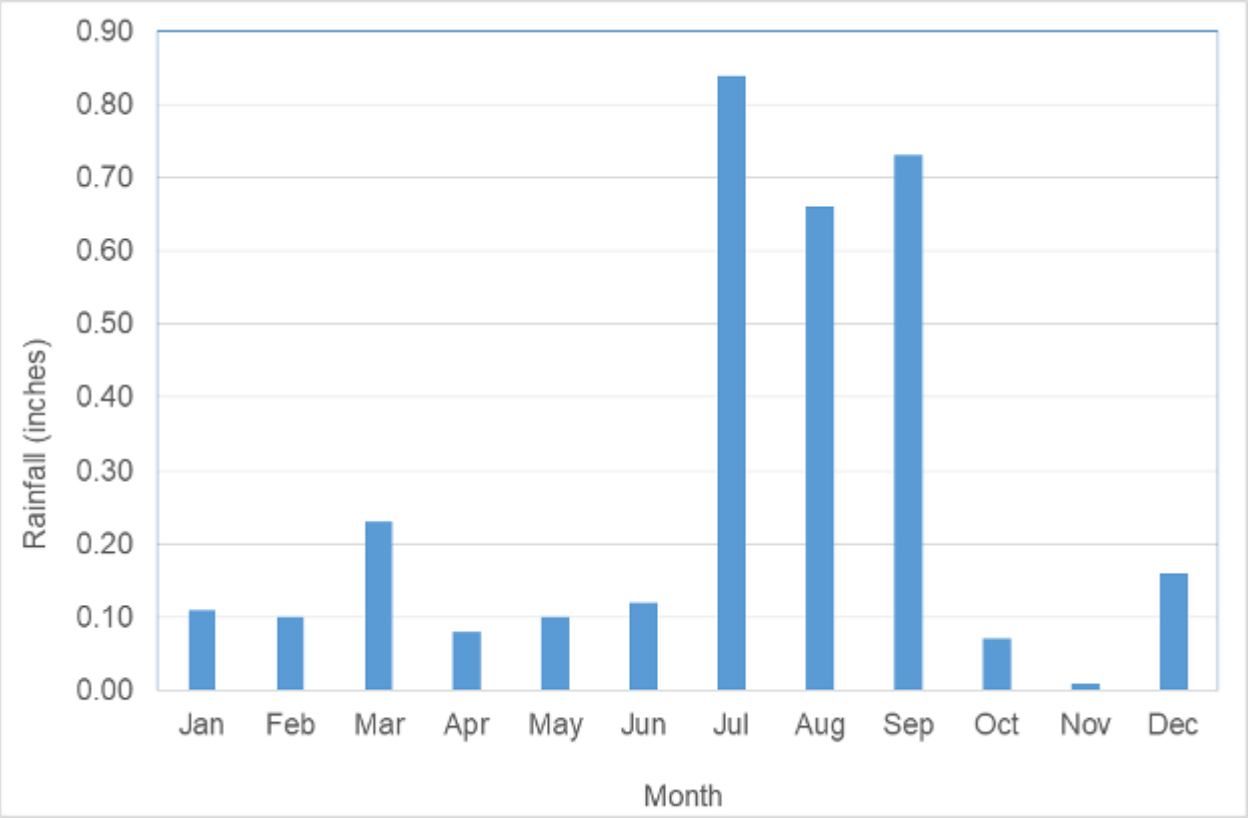


Figure 20: Monthly Average Rainfall at Gaj Rest House, Dadu

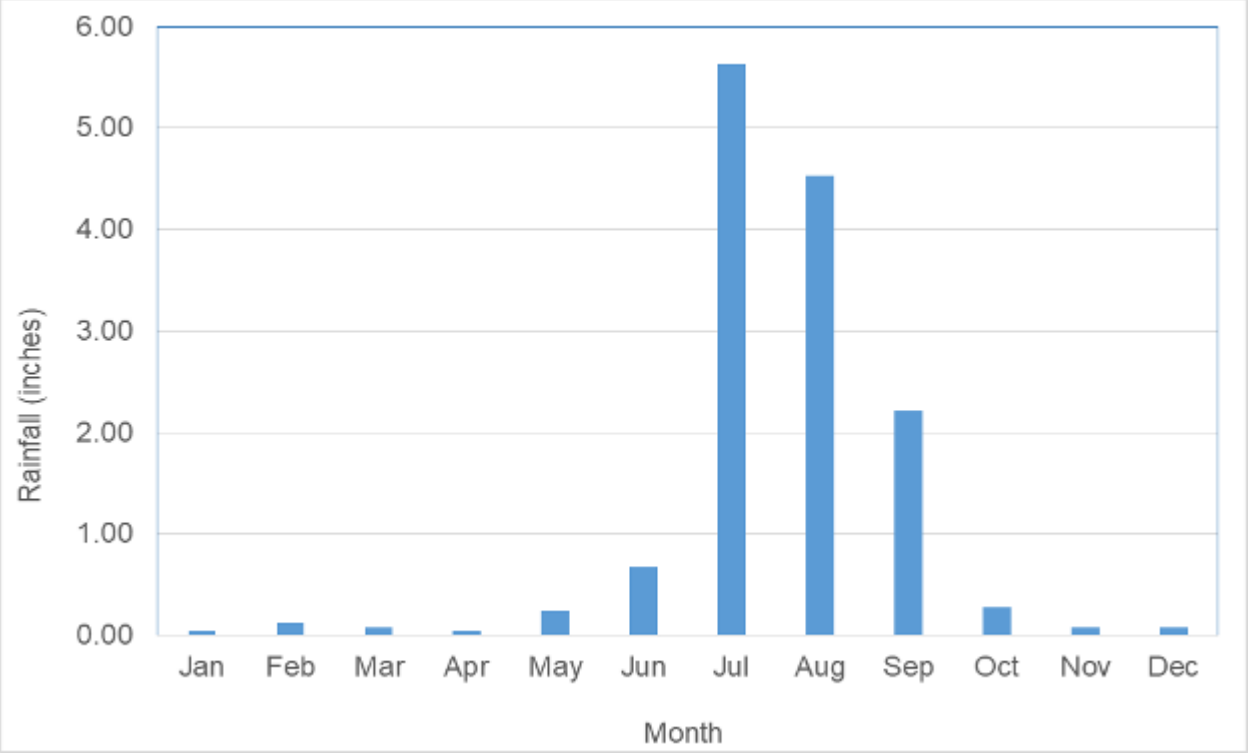


Figure 21: Monthly Average Rainfall at Nagarparkar

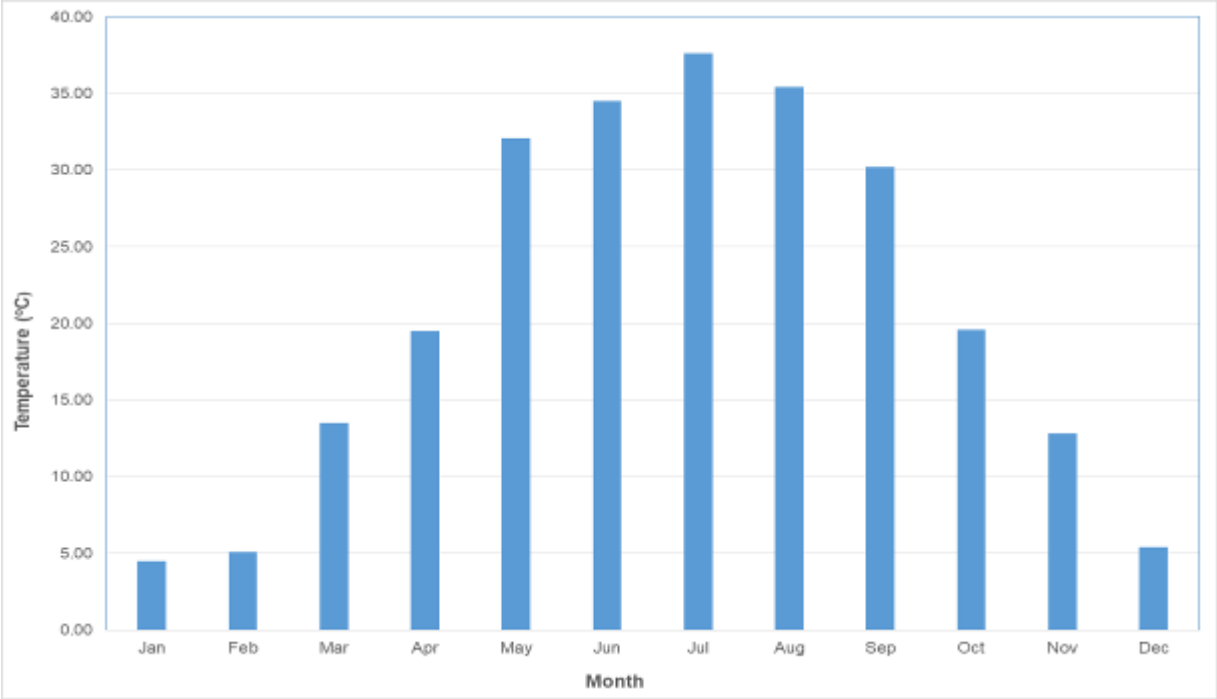


Figure 22: Monthly Average Temperature at Karachi

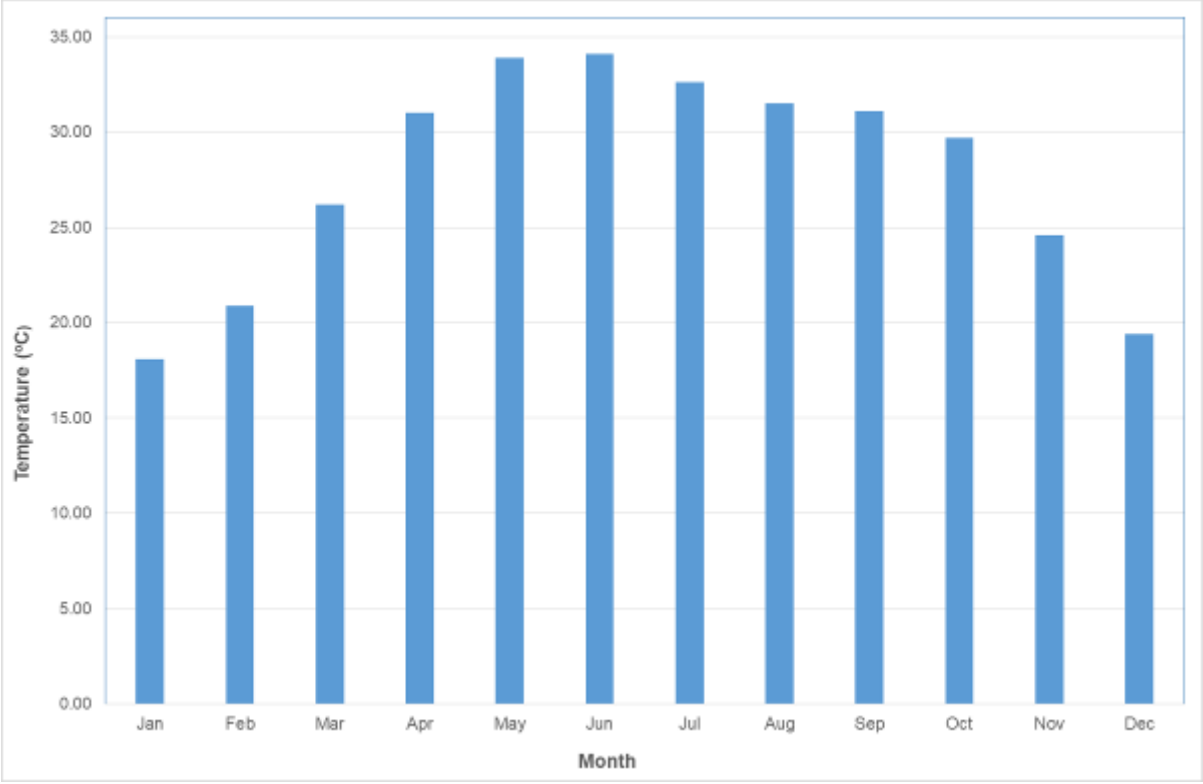


Figure 23: Monthly Average Temperature at Hyderabad

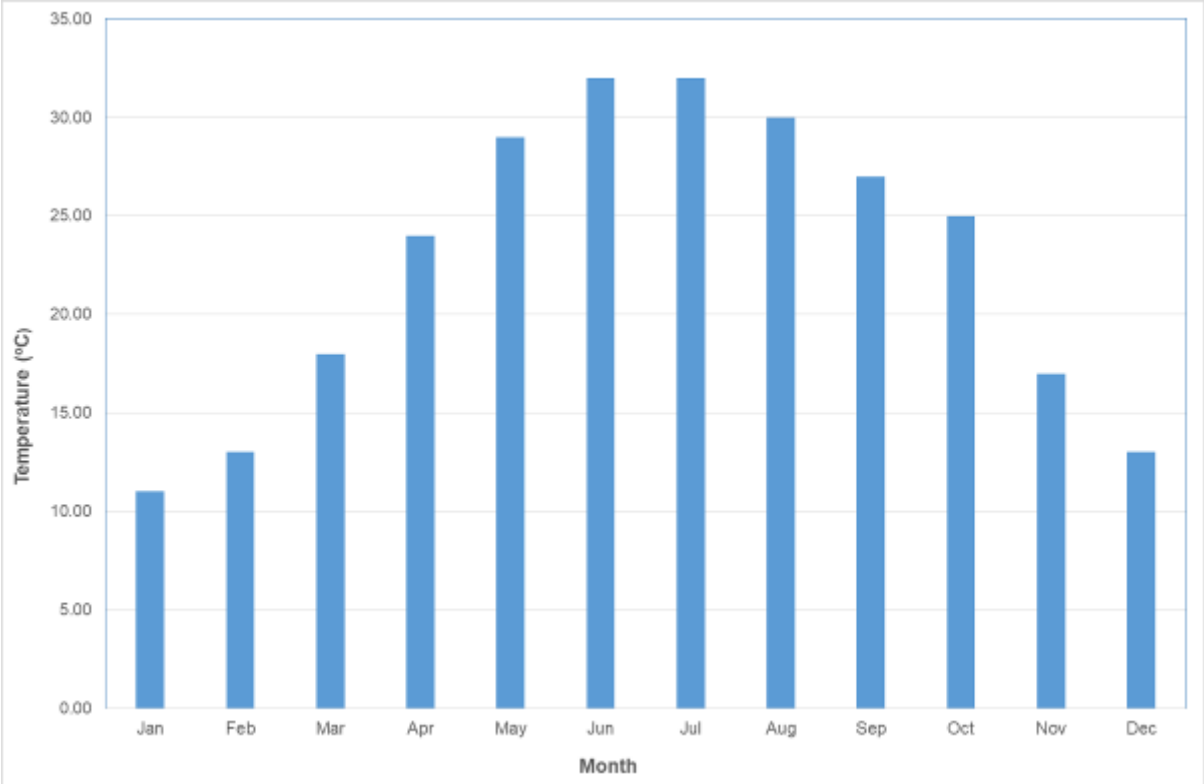


Figure 24: Monthly Average Temperature at Gaj Rest House, Dadu

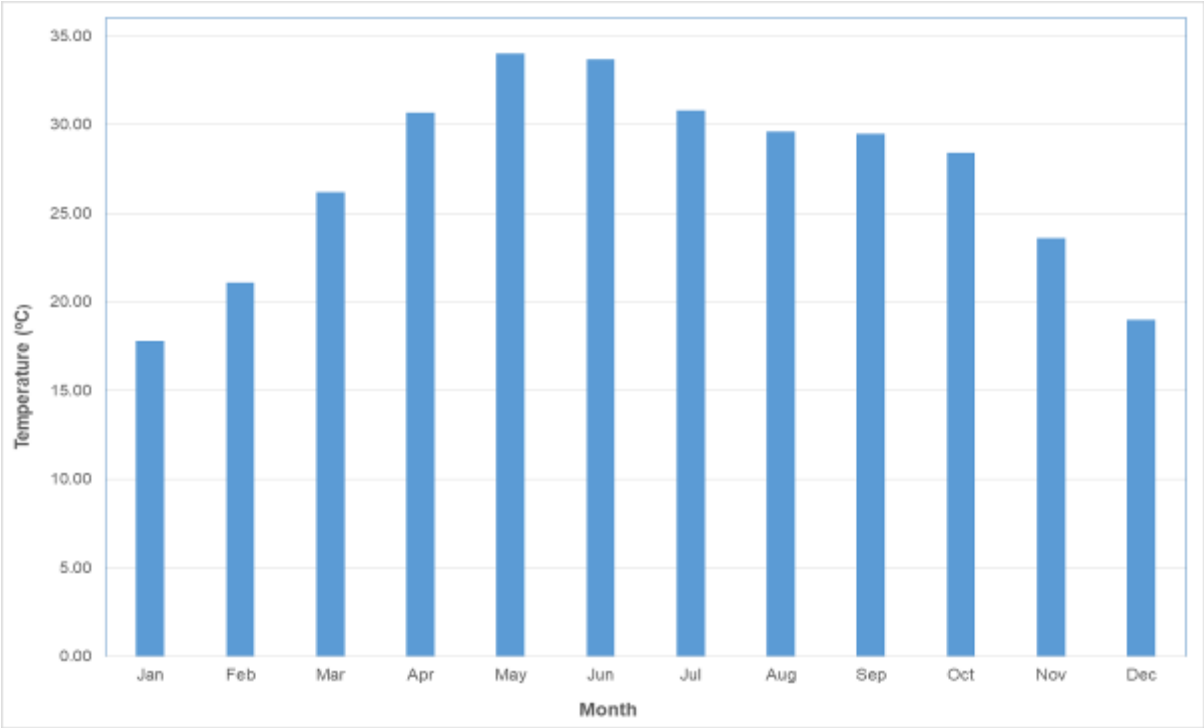


Figure 25: Monthly Average Temperature at Nagarparkar

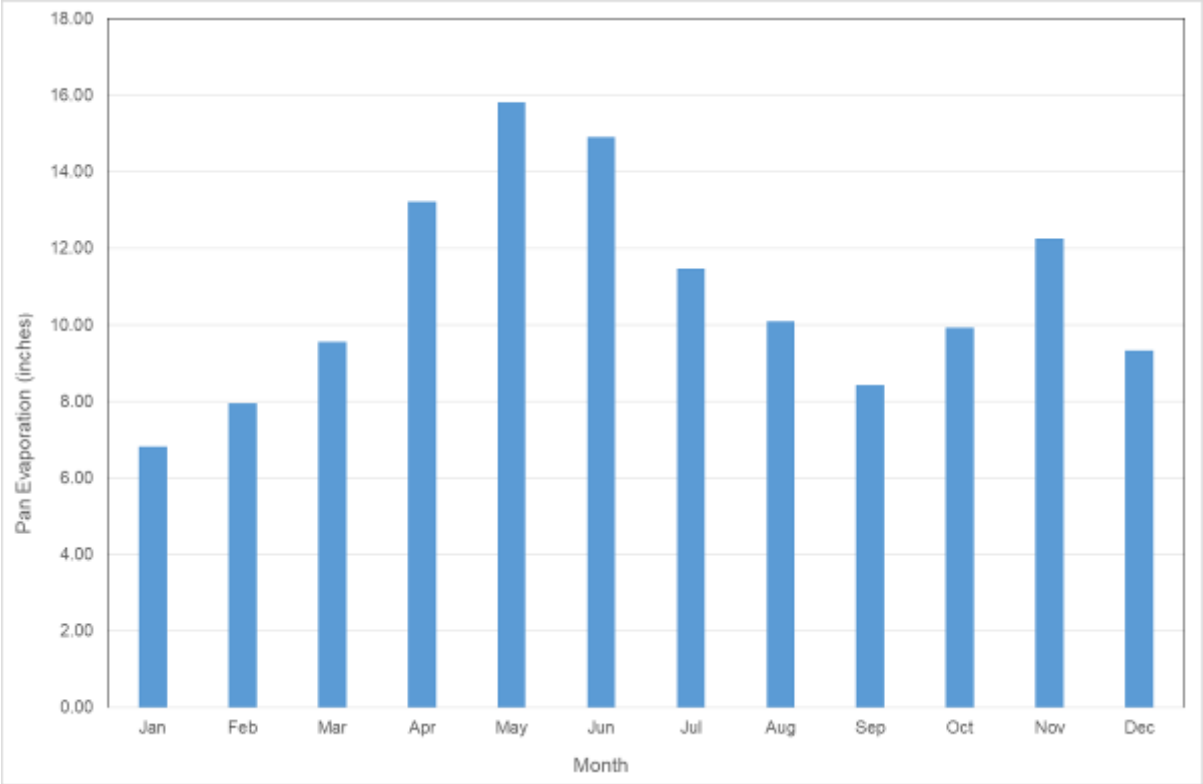


Figure 26: Monthly Average Evaporation at Karachi

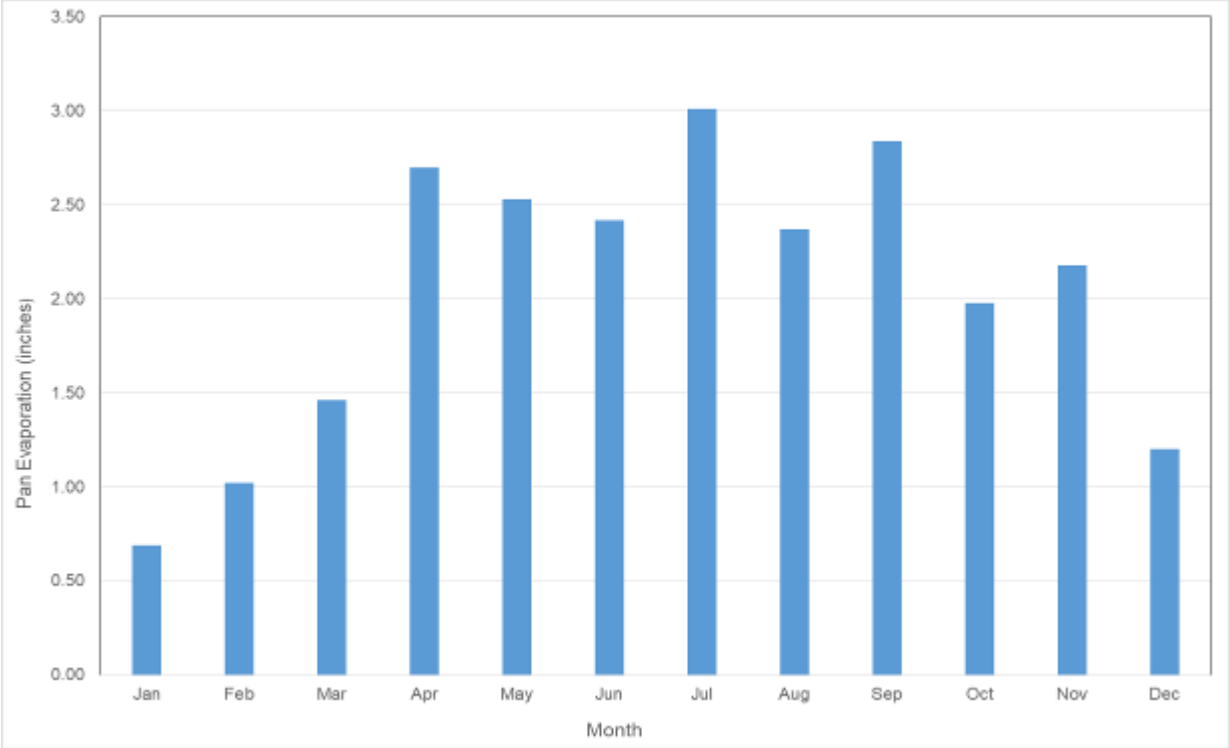


Figure 27: Monthly Average Evaporation at Hyderabad

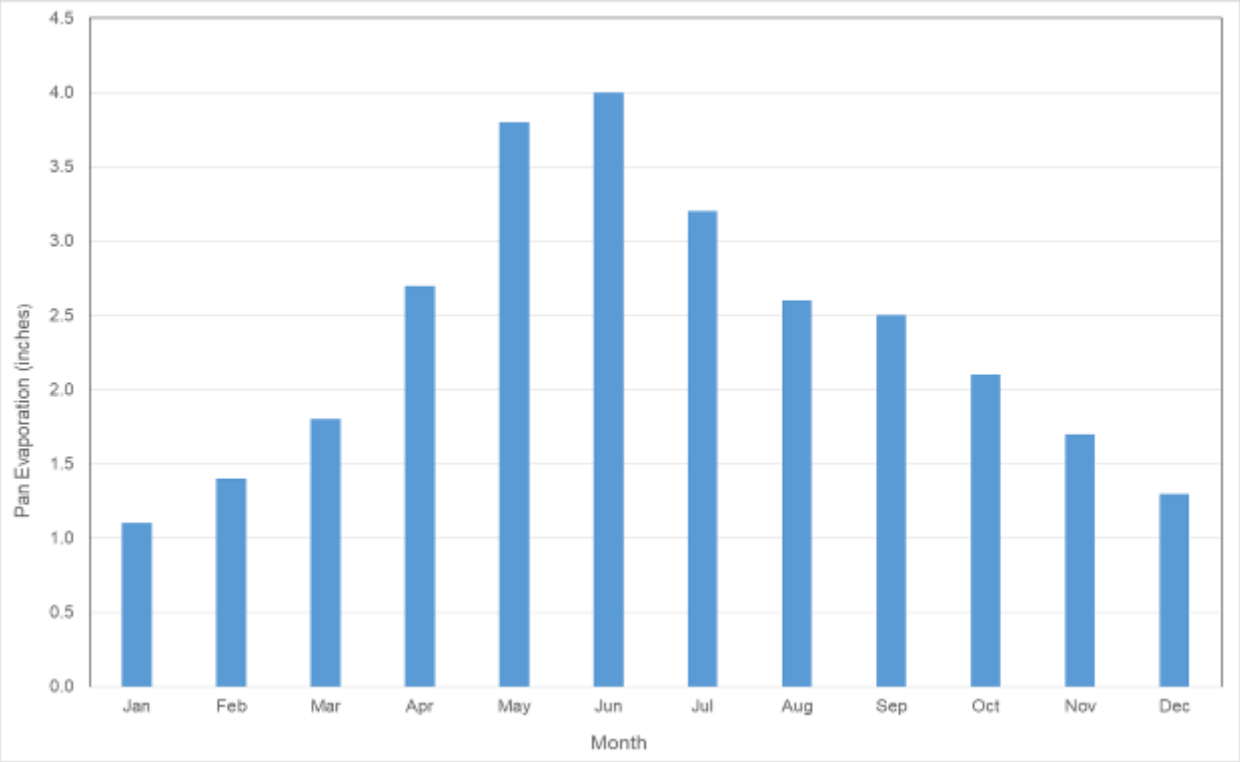


Figure 28: Monthly Average Evaporation at Gaj Rest House, Dadu

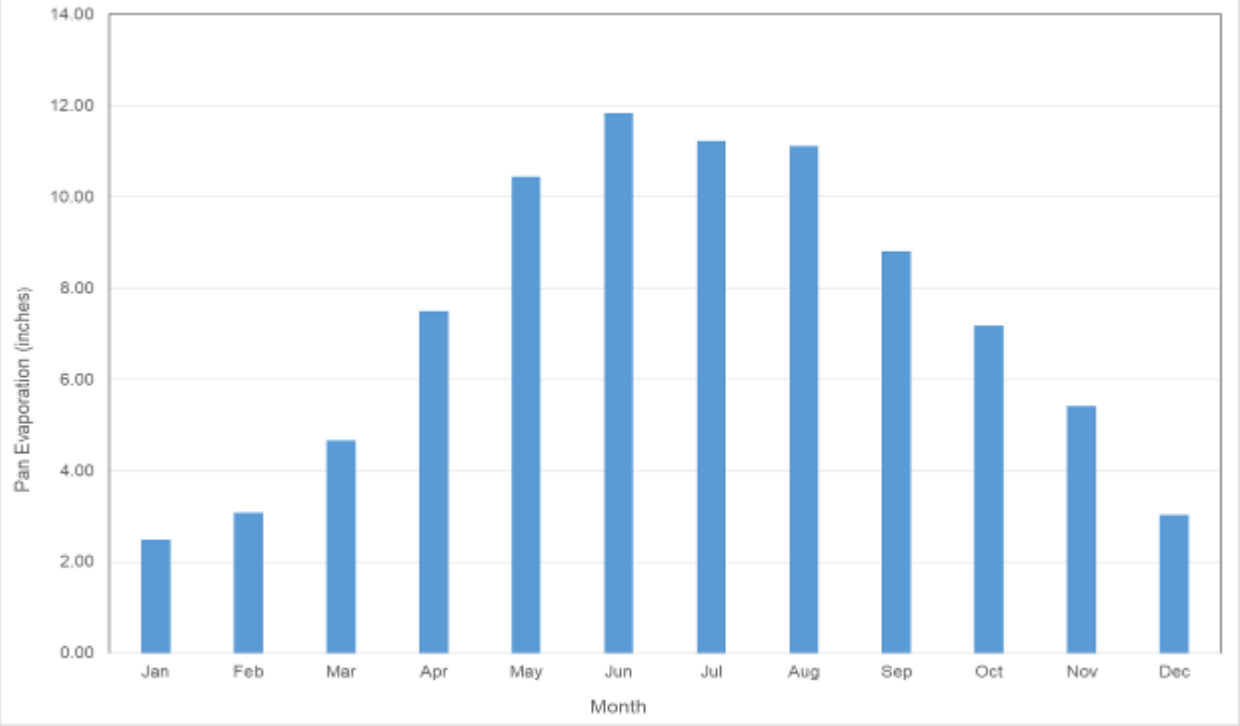


Figure 29: Monthly Average Evaporation at Nagarparkar

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 nearest to the sub-project area are Manchhar and Rann of Kutch. The details are provided in Table 12 below.

Table 12: Nearest Wetlands in Sub-Project Area

Name of Wetland / Lakes	District	Province	Away from the Project Area (kms)
Manchhar	Dadu	Sindh	36 kms away from Gabol Dam 37.7 kms Dhall Dhoro Dam 22 km away from Naing-II Dam
Rann of Kutch	Tharparkar	Sindh	3.5 km away from Bhansar Rathi Dam

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

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 flow keeps 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. 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. 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 Khirthar Range in Western Sindh. Khirthar 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) Groundwater

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

Ground water in sub-project areas of Nagarparkar and Kohistan are from the dug wells and tube wells, whose depth ranges from 120 to 400 ft. The results of groundwater are summarized in Table-13 and details are attached in Annex-2. These results reveal that the pH, Carbonate, EC, and Arsenic were within permissible limit of NEQS/SEQS 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 limits.
Above mentioned samples were obtained from ground water, parameters mentioned above exceeding limits is due to natural soil strata composition. Apparently no other source of pollution has been observed during survey, which is causing the high level of TDS, potassium and calcium.

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

Groundwater is found mostly in a strip parallel to the left bank of Indus River and some pockets in other areas (Figure-30).

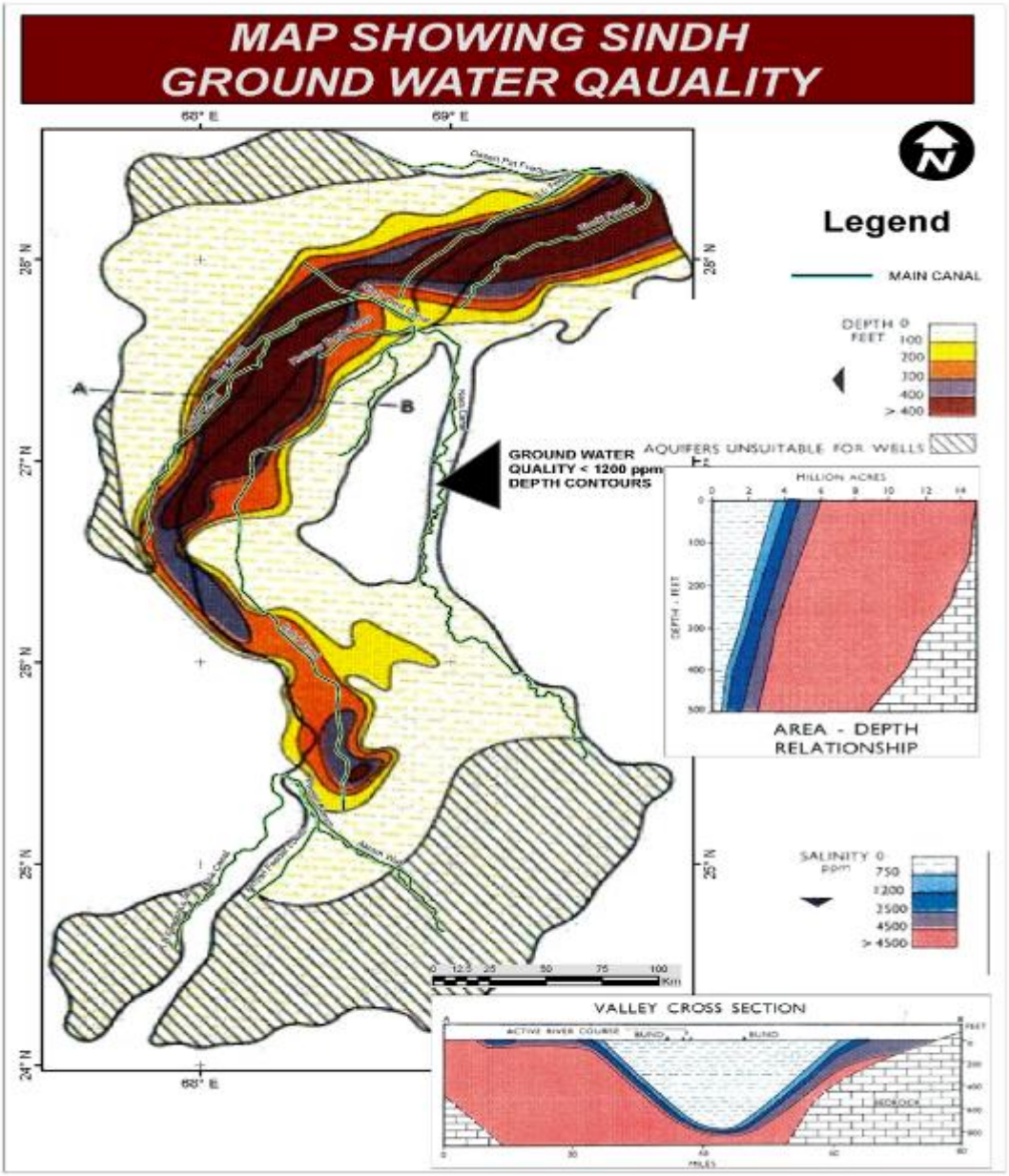


Figure 30: Map Showing Groundwater Quality

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 15-03-2016, 29-03-2016 and 19-04-2016. These results are given in Table-13. Detail may be seen in Annex 2.

Table 13: Groundwater Quality Analysis for Dams

Sr. #	Parameter	Unit	Groundwater Quality Results of Sub-projects (Dams)								Permissible Limits
			Naing -II Dam	Gabol Dam	Nali Dam	Qasim Tok Dam	Dhall Dhoro Dam	Upper Mole-II Dam	Sureshi Dam	Tikho-II Dam	Bhansar Rathi Dam	
1	Odour	-	Un-objectionable									Un-objectionable
2	pH	-	7.25	7.16	7.67	7.75	6.78	7.53	8.18	7.3	7.16	6.5-8.5 (WHO)
3	Colour	-	Colourless									Colourless
4	Conductivity	dS/m	991	700	1390	682	2470	1047	1553	2290	11150	NGVS
5	Total Dissolved Solids (TDS)	mg/l	634	448	890	436	663	670	994	1466	7136	1000 (WHO)
6	Potassium	mg/l	5.4	6.8	3.9	2.7	5.8	3.9	4.4	10.1	29	12 (EC)
7	Nitrate(No_3)		3.088	5.179	2.638	1.701	2.683	6.691	1.238	2.299	2.768	10 (WHO)
8	Nitrite(No_2)	mg/l	0.07	0.029	0.027	0.025	0.037	0.027	0.026	0.069	0.011	0.02 (PSQCA)
9	Taste	-	Un-objectionable									Un-objectionable
10	Carbonate	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NGVS
11	Bicarbonate	mg/l	220	220	230	230	200	310	430	380	560	NGVS
12	Phosphate (PO_4)	-	0.2	1.3	0.24	0.38	0.59	0.57	0.22	0.71	3.36	NGVS
13	Calcium	mg/l	92	64	56	44	112	80	40	104	296	75 (PSI)
14	Arsenic (ppb)	-	0	0	0	0	0	0	0	5	10	50 (PSQCA)
15	Total Hardness	mg/l	380	330	340	260	400	310	160	500	1540	500 (WHO)
16	Dissolved Oxygen (DO)	mg/l	4.4	4.6	3.4	4.3	4.8	4.3	3.8	3.9	3.7	No Limit Listed
17	Chemical Oxygen Demand (COD)	mg/l	0	0	0	0	0	0	0	2	61	150 NEQS
18	Total Suspended Solids (TDS)	mg/l	113	365	14	21	99	246	169	35	180	200 NEQS
19	E.coli	cfu	0	0	0	0	0	0	0	0	44	cfu/100 NEQS
20	Presumptive Coliforms/ 100mL	ml	900	70	90	900	900	240	0	500	900	0/100 (MPN/100ml) NEQS
21	Fecal Coliforms/ 100mL	ml	220	0	0	140	170	33	0	70	130	0/100 ml NEQS

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

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 particulate matter, carbon monoxide, sulphur dioxide, and nitrogen oxides. These emissions generally affect the air quality in the vicinity of the roads. However, traffic on the roads in the project area is low compared to the national highways or other major roads. The ambient air

quality tests were carried out in the month of Nov 2018 from 06-11-2018 to 09-11-2018 by SRP through Green Environmental Laboratories Karachi for Upper Mole-II, Sureshi, Tikho-II, Gabol, Dhal Dhoro, Naing-II, Qasim Tok, Nali and Bhasar Rathi. The analysis were carried out at proposed dam locations. Table-14 Results reveals that all parameters are within permissible limits of SEQS ambient air quality.

Table 14 Ambient Air Quality Analysis for Dams

S. No	Parameters/ Analysis	SEQS A.A Limits	WHO Limits of A.A	Results																										
				Upper Mole-II			Sureshi			Tikho-II			Gabol			Dhal Dhoro			Naing-II			Qasim Tok			Nali			Bhansar Rathi		
				Min	Max	Avr	Min	Max	Avr	Min	Max	Avr	Min	Max	Avr	Min	Max	Avr	Min	Max	Avr	Min	Max	Avr	Min	Max	Avr	Min	Max	Avr
	Unit		µg/m³/24 hrs																											
1	Sulphur Dioxide (SO2)	120.0	125.0 µg/Nm³	15.2	35.2	25.2	15.2	22.4	18.8	17.6	39.3	28.5	14.9	20.3	17.6	13.6	19.6	16.6	12.8	18.5	15.7	11.8	20.4	16.1	11.5	16.2	13.9	9.6	17.3	13.5
2	Oxides of Nitrogen (NO2)	80.0	200 mg/Nm³	18.6	25.3	22.0	16..3	22.6	19.5	20.4	28.4	24.4	14.9	21.9	18.4	14.3	20.4	17.4	14.2	18.5	16.4	15.9	20.9	18.4	14.6	19.6	17.1	10.5	17.4	14.0
3	Carbon Monoxide (CO)	10.0	10.0 µg/Nm³ 8 hrs	1.5	1.9	1.7	1.4	1.7	1.6	1.7	1.9	1.8	1.5	1.9	1.7	1.2	1.8	1.5	1.1	1.8	1.5	1.6	1.9	1.8	1.5	2.1	1.8	1.1	1.5	1.3
4	Particulate Matter (PM10)	150.0	150.0 µg/Nm³	98	115	106	68.9	94.6	81.8	78.0	93.0	85.5	69.4	102.5	86.0	98.2	135.0	116.6	102.1	158.2	130.2	120.6	152.9	136.8	138.6	145.2	141.9	89.5	105.3	97.4

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-15.

Table 15 : Ambient Noise Levels in Sub-project Areas

Sub-Project	Location		Noise Levels 65 dBA (SEQS) 55 dBA (WHO)	
	Northing	Easting	Min	Max
Upper Mole-II	25°24'24.7594"	67°27'07.7124"	43	48
Sureshi	25°31'40.4163"	67°38'44.6515"	40	51
Tikho-II	25°38'26.3715"	67°37'37.1002"	40	52
Dhall Dhoro	26°05'04.7440"	67°45'56.0934"	43	45
Gabol	26°05'00.7964"	67°45'14.3767"	43	44
Naing-II	26°14'30.7303"	67°30'39.4736"	42	44
Nali	26°36'59.5417"	67°23'27.8755"	42	43
Qasim Tok	26°33'55.6996"	67°21'45.0351"	44	48
Bhansar Rathi	24°34'19.5281"	70°50'24.1317"	43	47

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 16 and in Annex 2.

Table 16: Soil Analysis of Sub-project Area

S.No	Parameter	Units	Upper Mole-II Dam	Sureshi Dam	Tikho-II Dam	Gabol Dam	Dhall Dhoro Dam	Naing -II Dam	Nali Dam	Qasim Tok Dam	Bhansar Rathi Dam
1	EC	(ds/m)	0.76	2.51	1.11	1.17	3.4	1.28	0.46	1.48	2.1
2	pH	-	7.8	7.8	7.6	7.5	8	8	8.2	8	8.0
3	Bicarbonate (HCO3)	Meq/l	2.5	7	2	2.8	8	2.6	0.76	3.5	6.5
4	Chloride	Meq/l	3.51	12	6	5	19.01	5	2	6.5	11.05
5	Sulfate	Meq/l	1.57	6.05	3	3.9	7	5.2	2.76	4.8	3.40

S.No	Parameter	Units	Upper Mole-II Dam	Sureshi Dam	Tikho-II Dam	Gabol Dam	Dhall Dhoro Dam	Naing -II Dam	Nali Dam	Qasim Tok Dam	Bhansar Rathi Dam
6	Calciam + Magnesium	Meq/l	2.7	8.5	4.8	4.8	14	5	2.5	6	9.00
7	Sodium	Meq/l	3.89	14.29	5.3	7.73	18.01	8.1	3	9.6	10.56
8	SAR	-	3.35	6.93	3.42	4.98	6.8	5.74	2.4	5.54	4.98
9	ESP	-	3.55	8.22	3.64	5.74	8.08	6.73	2.23	6.47	5.73
Soil Texture											
1	Sand %		84.8	70.4	74.4	52.8	71.8	88.8	82.8	87.2	69.8
2	Silt%		9.6	14	20	24.4	21.96	2.4	4.4	4	15.96
3	Clay%		5.6	15.6	5.6	22.8	6.24	8.8	12.8	8.8	14.24
4	Texture Class		Loamy Sand	Sandy Loam	Sandy Loam	Sandy Clay Loam	Sandy Loam	Sand	Loamy Sand	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 Nagarparkar, and from Khirthar 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 Upper Mole-II, Sureshi, Tikho-II, Dhall Dhoro, Gabol, Naing-II, Qasim Tok and Nali dam area, six (06) large mammal species were observed in which Asiatic Jackal is common and can be easily seen, while Wild cat specie rarely found in the field. 9 small mammal species from different micro habitats were recorded, among those Khul's bat and Persian Jird were found most common in all dam sites. 9 reptile and amphibians were recorded from different sites, among that Indian monitor lizard, Indian fringe toad sand lizard and yellow bellied gecko were the common and can be seen easily. Indian back cobra is poisonous snake is being killed ruthlessly, its population drastically declined through its fragile habitats. 32 bird species mostly resident birds were observed in the study area. Common babbler has become very rare from the region, while House crow, Jungle Babbler, Common Myna, House Sparrow, Common Crow, Indian Roller and Collared dove population is quite satisfactory in Indus eco-region. Chestnut-bellied sand grouse, Red-vented bulbul and Red turtle dove population is declining in the region. Manchhar Lake is largest wetland in Pakistan found in Dadu and Jamshoro districts,

it was attractive place for migratory birds, but due to anthropogenic activities now this wetland has become degraded, and has no more attraction for migratory birds. Detail of mammals, Reptiles and bird found in Kohistan Sub project area is given in Table 17.

Table 17: Fauna in Kohistan Sub-project Areas

S/N	English Name	Scientific Name	IUCN Status	Qasim Tok	Nali	Naing-II	Gabol	Dhall Dhoro	Tikko-II	Sureshi	Upper Mole-II
Large Mammals											
1	Indian Wild Boar	Sus sacrofa	LC		+			+			
2	Grey Mongoose	Herpestes auropunctatus	LC		+				+		
3	Small Mongoose	Herpestes juvinicus	LC				+	+		+	
4	Asiatic Jackal	Canis aureus	LC	+	+	+			+		+
5	Wild Cat	Felis silvestris	LC					+	+		
6	Desert Fox	Velpus cena	LC					+			+
Total				**1**	**3**	**1**	**1**	**4**	**3**	**1**	**2**
Small Mammals											
1.	Palm Squirrel	Funambulus pennantii	LC	+	+	+	+	+	+	+	+
2.	Crested Porcupine	Hystrix indica	LC		+			+	+		
3.	Common Bat	Pipistrellus kuhlii	LC	+	+	+			+		+
4.	Indian Field Mouse	Mus booduga	LC				+	+			+
5.	Indian Hedgehog	Paraechinus micropus	LC		+				+		
6.	Persian Jird	Meriones persicus	LC	+			+	+	+	+	
7.	Indian Gerbil	Tatera indica	LC	+						+	
8.	House Shrew	Suncus murinus	LC			+			+		
9	Khul's Bat		LC	+	+	+	+	+	+	+	+
Total				**5**	**5**	**4**	**4**	**5**	**7**	**4**	**4**
Reptiles & Amphibians											
1	Skittering Frog	Euphlyctis cyanophlyctis	LC		+			+	+		
2	Yellow-Bellied House Gecko	Hemidactylus flaviviridis	LC	+	+		+		+	+	+
3	Keeled Back Gacko	Hemidactylus brookii	LC	+		+				+	+
4	Bengal Monitor	Varanus bengalensis	LC		+		+	+	+		
5	Ground Agama	Trapelus agilis	LC	+					+	+	
6	Spotted Gecko	Hemidactylus maculatus	LC								+
7	Saw-Scale Viper	Echis carinatus	LC		+						
8	Indian Fringe-Fingered Lizard	Acanthodactylus cantoris	LC	+	+	+	+	+	+		+
9	Grass Skink	Eutropis macularia	LC			+		+			+
Total				**4**	**5**	**3**	**3**	**4**	**5**	**3**	**5**
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		+			+			+
5	Blue-throat	Luscinia svecica	LC		+	+			+		
6	Collared Dove	Streptopelia decaocto	LC	+	+	+	+	+	+	+	+
7	Common Babbler	Turdoides caudate	LC	+	+		+	+	+		+
8	House Crow	Corvus splendens)	LC	+	+	+	+	+	+	+	+
9	Common/Barn Swallow	(Hirundo rustica	LC				+	+			

S/N	English Name	Scientific Name	IUCN Status	Qasim Tok	Nali	Naing-II	Gabol	Dhall Dhoro	Tikko-II	Sureshi	Upper Mole-II
10	Crested Lark	Galerida Cristata)	LC	+	+	+	+	+	+	+	+
11	Hoopoe	Upupa Epops	LC		+		+	+			+
12	Indian House Crow	Corvus Splendens	LC	+	+	+	+	+	+	+	+
13	Indian House Sparrow	Passer Domesticus	LC	+	+	+	+	+	+	+	+
14	Indian Roller	Coracias Benghalensis	LC	+	+		+		+		
15	Jungle Babbler	Turdoides Striata	LC	+	+	+	+	+	+	+	+
16	Grey Shrike	Colluricincla Harmonica	LC		+	+		+	+		
17	Night Jar	Caprimulgus Asiaticus	LC			+					
18	Red Wattle Lapwing	Vanellus Indicus	LC	+	+	+	+	+	+	+	+
19	Sun Bird	Cinnyris Asiaticus	LC						+		
20	Grey Partridge	Perdix Perdix	LC		+	+			+		
21	Little Owl	Athene Noctua	LC								+
22	Black Sholder Kite	Elanus Axillaris	LC					+			
23	Common Myna	Acridotheres Ginginianus	LC	+	+	+	+	+	+	+	+
24	Blue Rock Pigeon	Columba Livia Domestica	LC	+				+	+	+	
25	Common Kingfisher	Alcedo Atthis	LC					+			
26	Pied Kingfisher	Ceryle Rudis	LC					+			
27	Flycatcher	Muscicapa Striata	LC	+		+	+	+			
28	Barhamni Kite	Haliastur Indus	LC	+				+			
29	Indian Cuckoo	Cuculus Micropterus	LC		+				+	+	
30	Yellow Wagtail	Motacilla Flava	LC	+			+	+			+
31	White Wagtail	Motacilla Alba	LC					+			
32	Grey Fantail	Rhipidura Albiscapa	LC		+						
Total				**16**	**18**	**13**	**15**	**24**	**18**	**11**	**14**

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, Saccharum griffithii, Zizyphus nummularia, Tamarix indica, stocksiana, and Capparis decidua. Details of the flora are provided in Table-18 below and photo gallery of fauna and their habitats in Figure-31.

Table 18: Flora in Kohistan Sub Projects

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

HABITAT OF THE STUDY AREA	
	
Habitat of Tikko-II Dam site	Habitat of Dhall Dhoro Dam
	
Qasim Tok Dam site	Naing-II Dam Site Habitat
	
House Sparrow In Common In All Sites	Green Beater Sub-Project Area
	
Red Wattled Lapwing In Study Area	Dove Is common in Kohistan Area

HABITAT OF THE STUDY AREA	
	
Black Red Start In Qasim Tok Area	Observed In Dhall Dhoro Area
	
Common Found In Sureshi and Tikho-II Area	Indian Monitor Lizard Observed In Nali Area
	
Brilliant Agama Found In Tikho-II Dam	House Gecko Found at All Dam Sites

Figure 31 : Picture Gallery of Kohistan Sub Project Areas

Fauna of Sub-projects Nagarparkar Area

During the field study of Bhansar Rathi dam four (4) large mammal species were observed including Desert fox and Grey Mongoose, Indian wild boar and Asiatic Jackal recorded from different locations near the dame area. All mammalian species area common and listed as Least Concern (LC) in IUCN red list. 4 small mammals recorded from micro habitats of same site are common and Least concern in IUCN list, during expedition in Bhansar Rathi dam site 7 reptiles and one frog species identified, among them Indian Star tortoise is Vulnerable (VU) and rare species found in the area, Star Tortoise is also protected by Sindh Wildlife department. 26

bird species were recorded from the dam site and its surrounding area, among them Indian Peafowl is one of the beautiful and important bird can be observed frequently near the human population, it is susceptible to infectious diseases and die by viral attack. Indian Peafowl is protected by protected by Sindh Wildlife Act 1972 and Indian wildlife law. Its status is Least Concern (LC) by IUCN red list 2018. Indian Peafowl is one of the beautiful and important bird can be observed frequently near the human population, it has susceptible to infectious diseases and die by viral attack. Detail of Fauna of Nagarparkar Sub Project Areas is given in below Table-19.

Table 19: Fauna in Nagarparkar Sub Project Areas

S/N	English Name	Scientific Name	Conservation by IUCN
Large mammals			
1	Grey Mongoose	Herpestes javanicus	LC
2	Asiatic Jackal	Canis aureus)	LC
3	Indian wild boar	Sus scrofa	LC
4	Desert fox	Vulpes bangalinces	LC
Small Mammals			
1	Palm squirrel	Funambulus pennantii	LC
2	Kuhls' bat	Pipistrellus kuhlii	LC
3	Hedgehog	Parachinus micropus	LC
4	Indian desert Jird	Meriones hurrianae	LC
Reptiles and Amphibian			
1	Skittering frog	Euphlyctis cyanophlyctis	LC
2	Yellow-bellied house gecko	Hemidactylus flaviviridis	LC
3	Keeled Back Gacko	Hemidactylus brookii,	LC
4	Bengal monitor	Varanus bengalensis	LC
5	Indian fringe-fingered lizard	(Acanthodactylus cantoris	LC
6	Indian Star tortoise (reported ZSD)	Geochelone elegans	VU
7	Keeled Back Gacko	Hemidactylus brookii	LC
Birds			
1	Indian Peafowl	Pavo cristatus	LC
2	Indian Koel	Eudynamys scolopaceus	LC
3	Ashy crowned finch-lark	Eremopterix griseus	LC
4	Bank Myna	Acridotheres ginginianus	LC
5	Grey Shrike	(Lanius excubitor	LC
6	Black Drongo	Dicrurus macrocercus	LC
7	Desert Lark	Ammomanes deserti	LC
8	Black winged Stilt	Himantopus himantopus	LC
9	Green Bee-eater	Merops orientalis)	LC
10	Blue-throat	Luscinia svecica	LC
11	Cattle Egret	Bubulcus ibis	LC
12	Collared Dove	Streptopelia decaocto	LC
13	Common Babbler	Turdoides caudate	LC
14	Common Crow Pheasant	Centropus sinensis	LC
15	Pied Kingfisher	Ceryle rudis	LC
16	Common Myna	cridotheres tristis	LC
17	Common/Barn Swallow	(Hirundo rustica	LC
18	Eastern Pied Wheatear	Oenanthe pleschanka	LC
19	Eurasian sparrow hawk	Accipiter nisus	LC
20	Hoopoe	Upupa epops	LC
21	Indian house crow	Corvus splendens	LC
22	Indian House Sparrow	Passer domesticus)	LC

S/N	English Name	Scientific Name	Conservation by IUCN
23	Indian Pond Heron	Ardeola grayil	LC
24	Little Egret	Egretta garzetta	LC
25	Indian peacock	Pavo cristatus	LC
26	Black Redstart	Phoenicurus ochruros	LC
VU = Vulnerable, LC = Least Concern			

Flora of Nagarparkar Sub-project Area

The common plants of Nagarpar sub-project area are (Euphorbia caducifolia), phog (Calligonum polygonoides), and (Calotropis gigantea). In irrigated tracts, Babul (or Babur), Acacica nilotica), Talhi (Dalbergia sissoo) Nim (Azadirachta indica), Jar (Salvadora oleoides), and Lai (Tamarix gallica) are found.

Sand dunes are represented by xerophytic plants because of their topographical features. They are all of deserted nature with the sandy soil makeup. The dominant and frequent species like Euphorbia caducifolia, Calligonum polygonoides, Aerva javanica, Salvadora oleoides, Indigofera spp., Aristida spp and Tribulus longipetalus were forming common vegetation on them. There is no previous report available on the vegetation of this area. Details of flora found in Nagarparkar Sub-projects areas are given in Table-19 and a photo gallery of fauna and their habitats are given in Figure 32.

Table 20: Flora of Nagarparkar Sub Projects Areas

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

Habitat of the Nagarparkar Area

Wild Habitat Of Site

Water Pond Near Dam Site

Indian Peafowl Near A Village

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

Common Myna Found Near Sb-Project Area

Green Beeeater Recorded Near Sub-Project Area

Habitat of the Nagarparkar Area

House Crow Is Common In Nagarparker Area

House Sparrow Recorded Near Sub-Project Area

Tree Squirrel Observed Different Sites Near Sub-Project Area

Desert Jird Observed Near Sub-Project Area

Figure 32: 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-20. A total of 139 mature and young trees including 23 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, 42 trees are of Kandi (Prosopis Cinereria) varying from 10-15 years of age (Mature) and 19 trees including young six months to 1 year of age. 74 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 21 : 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	Upper Mole-II	Sindhi Babur	Acacia nilotica	2	2	1	0
2	Sureshi	Kandi	Prosopis Cinereria	06	03	03	00
3	Tikho-II	Lai	Tamarix gallica	19	07	16	05
4	Gabol	Sindhi Babur	Acacia nilotica	01	0	01	0
5	Dhall Dhoro	Kandi	Prosopis Cinereria	1	0	1	1
6	Naing-II	Sindhi Babur	Acacia nilotica	18	08	16	10
7	Nali	Kandi	Prosopis Cinereria	35	20	15	15
8	Qasim Tok	-	-	0	0	0	0
9	Bhansar Rathi	Sindhi Babur	Acacia Nilotica	2	2	0	0
		Kandi	Procopius Cineraria	2	1	0	0
Sub total				**86**	**43**	**53**	**31**
Total Number of Existing trees				**139**			
Total Number of cut down trees				**74**			

3.6.3. Characteristics of Khirthar National Park

Khirthar National Park is Pakistan's second biggest National Park. It is also the first National Park from Pakistan to be included in the 1975 United Nation's list of National Parks around the world. Khirthar is an area of outstanding beauty and cultural heritage which provides important habitat for a variety of mammals, birds and reptiles characteristic of the arid subtropics. Approximately one third of the park lies in the north of Karachi district and two thirds in the south-west of Dadu district. The park is part of a 447,161ha protected areas complex, being contiguous with Mahal Kohistan Wildlife Sanctuary (70,577ha) to the south and Hab Dam Wildlife Sanctuary (27,219ha) to the south-west. Surjan, Sumbak, Eri and Hothiano Game Reserve (40,632ha) lies just to the east of the park. There are two tourist centers in the Park managed by Sind Wildlife Management Board, namely Khar and Karchat. The centers offer cottage and dormitory accommodation and guides are available. There are some 671km of non-metallic roads within the park, mostly are motor able only by 4X4-vehicle only.

3.6.4. Characteristics of Run of Kutch

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

Phoenicopterus minor).

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

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

4.1. Methodology

This section describes the socio economic condition of the subproject area. The socio-economic survey and social impacts assessment was made by ACE 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 SRP (previously DACREP) preparatory study. The previous data has now been updated through supplementary field visits by Mr. Nasir Ali Panhwar Social Safeguard Consultant (PMT), Mr. Sajid Ali Memon Social Officer, and Ms Marvi Memon Social Officer along with PISSC team which includes Mr. Naimatullah Khan Kakar (Sr. Sociologist) and Imran Ali Assistant Social Safeguard Specialist. 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 in 8 villages Dhal, Hairdin, Naingwal, Mole, Goth Mohammad Safar Bareja, Goth Khudana, Goth Faiz Mohammad and Goth Nabi Bux Bareja in Jamshoro district, 2 villages Murad Jamali and Mohammad Ali Jamali in Dadu district while 3 villages of Bhansar Rathi dam Goth Haji Ahmed, Goth Pir Bux and Goth Rathi in Tharparkar district. All of these 13 villages were within the primary impact zone. 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 location of villages visited is provided in Table-22.

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 22: Villages Visited for Socio-economic Baseline Data

S.No	Name of the Dam	District	Tehsil	UC	Villages	Co-ordinates	
						Northing	Easting
1	Dhall Dhoro	Jamshoro	Sehwan	Jhangara	Dhal	26,05.157N	067,46.058E
2	Gabol	Jamshoro	Sehwan	Jhangara	Hairdin	26,05.162N	067,45.219E
3	Naing-II	Jamshoro	Sehwan	Jhangara	Naingwal	26,14.30.55"N	067,39.47"E
4	Upper Mole -II	Jamshoro	Thana Bula Khan	Mole	Mole	25,24.358N	067,27.114E
5	Tikho-II	Jamshoro	Thana Bula Khan	Toung	Goth Mohammad Safar Bareja Goth Khudana Goth Faiz Mohammad	25,41.741N	067,38.472E
6	Sureshi	Jamshoro	Tana Bula Khan	Sari	Goth Nabi Bux Bharijo	25,31.734N	067,38.784E
7	Qasim Tok	Dadu	Johi	Tando Rahim Khan	Murad Jamali	26,33.931N	067,21.730E
8	Nali	Dadu	Johi	Wahi Pandi	Mohammad Ali Jamali	26,36.844N	067,23.727E
9	Bhansar Rathi	Tharparkar	Nagar Parkar	Pithapur	Rathi Village, Goth Pir Bux & Goth Haji Ahmed	24”34′45.19”N	070°50′26.29”E

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 language.

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 Dhall Dhoro-II, Naing-II, Nali, Qasim Tok, Gabol, Upper Mol-II, Sureshi, Thiko and Bhansar Rathi dams are 748 with a total population of 9062. Dhall Dhoro, Naing-II, Gabol, Uper Mole-II, Thiko-II and Sureshi dams are in Jamshoro district, Qasim Tok and Nali dams are in Dadu district while Bhansar Rathi dam is in Tharparkar district. Population of the Project area belongs to the Khaskhely, Burfat, Gabol, Nohani, Jamali, Bareja Kolhi and Samoon tribes. Khaskheli and Burfat are found on Upper Mole-II dam, Gabol is in Dhall Dhoro and Gabol dams, Nohani in Naing-II dam, Jamali in Nali and Qasim Tok dam, Bareja are in Sureshi and Tikho-II dams while Kolhi and Samoon are in Bhansar Rathi dam. Sindhi is the main language in the Sub-Project area although most men can also speak Urdu. The sub-project wise details are given in the Table-23.

Table 23: Population and Tribes on Sub-Projects

S.nr	Name of Village	Tribe /Clan	No of Households	Population	Total Land Owned Estimated (In Acres)	Source of Irrigation			Economic Activity	
						Tube well	Dug Well	Other	Primary	Secondary
Population and tribe on Sub-Project Dhal Dharo Dam										
1	Dhal	Gabol	8	202	400	0	9	Rain fall	Agriculture	Livestock
	Total		**8**	**202**	**400**	**0**	**9**			
Population and tribe on Sub-Project Naing II Dam										
1	Naingwal	Nohani	67	1043	1750	0	28	Rain fall	Agriculture	Livestock
	Total		**67**	**1043**	**1750**	**0**	**28**			
Population and tribe on Sub-Project Nali Dam										
1	Goth M.Ali	Jamali	28	413	971	17	0	Rain fall	Agriculture	Business /labor
	Total		**28**	**413**	**971**	**17**	**0**			
Population and tribe on Sub-Project Qasim Tok Dam										
1	Goth Mureed	Jamali	27	**759**	981	10	0	Rain fall	Agriculture	Labor
	Total		**27**	**759**	**981**	**10**	**0**			
Population and tribe on Sub-Project Gabol Dam										
1	Goth Gabol	Gabol	22	158	555	0	2	Rain fall	Livestock	Agriculture
	Total		**22**	**158**	**555**	**0**	**2**			
Population and tribe on Sub-Project Upper Mole Dam-II Dam										

1	Goth Mutal Khan	Khaskheli/ Burfat	32	369	1732	11	24	Rain fall	Agriculture	Livestock /Labor
	Total		**32**	**369**	**1732**	**11**	**24**			
Population and tribe on Sub-Project Sureshi Dam										
1	Goth Nabi Bux	Bareja/ Khaskheli	75	2000	967	6	0	Rain fall	Agriculture	Livestock /Labor
	Total		**75**	**2000**	**967**	**6**	**0**			
Population and tribe on Sub-Project Tikho Dam										
1	Goth Mohammad Safar	Bareja	12	110		2	0	Rain fall	Agriculture	Livestock /Labor
2	Goth Khudana	Bareja	8	70		0	0	Rain fall	Agriculture	Livestock /Labor
3	Goth Faiz Muhammad	Bareja	10	80		0	0	Rain fall	Agriculture	Livestock /Labor
	Total		**30**	**260**	**1000**	**2**	**0**			
Population and tribe on Sub-Project Bhansar Rathi Dam										
1	Goth Rathi	Kohli, Mangwar	226	1834	2812	0	0	Rain fall	Livestock	Agriculture /Labor
2	Goth Pir Bux	Samoon	195	1552	2146	0	0	Rain fall	Livestock	Agriculture /Labor
3	Haji Ahmed Goth	Samoon	38	472	675	0	0	Rain fall	Livestock	Agriculture /Labor
	Total		**459**	**3858**	**5633**	**0**	**0**			
	Grand Total		**748**	**9062**	**13989**	**46**	**63**			

4.4. Languages

Sindhi is the dominant language spoken in the project area, as 100 per cent of the population speaks Sindhi and 42.6 percent spoken Dhatki also. National language Urdu is spoken and understood by the majority of the people in the project area.

4.5. Family System

The majority of those in the study area live together with their extended families (parents living with married children and their families). Families believe this is a more economical way of living as they often work together on the same land and are able to share their joint incomes to support the entire family, including elderly relatives who are unable to work. It is also thought to be more efficient to share basic amenities such as water, electricity, housing and food rather than for each family to purchase immediately or from their own source. The sub-project wise details of population and average family size are given in Table-24.

Table 24: Population and Average family size in Sub-Projects

S.No	Village Name	Sub-project Name	Total Households	Total Population	Average Family size
1	Muhammad Ali Jamali Goth	Nali Dam	28	413	15.8
2	Mureed Jamali	Qasim Tok Dam	27	759	22.6
3	Naingwal	Naing-II Dam	67	1043	16.3
4	Matal Khan Goth	Upper Mole -II Dam	32	369	11.1
5	Goth Nabi Bux	Sureshi Dam	75	2000	26.6
6	Gabol Goth	Gabol Dam	22	158	6.7
7	Dhall	Dhall Dhoro Dam	8	202	6.7
8	Goth Safar Muhammad	Tikho-II Dam	12	110	9.1
9	Goth Khudana	Tikho-II Dam	8	70	8.7
10	Goth Faiz Muhammad	Tikho-II Dam	10	80	8
11	Goth Rathi	Bhansar Rathi	226	1834	8.1
12	Goth Haji Ahmed	Bhansar Rathi Dam	38	472	12.4
13	Goth Pir Bux	Bhansar Rathi Dam	195	1552	7.9
Total			**748**	**9062**	

4.6. Religious Affiliation

During the socio-economic field survey it was observed that 97.98 percent of the population are Muslim and 2.02 percent are Kolhi and Menghwar of Hindu community.

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, 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 95 per cent of the conflicts were resolved at village level. Those living within communities of the project area feel obliged to accept the decision of the village or tribal leaders.

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

4.9. Housing

The project area consists of rural population living comparatively in isolation. Majority of the population live in small settlements of five to ten houses. In Upper Mole-II 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 all other sub-projects area of Jamshoro and Dadu districts twenty to seventy houses are normally settled together. All huts house consists of wooden beams of all shapes and sizes, cover of thick date-palm mats and a layer of mud with clay plaster at the top. It was observed that all the people were living in self-owned houses.

Houses near Bhansar Rathi Dam site

Houses near Qasim Tok Dam site

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 1 girls Primary schools, in which the enrolment are 371 boys and 25 in girls Primary school. While there are two Middle Schools in Mole village for boys and girls. The enrolments in middle schools are reported 90 boys and 25 girls. Education facilities in the sub-project area are given inTable-25.

Table 25: Education Facilities in the Sub-Project Area

Name of Sub-project	Boys Primary School	Teachers	Enrolment	Girls Primary School	Teachers	Enrolment	Boys Middle School	Teachers	Enrolment	Girls Middle School	Teachers	Enrolment
Naing-II Dam	1	4	130	0	0	0	0	0	0	0	0	0
Gabol Dam	0	0	0	0	0	0	0	0	0	0	0	0
Dhall Dhoro Dam	0	0	0	0	0	0	0	0	0	0	0	0
Upper Mole -II	1	1	50	0	0	0	1	3	90	1	1	25
Tikho-II Dam	0	0	0	0	0	0	0	0	0	0	0	0
Sureshi Dam	1	1	40	0	0	0	0	0	0	0	0	0
Nali Dam	1	2	50	0	0	0	0	0	0	0	0	0
Qasim Tok Dam	1	2	60	1	2	25	0	0	0	0	0	0
Bhansar Rathi Dam	1	1	41	0	0	0	0	0	0	0	0	0
Total	**6**	**11**	**371**	**1**	**2**	**25**	**1**	**3**	**90**	**1**	**1**	**25**

4.12. Health Facilities

It was found that many of the people have suffered from hepatitis, typhoid, malaria, eye problems, diarrhoea and other hygiene related complaints. Sometime women die during delivery cases. Majority of the women are malnourished usually being the last ones to eat their meals in the family. Only one Basic Health Units (BHU) in Mole dam and 3 Dispensary reported in Nali dam, Sureshi dam and Qasim Tok dam sub-project area. In all other project areas, there is no any health facility like Basic Health Units (BHU), dispensary, midwifery centres and medical stores. The seriously ill patients are taken for treatment to Karachi, Hyderabad, Dadu, Jamshoro and Mithi civil / district hospitals.

4.13. Transport

Most of surveyed villages have an average 3.6 km village tracks or unsurfaced (Katcha) roads that are in bad condition except some of the villages. The construction and maintenance of village roads is the responsibility of local government. One Indus highway (N55) Jamshoro-Dadu passes along the sub-projects area of Kohistan region and a national highway Karachi to Nagarparkar passes along Tharparkar region. M9 Motorway connects Karachi and Jamshoro for sub-projects area of Jamshoro district.

The socio-economic baseline survey reveals that the major source of the human transport in the villages of the project area 44.4% is Buses, 66.6% Van/Pickups for the general public, 44.4% individual cars and in 100% villages use motor bikes. The farm inputs and outputs are transported through Trucks and Tractor Trolley. The animals from the sub-project areas transported to Hyderabad and Karachi by Trucks. The Firewood is also transported through Trucks and Trolleys. Transport facilities of sub-project area is given in Table 26.

Table 26: Transport Facilities in the Project Area

Name of Sub-project	Van/Pickup	Bus/Truck	Car	Motor Bike	Distance from Village to Main Road (km)
Naing-II Dam	1	1	1	1	4
Gabol Dam	1	0	0	1	4
Dhall Dhoro Dam	1	0	0	1	4
Upper Mole -II	0	1	1	1	1
Tikho-II Dam	0	0	0	1	4
Sureshi	1	1	0	1	4
Nali	1	0	1	1	4
Qasim Tok	0	0	0	1	4
Bhansar Rathi Dam	1	1	1	1	1
Percentage (%)	**66.6**	**44.4**	**44.4**	**100**	**3.6**

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 all sub-project areas.

4.15. Energy Sources

Electricity is available in 30.6 per cent households, while 69.4% households of the project area are without electricity. The households having electricity utilize mainly for lighting of the houses and operation of tube wells for drinking water supplies and irrigation etc. While Gabol, Dhall Dhoro, Tikho-II and Bhansar Rathi dams project area are not connected with national grid. The area people collect firewood from the surrounding area and some people purchase firewood from nearby town. The fire wood per 40 kg cost is Rs.250. Moreover, use of solar system for irrigation purpose was also witnessed in some sub-project area.

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 sweet and good quality in the sub-project areas. While in Bhansar Rathi dam area there is no any drinking water source the villagers use the rain water stored in earthen reservoir. Survey results showed that in all sub- project area the drinking water source was their irrigation tube wells, while in Upper Mole-II and Qasim Tok sub project area hand pumps are additional source of drinking water. The water level was observed 270 – 25 ft deep. Villagers of Qasim Tok sub project reported that their tube wells water is brackish and they use hand pumps water for drinking purpose.

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-27.

Table 27: Drinking Water Sources in the Sub-Project Areas

Sr. No	Name of the Dam	Hand Pumps	Drinking	Number of Tube-Wells and Use			Piped Water	Purchasing Water Tankers
				Number	Drinking use	Irrigation use		
1	Naing-II	0	×	28	✓	✓	0	×
2	Gabol	0	×	2	✓	✓	0	×
3	Dhall Dhoro	0	×	9	✓	✓	0	×
4	Upper Mole -II	200	✓	35	✓	✓	0	×
5	Tikho-II	0	×	2	✓	✓	0	×
6	Sureshi	0	×	6	✓	✓	0	×
7	Nali	0	×	17	✓	✓	0	×
8	Qasim Tok	7	✓	10	✓	✓	0	×
9	Bhansar Rathi	0	×	0	×	×	0	0
Total		**207**		**109**			**0**	
Percentage			**25**		**78**	**78**		**0**

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 9 villages detail of which is given in Table 28. 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.

Focus group interview in Qasim Tok sub-project area

Women fetching water in Sureshi sub-project area

Table 28: Location of conducted cluster meetings with females

Name Of Village	Name Of Dam	Co-ordinates	House Holds (No)	Income and Skills	Education Level	Women Rights	Health and Hygiene	Income Source
Dhall	Dhall Dhoro	N 26°05′157" E 067°46.058"	8	Embroidery	0 %	poor	poor	Livestock and agriculture
Naingwal	Naing-II	N 26°14′30.55" E 067°30′39.47"	67	Embroidery	0 %	poor	poor	Embroidery, poultry and agriculture
Mohammad Ali Jamali Goth	Nali	N 26°36.844" E 067°23.727"	28	Embroidery	0 %	poor	poor	Embroidery, poultry and agriculture
Mureed Jamali	Qasim Tok	N 26°33.931" E 067°21.730"	27	Embroidery	0 %	poor	poor	Embroidery and agriculture
Goth Gabol	Gabol	N 26°05.162" E 067°45.219"	22	Embroidery	0 %	poor	poor	Embroidery poultry and agriculture
Matal khan Goth	Upper Mole-II	N 25°24.358" E 067°27.114"	32	Embroidery	0 %	poor	poor	Embroidery poultry and agriculture
Goth Nabi Bux	Sureshi	N 25°31.734" E 067°38.784"	75	Embroidery	0 %	poor	poor	Livestock and agriculture
Goth Mohammad Safar Goth Khudana Goth Faiz Mohammad	Tikho-II	N 25°41.741" E 067°38.472"	30	Embroidery	0 %	poor	poor	livestock and Agriculture
Rathi	Bhansar Rathi	24"34′45.19"N 070°50′26.29"E	459	Embroidery	0%	poor	poor	Livestock raring and Agriculture

All women living within the sub-project areas were found illiterate. Only one girl's middle school reported in Mole-II sub-project area and only 25 girls of the village attending the school. Overall the total educated population of the project area, only 0.7% 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.

The time consumed on fetching water in each village by the women varies from area to area i.e. Tharparkar and Kohistan. For instance in Tharparkar area it takes three to four hours to fetch water, while in Kohistan, it takes about one to two hours. The time to fetch water would be decreased considerably as with the completion of sub projects fresh groundwater aquifers would be recharged.

4.18. NGOs

During the field survey it was observed that only two NGOs: were reported working in the project area (Baanh Beli and Thardeep Rural Development Program TRDP). The NGOs working in the area along with their area of interest are detailed in Table-29.

Table 29: NGOs working in Sub-project Area

NGO working in the village								Currently, any major development projects under implementation	What are the Social Impacts of these projects
Name of Village	Name of Sub-Project	yes	no	Working Area of Interest.					
				Health	Education	Micro credit	others		
Naingwal	Naing-II Dam	1	0	0	1	0	0	0	0
Hairdin Goth	Gabol Dam	0	1	0	0	0	0	0	0
Dhall Dhoro	Dhall Dhoro Dam	0	1	0	0	0	0	0	0
Matal Khan Goth	Upper Mole -II	1	0	1	0	0	0	0	0
Goth Mohammad Safar Khan	Tikho-II Dam	1	1	1	1	0	0	0	0
Goth Khudana	Tikho-II Dam	1	0	1	1	0	0	0	0
Goth Faiz Mohammad	Tikho-II Dam	1	0	1	1	0	0	0	0
Goth Nabi Bux	Sureshi Dam	1	0	0	0	0	0	0	0
Goth Mohammad Ali Jamali	Nali Dam	0	1	0	0	0	0	0	0
Goth Mureed Jamali	Qasim Tok Dam	0	1	0	0	0	0	0	0
Goth Pir Bux	Bhansar Rathi Dam	1	0	0	0	0	1	0	0
Goth Haji Ahmed	Bhansar Rathi Dam	1	0	0	0	0	1	0	0
Goth Rathi	Bhansar Rathi Dam	1	0	0	0	0	1	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.

The sub-project wise needs are given in the following Table-30.

Table 30: Priority Needs of the Male Community Members in Sub-project Area

Name of Dam	Drinking Water	Education	Link Road	Health	Electricity	Gas Connection	Employment
Naing-II	×	✓	×	✓	×	×	×
Gabol	×	✓	×	✓	×	×	×
Dhall Dhoro	×	✓	×	✓	×	×	×
Upper Mole -II	×	✓	×	✓	×	×	×
Tikho-II	×	✓	×	✓	×	×	×
Sureshi	×	✓	✓	✓	×	×	✓
Nali	×	✓	×	✓	×	×	×
Qasim Tok	✓	✓	✓	✓	×	×	×
Bhansar Rathi	✓	✓	×	✓	×	×	×

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 facilities 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 9 archaeological sites situated in sub-projects district areas. The names and number of nearby archaeological sites are given in the Table-31. The Archaeological Site Map is given as Figure 33.

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 31: Major 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
6	Jain Temple	Vira Wah	Tharparkar	20
7	Ranni Kot Forte	Sunn	Jamshoro	60-70 Km away from all sites
8	Tomb of Yar Muhammad Khan Kalhoro	Dadu	Dadu	50 Km away from Qasim Tok and Nali Dams
9	Tom of Lal Shahbaz Qalandar	Sehwan	Jamshoro	35 Km away from Gabol and Dhall Dhoro

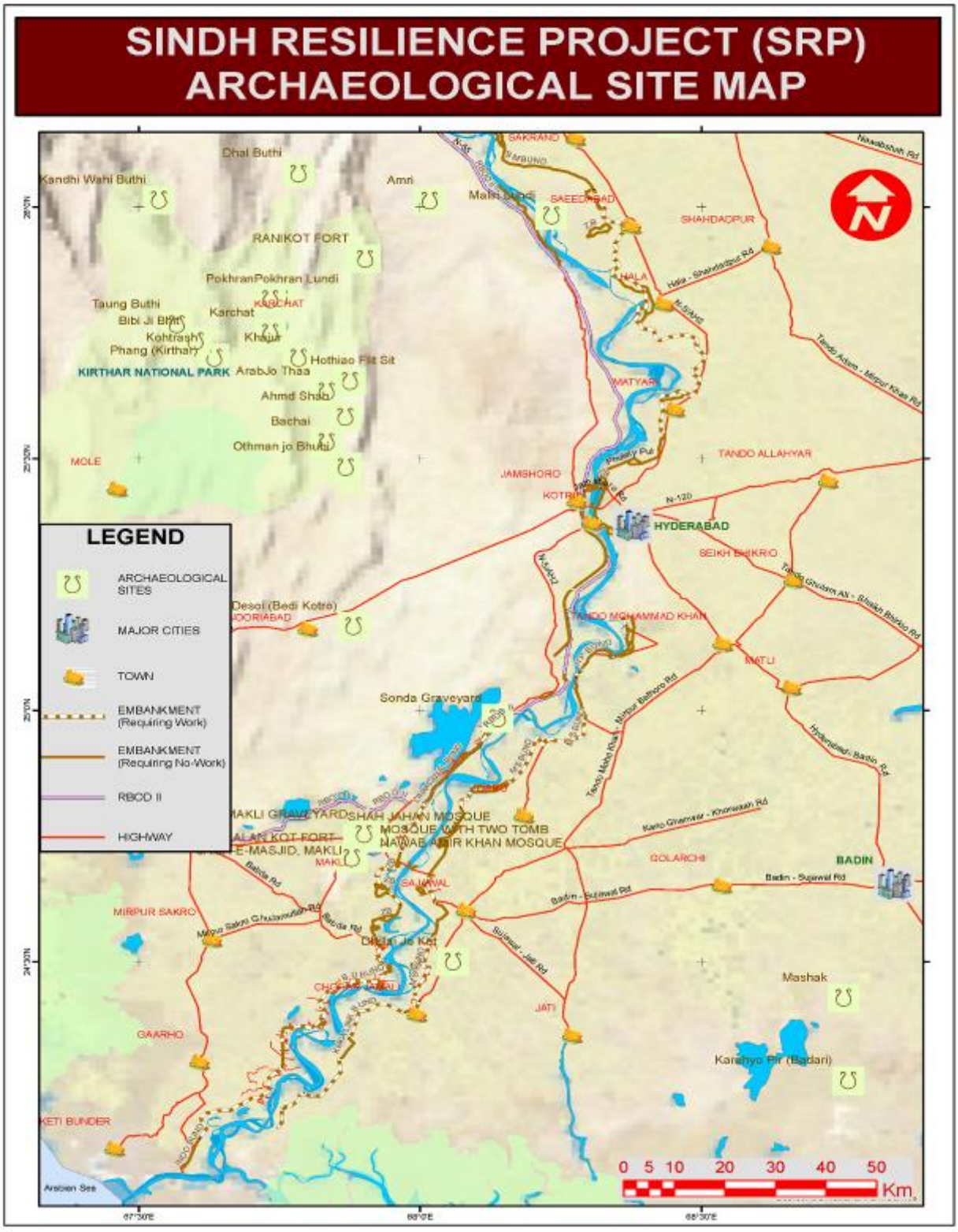


Figure 33: Archaeological Map of the Subproject Area

5. STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

5.1. Consultation

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

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 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

The first consultation was carried out during field visits conducted on 16/03/2016 to 06/04/2016. Field team comprising ESMU members PMT- SRP, staff of PISSC along with staff of concerned sub-divisions of SID visit 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 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 drought. Team told that execution of subproject will ensure welfare of human lives as well as livestock.

Moreover, another round of consultation was undertaken in January, March, June and August 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
A	**Bhansar Rathi Dam**		
1	Goth Rathi	16/1/2018	4
2	Goth Haji Ahmed	16/1/2018	6
3	Goth Pir Bux	16/1/2018	3
B	**Tikho-II Dam**		
1	Goth Mohammad Safar bareja	02/08/2018	6
2	Goth Khudana	02/08/2018	
3	Goth Faiz Mohammad	02/08/2018	
C	**Sureshi Dam**		
1	Goth Nabi Bux	02/08/2018	4
D	**Upper Mole -II Dam**		
1	Matal Khan Goth	18/3/2016	3
E	**Gabol Dam**		
1	Hairdin Goth	25/6/2018	5
F	**Dhall Dhoro Dam**		
1	Dhall	25/6/2018	4
G	**Nali Dam**		
1	Goth Mohammad Ali Jamali	26/6/2018	5
H	**Qasim Tok Dam**		
1	Goth Mureed Jamali	26/6/2018	8
I	**Naing-II Dam**		
1	Naingwal	27/6/2018	6

Figure 34: Consultation with Residents of Village Muhammad Ali Jamali at Nali Dam

Figure 35: Consultation with Residents of Village Mureed Jamali near Qasim Tok Dam

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.

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-32.

Table 32: List of Villages and Number of Participants visited by Female Sociologist

S#	Name of Village	Date	No of Participants
A	**Naing-II Dam**		
1	Naingwal	20/3/2016	13
B	**Gabol Dam**		
1	Hairdin Goth	16/3/2016	7
C	**Dhall Dhoro Dam**		
1	Dhall	16/3/2016	6
D	**Upper Mole -II Dam**		
1	Matal Khan Goth	21/3/2016	8
E	**Tikho-II Dam**		
1	Goth Safar Bareja, Goth Khudana and Goth Faiz Mohammad	21/4/2016	5
F	**Sureshi Dam**		
1	Goth Nabi Bux	22/3/2016	9
G	**Nali Dam**		
1	Goth Mohammad Ali Jamali	23/3/2016	15
H	**Qasim Tok Dam**		
1	Goth Mureed Jamali	23/3/2016	11
I	**Bhansar Rathi Dam**		
1	Goth Rathi, Goth Haji Ahmed and Goth Pir Bux	12/10/2017	29

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.

Figure 36: Female Sociologist while consultation with women of Naing-II Dam

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.

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. Impacts and Mitigations

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

6.1.4. Health and Safety Related Mitigations.

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

- The contractor will have to prepare an Occupational Health and Safety 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 maintain workers hygienic conditions in labour camps
- The Contractor shall make available the First aid kit with adequate medicines and bandages at all the times and all the sites. The location of these kits shall be clearly marked and shall be easy to access by all.
- No private property without permission of the owner will be used for transportation;
- Drivers will fix net on containers while transporting stones and soil etc.
- Community liaison will be maintained during construction stage and GRM will be established to address complaints related to safety hazards.

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

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 Pollution Mitigation Measures

The air related mitigation is discussed as follows,

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

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

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 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-33.

Table 33: Site Wastes

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

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

ii) Anticipated Aquatic and Terrestrial Life

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

- **Impact on Reservoir Area**

Reservoir area houses the population of plants, animal habitats, and reptile animals except fish fauna due to non-perennial system in the reservoir. Reservoir area of three dams located in Kirthar National Park are not exceeding 0.33 Sq.km, however Kirthar National Park is wide spread over 3087 sq.kms. Keeping in view the small / negligible area involved in construction it may be inferred that wildlife of Kirthar National Park would migrate naturally. In addition to that it will be ensured that construction activities will be confined in the designated area. So, there would be no major effect on them during construction stage. After the construction of the Dams, 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.

- **Impact on Command/Lower Riparian**

The dams in Kohistan area, i.e. Upper Mole-II, Sureshi, Tikho-II, Gabol, Dhall Dhoro, Naing-II, Qasim Tok and Nali will be constructed on well-defined nais (rivers). In order to quantify the impacts of small dam ratio of reservoir capacity against mean annual flow is estimated, as given below.

Dam	Reservoir Capacity (Ac-ft)	Mean Annual Flow (Ac-ft)	Ratio of Reservoir Capacity against Mean Annual Flow (%)
Upper Mole-II	139	8924	1.55
Sureshi	126	797	15.80
Tikho-II	116	3994	2.90
Gabol	87	788	11.0
Dhall Dhoro	110	3619	3.03
Naing-II	226	20261	1.11
Qasim Tok	1107	18670	5.9
Nali	113	380	29.7

The above table reveals that ratio of reservoir capacity against mean annual flow of eight dams Upper Mole-II, Sureshi, Tikho-II, Gabol, Dhall Dhoro, Naing-II, Qasim Tok and Nali dams varies in the range of 1.1 to 29.7 %.

The nine dams can be categorized in three groups. The five recharge dams including Dhall Dhoro, Gabol, Naing-II, Nali and Qasim Tok will be constructed on the tributaries of Manchhar Lake. These nais recharge the groundwater on the way and sometimes spread on banks. The combined reservoir storage capacity of these dams is 1,738 acre-ft. As an average year, these dams will be reducing flows to Manchhar by that amount annually. However it may be noted that the sources of water for feeding Manchhar Lake are; Indus River, hill torrents and Main Nara Valley Drain (MNVD). The water availability of Manchhar Lake from above sources is 862,000 Ac-ft, as given below.

Inflow Source	Existing Inflows to Manchhar Lake (Acre-ft)
Naing and Jhal Nai Systems	106,000
Shol Nai System (including Nai Gaj Flows)	178,000
Indus River	83,000
MNV Drain	661,000
Total	**1,028,000**
Evaporation Loss	(166,000)
Net Water Availability	**862,000**

The quality of these sources is good except MNVD. The water availability of Manchhar Lake from above sources is 862,000 Ac-ft. In above five dams, only 0.20% of water availability of Manchhar Lake will be diverted. However, a part of sub-surface flow will also join Manchhar Lake. Thus, construction of these dams will not have any significant impact on lower riparian.

Sureshi, Tikho-II and Upper Mole-II will be constructed on the tributaries of Malir River. The combined reservoir storage capacity of these dams is 393 acre-ft and the mean annual runoff of Malir River is 60,720 acre-ft. In these three dams only 0.65% of Malir River inflow will be stored as groundwater. Since these dams are recharge dams, the groundwater will ultimately join Malir River and no significant impact on lower riparian is envisaged. The water to be diverted and water availability of Manchhar Lake / River of recharge dams are given below.

S.No	Dam	Water to be Diverted by the Dams (Ac-ft)	Water Availability of Manchhar Lake / River (Ac-ft)	Ratio of Water to be Diverted by the dams against Water Availability of Manchhar Lake
1	Dhall Dhoro	87		
2	Gabol	110		
3	Naing-II	226		
4	Nali	67		
5	Qasim Tok	1,248		
	Sub-total	**1,738**	**862,000**	**0.20%**
6	Sureshi	126		
7	Tikho-II	128		
8	Upper Mole-II	139		
	Total	**393**	**60,722**	**0.65%**

The ratio of reservoir capacity of Bhansar Rathi Dam has appreciable size of reservoir as compared to mean annual inflows as given below:

Dam	Water to be Diverted by the Dams (Ac-ft)	Water Availability of Manchhar Lake (Ac-ft)	Ratio of Water to be Diverted by the dams against Water Availability of Manchhar Lake
Bhansar Rathi	2,416	1,900	127

It may be noted that Bhansar Rathi dam will be storing almost all of flows along the runoff area. This dam will store the rain water before it is released into salty marshes of Rann of Kutch.

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-37. The total catchment area of Rann of Kutch is spread on 1810 sq.-miles. The total catchment areas of the Bhansar Rathi Dam sub-project of Nagarparkar are 8.46 sq. Miles.

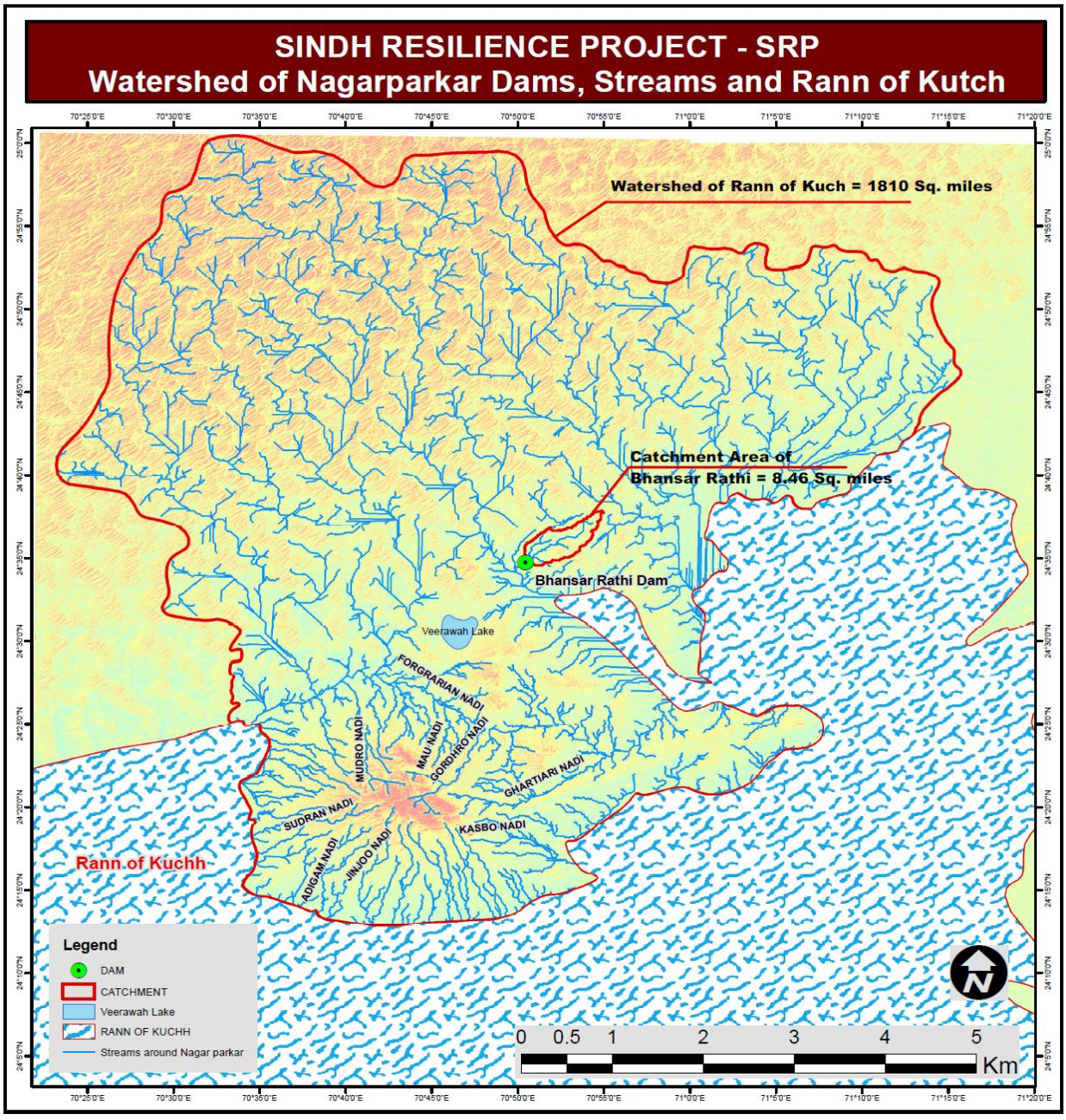


Figure 37: Watershed of Nagarparkar Dam, streams and Rann of Kutch

As the catchment area of Bhansar Rathi is only 0.50% of the total watershed area of the marshy lands of Runn of Kutch in project vicinity. Bhansar Rathi dam will harvest annually mean flow of about 1,900 Ac-ft. out of total inflows of 320,000 Ac-ft. which is only 0.6%.

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

marshes due to construction of these dams. Thus there will be negligible impact of the sub-projects on eco-system of marshy lands.

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 drinking and domestic purposes. It will bring revolutionary improvement of the ecosystem in the area and livestock of the area would benefit since there would be enough water and food.

- **Impacts of Dam Breach**

The study of dam break for 9 dams was done as a part of detailed design by PISSC. In their report titled “Detailed Design Vol - I (Phase-II Dams) August 2018 the following results are in table: 34 given below.

Table 34: Summarized Results for Dam Break Study

Sr. No.	Description	Dhall Dhoro	Gabol	Naing-II	Nali	Qasim Tok	Sureshi	Upper Mole-II	Tikho-II	Bhansar Rathi
1	**Flood Volumes**									
1.1	Reservoir Volume at Normal Reservoir Level or Dam Breach Volume (Acre-ft)	87	110	226	67	1,248	126	139	128	2,416
1.2	Design (100-year) Flood Hydrograph Volume (Acre-ft)	1,240	9,491	32,446	13,320	609	985	12,193	10,669	4,525
1.3	Combined volume: Dam Breach+100-year Flood (Acre-ft)	1,327	9,601	32,672	13,387	1,856	1,111	12,332	10,797	6,941
2	**Discharge Peaks**									
2.1	Case 1: Breach Hydrograph Peak (cfs)	4,975	4,399	8,575	792	6,448	6,448	4,602	5,681	7,477
2.2	Case 2: Design (100 year) Flood Peak (cfs)	1,993	7,764	17,039	8,420	1,262	1,557	5,125	4,857	3,382
2.3	Case 3: Combined : Dam Breach + 100 year Flood (cfs)	6,968	12,163	25,614	9,212	7,710	8,005	9,727	10,537	10,859
3	**Inundated Area (Sq.Miles)**									
3.1	Case 1: Dam Breach only	1.75	0.23	0.20	0.10	5.05	2.96	1.88	2.11	1.27
3.2	Case 2: Design (100-year) Flood only	3.13	18.47	47.37	11.76	1.54	2.82	31.99	30.76	1.12
3.3	Case 3: Combined : Dam Breach + 100 year Flood	4.69	20.91	48.51	13.30	5.64	3.91	33.03	32.22	1.67
4	**Estimated Population Affected According to Land Scan Population Grid**									
4.1	Case 1: Dam Breach only	126	28	66	28	3,692	1,887	836	452	134
4.2	Case 2: Design (100-year) Flood only	3,950	11,120	14,910	13,020	950	1,799	64,587	3,599	122
4.3	Case 3: Combined : Dam Breach + 100 year Flood	4,062	11,136	14,966	13,040	3,942	1,997	65,746	3,828	148

It can be noted that except Qasim Tok and Bhansar Rathi Dams, the reservoir sizes of all other seven (7) dams are small in volume. Thus areas inundated by breach of dams are small and consequently the population affected in case of dam breach only is small. Therefore the incremental impact of dam breach on 100-year design flood is not appreciable. The number of population affected depends on the human settlements downstream of the dam. In case of Upper Mole-II Dam appreciable population may be affected in event of high flood. The reason is that flows from Mole River enter into Malir River, which passes through Malir Town and some parts of Karachi City. An emergency preparedness plan will be prepared for Upper Mole-II dam.

6.1.10. Water Related Mitigations

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

Moreover, the Contractor must provide the following facilities at each 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.
- Proper collection and disposal of water used for construction (to be contractor's responsibility).
- Collection drains and oil interceptors.
- Regular monitoring of water quality shall be carried out by the PISSC and ESMU of PMT.
- Contractor will purchase water from nearby available resources as well as dig his own well.
- Water consumption will be monitored during construction stage and record will be maintained to avoid any wastages.
- Sewage treatment facilities to be provided to treat the 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.
- 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. 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 and livestock will increase significantly.

6.2.2. Land and Property Value

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

6.2.3. Development of Borrow Land

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

6.2.4. Reclamation of Land

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

6.2.5. Development of Roads

For the transportation of construction material, equipment and heavy machinery the existing Motorway M9 from Karachi to Hyderabad and 40 km link roads from Motorway will be used for Upper Mole-II, Sureshi and Tikho-II sites. From Jamshoro to Dadu and Sehwan N55 Highway will be used for Dhall Dhoro, Gabol, Naing-II, Qasim Tok and Nali Dams. While National Highway N5 Karachi to Nagarparkar via Thatta and Badin and from Nagarparkar to dam site is 30 Km link road will be used. No permanent or temporary roads therefore required to be constructed for accessibility of the dam-site.

6.2.6. Land Use Changes

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

6.2.7. Biodiversity

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

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

Moreover, as the catchment area of Bhansar Rathi proposed Dam in Nagarparkar is only 0.50% of the total watershed area of the marshy lands of Runn of Kutch in project vicinity. It may be noted that Bhansar Rathi dam will harvest annually mean flow of about 1,900 Ac-ft. out of total inflows of 320,000 Ac-ft. which is only 0.6%. Hence, it may be concluded that, there will be no impact on Indian tortoise or any other species due to project activities.

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

However, three proposed dam sites are located in Khirthar National Park for which NOC has been obtained from Sindh Wildlife Department. Since, three dam sites (Upper Mole-II, Sureshi and Tikho-II) are not exceeding 0.33 sq.km however Khirthar National Park is wide spread over 3087 sq-kms, keeping in-view small area of dams, it is envisaged that biodiversity of Khirthar National park will not be affected. However mitigation measures mentioned in Table- 35 has been suggested are also integrated in the ESMMP Table: 38, which will be dovetailed and implemented with Khirthar National Park plan.

After the creation of reservoirs diverse wildlife including migratory birds may be attracted.

Table 35 Mitigation Measure for Khirthar National Park

Area	Mitigation Measure	Responsibility
Construction Mitigation Measures	Construction activities will be confined in the designated areas Prior to entry into the park, heavy equipment will be cleaned to prevent importation of non-native plant species, hydraulic fittings will be tighten , and it will be ensured that hydraulic hoses are in good condition and shall be replaced and repaired if petroleum leaks observed.	Contractor, PISSC and PMT
	Prior to entry in the park, all major Environmental parameters will be checked and ensured that impacts stay within the parameters of the project area and do not escalate beyond the scope of the environmental assessment.	Contractor, PISSC and PMT
	It will be ensured and implemented that the project remains within the parameters of Sindh Environmental	Contractor, PISSC and PMT

Area	Mitigation Measure	Responsibility
	Quality Standards.	
	Orientation of project will be provided to all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working.	Contractor, PISSC and PMT
	Proper and timely maintenance will be provided for vehicles and equipment used during construction to reduce the potential for mechanical breakdowns	Contractor, PISSC and PMT
	It will be ensured that all construction equipment has functional exhaust/muffler systems.	Contractor, PISSC and PMT
	Truck and related construction equipment speeds will be limit in active construction areas to a maximum of 15 KM/hr and strictly adhering to park regulations and posted speed limits in other areas while inside park boundaries.	Contractor, PISSC and PMT
	Water bowsers will be used to control excess airborne particulates at staging areas, active construction zones, and unpaved roads leading to/from active construction areas.	Contractor, PISSC and PMT
Near Wildlife Habitats	Effects of light and noise on adjacent habitat shall be limited through controls on construction equipment.	Contractor, PISSC and PMT
	Adequate education will be provided and enforcement to limit construction worker activities that are destructive to wildlife and habitats.	Contractor, PISSC and PMT
	Firing any gun or doing any other act which may disturb any animal or bird shall be prohibited which interferes with the breeding places.	Contractor, PISSC and PMT
	Noisy work shall be performed (such as the operation of heavy equipment) between the hours of 6:30 a.m. and 5:00 p.m. to minimize disruption to nearby community.	Contractor, PISSC and PMT
Waste Management Measures	Trash will be properly secured during the workday and all trash shall be removed from site at the end of each workday.	Contractor, PISSC and PMT
Breaking up of Land for Cultivation or	It will ensured that, project acvities will remain isolated as per design excavations, no other activities will be permitted.	Contractor, PISSC and PMT

Area	Mitigation Measure	Responsibility
mining purpose		
Polluting water flowing in and through the National Park	Potential impacts related to water pollution sources have been identified and their mitigation measures also proposed in section 6.1.9 (Table -33) and 6.1.10	Contractor, PISSC and PMT

6.2.8. Watershed Erosion and Sedimentation

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

6.2.9. Downstream Erosion and Siltation

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

6.2.10. Wastewater Discharge

Domestic wastewater from the contractor's camp will be collected in the septic tanks, before reaching top level treated water will be collected in the water tanker then after same water will be used for sprinkling purpose on the haul routes to settle down the dust. Therefore, no adverse impact is foreseen in the area.
However the design of septic tanks will be done during construction stage by contractor on the basis of occupancy in the camp and same will be ensured in Contractors' ESMP.

6.2.11. Socio Economic Impacts

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

i) Population and Settlement Pattern

During the construction stage considerable job opportunities will be created. For skilled jobs people from other parts of the country would be employed. There would be some temporary increase in the visitor population who would however leave the area after the completion of the construction activities. During the operation stage no adverse impact is envisaged.

ii) Human Resource Development

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

iii) Impacts of Labor Employed from Outside

Some social impacts could arise due to labour influx, people can migrate to the project area in addition to the labour force, thereby exacerbating the problems of labour influx. There shall also be a risk to community health from HIV/AIDS or other transmitted infections as a result of the presence of a migrant construction labour. There could be risk of gender based violence from the migrant labour, who often remain away from home on the site. This may lead to inappropriate behaviour including sexual harassment of women girls and boys of the local community. Problem of child labour could also arise due to increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

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

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

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

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

iv) Socio Economic Uplift

During the construction stage of the sub-project socio economic condition of the population of the area may improve as a result of increase in per capita income through creation of direct and indirect opportunities of jobs. During operation stage, 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 of both regions have never used the flood water for irrigation purpose, the main reason being that the command areas have used either direct rain or wells. The five recharge dams of upper Kohistan including Dhall Dhoro, Gabol, Naing-II, Nali and Qasim flows to Machhar Lake which is only 0.21% of total water of Manchhar lake and rest of three dams of upper Kohistan Sureshi, Tikho-II and Upper Mole-II will be constructed on the tributaries of Malir River which is 0.65% of Malir River annual runoff. Furthermore, the flood water of Bhansar Rathi go waste without its efficient use into the Rann of Kutch.

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

7. GRIEVANCE REDRESS MECHANISM (GRM)

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

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

7.1 Public Complaints Centre

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 Deputy Commissioner Jamshoro, Dadu 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 Jamshoro, Dadu 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 Specialists of PMT, Senior Engineer from PMT, Representative of DC office of Jamshoro, Dadu 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.

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-38 and described below.

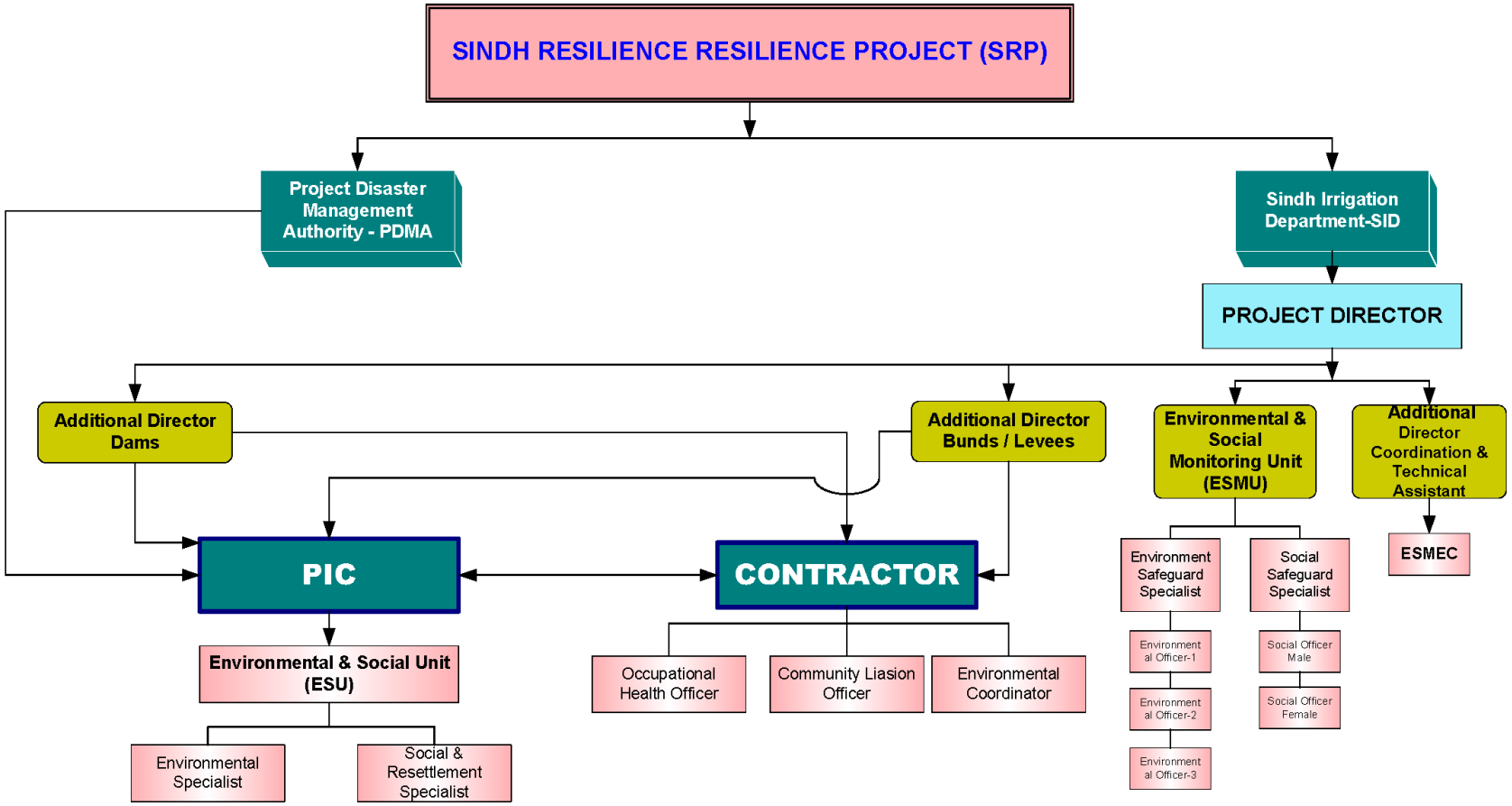


Figure 38: Organizational Chart of Sindh Resilience Project

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 (E.CoP)

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

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 Section 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. Plan shall also include Environmental effects monitoring.

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 of Hazardous Materials

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

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-36 given below.

Table 36: 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 types of trainings for nine dams are to be conducted throughout the life of sub- projects. Each training will cost about 150,000 rupees. Total Budget is 1,350,000.

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 Emergency Preparedness Plan in case of Dam Break

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

8.6 Mitigation and Monitoring

Mitigation measures for reduction of environmental degradation and social impacts especially relating to air quality, soil contamination, pollution of water resources, loss of habitat and disruption to wildlife will need to be implemented and monitored. Monitoring tasks will vary over the construction and operation stages of the sub-projects. Physical, biological and socio-cultural parameters will be measured/monitored to determine compliance with national and international standards and compliance with the ESMP itself. Monitoring during the construction phase will largely consist of compliance with mitigations identified in Section 8. Table 35 presents the mitigation and monitoring plan.

8.7 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-35.
To aid the monitoring process, the Contractor will complete the following:

- Submit the plans detailed earlier in Section 8.
- Train construction staff for the implementation of the ESMP and safety measures.
- Submit various progress reports to the Environmental and Social Specialists of PISSC and ESMEC.
- Explain 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 35 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;
- Installation of signage regarding community health and safety
- Safety at workplaces and working hours during construction;
- Incidence of liquid/solid waste in the vicinity of work camps (type and amount of waste, amount, interference with local residents, fauna, flora and crops);
- Plantation of saplings of new trees against trees cut
- Survival rate of saplings of new trees
- Arrangements made at construction sites for protection of floral and faunal resources
- Assurance of installation of signage regarding community health and safety

(ii) Environmental Effects Monitoring

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

8.8 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.

8.9 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.

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

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

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

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

8.10 Environmental and Social Management and Monitoring Cost

It is estimated that 74 trees will be felled for the construction of the above mentioned 9 dams. The replanting of 5 times trees to this number would cost Rs 370,000 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-37 below.

Table 37: Cost of Environmental / Social Management and Monitoring

Items	Unit Cost	No of Units	Estimated
A. Upper Mole-II Dam			
Training (Different trainings for 50 persons)	3000	50	150,000
Generators & Construction Machinery Stack +Noise Monitoring	7000	26	1050,000
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	**6,722,400**		
Contingency Cost 10%	**672240**		
Total	**7,394,640**		
B. Nali Dam			
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

Items	Unit Cost	No of Units	Estimated
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. Sureshi Dam			
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. Tikho-II Dam			
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**		

Items	Unit Cost	No of Units	Estimated
Contingency Cost 10%	**674,840**		
Total	**7,423,240**		
E. Dhall Dhoro Dam			
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. Gabol Dam			
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 Lac for each person) three different persons will be deputed on site)	300,000		
Subtotal	**6,848,400**		
Contingency Cost 10%	**684,840**		
Total	**7,533,240**		

Items	Unit Cost	No of Units	Estimated
G. Naing-II Dam			
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 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**		
H. Qasim Tok Dam			
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 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**		
I. Bhansar Rathi 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 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**		
Total of A+B+C+D+E+F+G+H+I	**67,458,160**		
Compensatory tree Plantation	**370,000**		
Total Cost	**67,828,160**		

Table 38: Environmental, Social Management and Monitoring Plan

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

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	Conflicts arising due to mixing of local and migratory job seekers.	Preference to provide jobs to local job seekers; Motivation to the workers for a good workmanship.	Jobs will be given to locals; Any complaint will be registered in complaint box.	Fortnightly	Monitoring by PISSC/PMT
Workers safety and hygienic conditions	Health risks due to unsafe and unhygienic living environment	Preparation and implementation of OHS Plan. Safety measures taken by the contractor such as installation of firefighting equipment, safe storage of hazardous material, fencing, provision of first aid facilities etc.; Contingency measures in case of accidents; Obligatory insurance of contractor's staff and laborers against accidents; Provision of adequate sanitation, washing, lighting, cooking and dormitory facilities. OHS trainings to construction and camp staff.	Approved OHS Plan. Evidence of OHS trainings conducted. Accident/Incident reported.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Camp site security	Security hazards. Security related conflicts with local community.	Proper fencing of the camp site; Deployment of guards for security; Friendly relations with the local community.	Any security issue emerged.	Monthly	Execution by contractor Monitoring by PISSC/PMT
Parking/repair of machinery and equipment	Soil and water contamination due to spillage of liquid wastes (Lubricants, fuel, chemicals from the machinery yard).	Proper maintenance of machinery and equipment; Ensuring proper storage and disposal of used oil etc.; Ensuring good housekeeping practices at workshop areas; Avoiding waste oil spill into soil and 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;	Fortnightly	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).	Fortnightly	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
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 treatment arrangement such as lined septic tank and collection chamber/ soaking pit;	Inspection to ensure that sewage system is actually operating; Photographic record;	Monthly	Execution by contractor Monitoring by PISSC/PMT
Solid waste generation	Land pollution	Ensure proper collection and disposal of waste generated from camp at designated disposal pit (away from the camp site) approved by the Engineer; Prohibition on burning of waste; Good housekeeping practices to minimize waste generation.	Covered disposal containers placed at camp; Designated disposal pit available; Visual inspections.	Fortnightly	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.	Fortnightly	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	During activity of steel formation, concreting work, entry of	Approved OHS Plan. Evidence of OHS trainings	Preparation at the start of	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		unauthorised persons will be restricted. Without PPEs no any person will be allowed to enter in work area. Job specific PPEs will be provided. Prior to activity TBTs will be provided. Training on the benefits of use of PPEs, and work at height will be provided on periodically basis. Housekeeping will be maintained on site and in Camp areas to avoid any trip hazard. Provision of first aid facilities and standby emergency vehicle (ambulance). Occupational Health and Safety officers will be deputed on site to supervise the OHH related issues. Orientation of project will be provided to all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working.	conducted. PPE provided and used; First aid facilities provided; Record of injuries/ illness and near misses.	execution of civil works and monitoring of its implementation on daily basis.	
	Workers code of conduct.	The contractor will prepare workers code of conduct plans and Camp layout plan and get it approved from the Resident Engineer and PMT for implementation at site. Especially working in Khirthar National Park.	The approved code of conduct is implemented.	During the life of contract.	Execution by contractor Monitoring by PISSC/PMT
	Child Labor	The contractor should maintain the labor registry for workers at site, and age verification should be conducted	Labor register is made available at site containing complete data of all employees hired by the	During the life of contract.	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		upon employment to make sure that children are not employed in the project	contractor		
	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.	Monthly	Execution by contractor Monitoring by PISSC/PMT
		Prior to entry into the park, heavy equipment will be cleaned to prevent importation of non-native plant species, hydraulic fittings will be tighten , and it will be ensured that hydraulic hoses are in good condition and shall be replaced and repaired if petroleum leaks observed. Proper and timely maintenance will be provided for vehicles and equipment used during construction to reduce the potential for mechanical breakdowns	Check the fitness of the heavy machinery / equipment.		Execution by contractor Monitoring by PISSC/PMT
	Noise from vehicles, compaction rollers, concrete mixers and construction equipment exceeding 75 dB is	Proper engine 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

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	harmful for receptors.				
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.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
		Truck and related construction equipment speeds will be limit in active construction areas to a maximum of 15 KM/hr and strictly adhering to park regulations and posted speed limits in other areas while inside park boundaries.			
	Soil erosion and contamination	ehicle speeds to 30km/h.; Restriction on repair of vehicles and equipment in the field.	Monitoring compliance; Log of vehicle and equipment repairs; Soil erosion observed		Execution by contractor Monitoring by PISSC/PMT
	Air pollution	Use of machinery and vehicles with properly tuned to avoid the exhaust emissions. Sprinkling of water on site and on routes near communities. Water bowsers will be used to control excess airborne particulates at staging areas, active construction zones, and unpaved roads leading	Route maps of vehicle movement; Log of vehicle maintenance.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		to/from active construction areas It will be ensured and implemented that the project remains within the parameters of Sindh Environmental Quality Standards.			
	Water pollution	Avoiding washing of vehicles along the pond area. It will be ensured and implemented that the project remains within the parameters of Sindh Environmental Quality Standards.	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.	Fortnightly	Execution by construction contractor Monitoring by PISSC/PMT
	Occupational, Health and Safety issues	Preparation and implementation of OHS Plan. Fixing of sign board at detours; Use of PPE; Awareness raising of drivers; Avoiding speedy movement of vehicles near communities; Training of construction workers and others; Regular liaison with communities.	Approved OHS Plan. Evidence of OHS trainings conducted. PPEs used by workers; Reflectorized road signs; Visual inspections.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
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
	Accident risks	Preparation and implementation of OHS Plan. Preparation of emergency response procedures (ERPs); Usage of PPEs; Provision of first aid kits and emergency vehicle. Trained drivers will be hired to operate machinery safely: Availability of trained operator to operate machinery.	PPEs provided and used; Record of any accident. Availability of ERPs	Fortnightly	Execution by contractor Monitoring by PISSC

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	Loss of natural vegetation and associated fauna	59 Trees including young and mature expected to removed/relocated from site. On place of cut down/uprooted trees 295 new trees will be planted. Cost has been allocated for tree plantation for better environment in ESMP Implementation Cost. Tree plantation plan for indigenous species will be prepared including the type of species, location for plantation and other necessary information. No invasive species will be planted.	Record of tree cutting; Photographic record;	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Damage to infrastructure	Restoration/ rehabilitation of damaged infrastructure with entire satisfaction of the affected persons. Construction activities will be confined in the designated areas.	Visual inspections; Photographic records; Consultations/Interviews, Infrastructure restoration records.	Monthly	Execution by contractor Monitoring by PISSC/PMT
	Breaking up of Land for Cultivation or mining purpose	It will ensured that, project acvities will remain isolated as per design excavations, no other activities will be permitted.	Review the designs and layout	Monthly	Execution by contractor Monitoring by PISSC/PMT
	Noise pollution	Noisy work shall be performed (such as the operation of heavy equipment) between the hours of 6:30 a.m. and 5:00 p.m. to minimize disruption to nearby community.Use of noise reduction devices; Regular inspection, maintenance and lubrication of the construction vehicle and equipment; Use of PPEs such as earplugs and earmuffs by	Noise levels measured.	Fortnightly	Execution by construction contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		the workers; Avoid night time activity. Construction activities will be confined in the designated areas			
	Air pollution	Proper engine tuning of machinery/ equipment; Water sprinkling particularly at work sites near the communities.	Dust emission controlled; Monitoring on stack of machinery and equipment; Evidence of measurement records;	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Land degradation; soil erosion; pooling of water and drainage problem	Excavation of borrow sites as per specifications from river bed.	Visual inspections; Photographic records.	Fortnightly	Executing agency and contractor Monitoring by PISSC/PMT
	Residual wastes; construction material waste	Remove any left-over construction material/wastes from the construction sites. Trash will be properly secured during the workday and all trash shall be removed from site at the end of each workday.	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	Visual observations; Record of accident; any complaint from the community.	All activities on daily basis except public consultation that will be carried out on monthly basis	Executing agency and contractor Monitoring by PISSC/PMT

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

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		client.			
Impacts on lower riparian	Strom water will be blocked for lower riparian / downstream users.	With the construction of dams aquifer will recharge. It is expected that groundwater level will be raised. Solar operated tube well will be installed for closely monitoring of groundwater level.	Make sure that groundwater level is recharged	Monthly basis	Contractor, PMT, SID

ANNEXURE-I: PHOTOGRAPHS

Upper Mole-II Dam

Proposed location of Upper Mole-II Dam

Proposed location of Upper Mole-II Dam

Sureshi Dam

Proposed location of Sureshi Dam

Proposed location of Sureshi Dam

Tikho-II Dam	
	
Proposed location of Tikho-II Dam	Proposed location of Tikho-II Dam
Dhall Dhoro Dam	
	
Proposed dam site location of Dhall Dhoro Dam	Proposed dam site location of Dhall Dhoro Dam

Gabol Dam	
	
Proposed Dam location of Gabol Dam	Proposed Dam location of Gabol Dam
	
Proposed Dam location of Gabol Dam	Proposed Dam location of Gabol Dam

Qasim Tok Dam	
	
Proposed Dam location of Qasim Tok Dam	Proposed Dam location of Qasim Tok Dam
	
Proposed Dam location of Qasim Tok Dam	Proposed Dam location of Qasim Tok Dam

Nali Dam	
	
Proposed Dam location of Nali Dam	Proposed Dam location of Nali Dam
	
Proposed Dam location of Nali Dam	Proposed Dam location of Nali Dam

Naing-II Dam	
	
Proposed Dam location of Naing-II Dam	Proposed Dam location of Naing-II Dam
	
Proposed Dam location of Naing-II Dam	Proposed Dam location of Naing-II Dam

Bhansar Rathi Dam	
	
Proposed location of Bhansar Rathi Dam	Proposed location of Bhansar Rathi Dam
	
Proposed location of Bhansar Rathi Dam	Proposed location of Bhansar Rathi Dam

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

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SOILANALYSIS TEST REPORT

Client Sample ID	Bhansar Dam	Lab Entry No.	SS/6606/016
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	2.10
2	pH		8.0
3	Bicarbonate (HCO_3) Meq/l	"	6.5
4	Chloride (Meq/l)	"	11.05
5	Sulfate (Meq/l)	"	3.40
6	Calcium + Magnesium (Meq/l)	"	9.00
7	Sodium (Meq/l)	"	10.56
8	SAR	"	4.98
9	ESP	"	5.73

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
69.8	15.96	14.24	Sandy Loam

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SOILANALYSIS TEST REPORT

Client Sample ID	Dhal Dhoro Dam	Lab Entry No.	SS/6608/016
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	3.40
2	pH		8.0
3	Bicarbonate (HCO_3) Meq/l	"	8.0
4	Chloride (Meq/l)	"	19.01
5	Sulfate (Meq/l)	"	7.00
6	Calcium + Magnesium (Meq/l)	"	14.0
7	Sodium (Meq/l)	"	18.01
8	SAR	"	6.80
9	ESP	"	8.08

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
71.8	21.96	6.24	Sandy Loam

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SOILANALYSIS TEST REPORT

Client Sample ID	Nali Dam	Lab Entry No.	SS/6556/016
Client Name & Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15-03-2016
		Reporting Date	29.03.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	0.46
2	pH		8.2
3	Bicarbonate (HCO_3) Meq/l	"	0.76
4	Chloride (Meq/l)	"	2.0
5	Sulfate (Meq/l)	"	2.76
6	Calcium + Magnesium (Meq/l)	"	2.5
7	Sodium (Meq/l)	"	3.0
8	SAR	"	2.4
9	ESP	"	2.23

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
82.8	4.4	12.8	Loamy sand

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SOIL ANALYSIS TEST REPORT

Client Sample ID	Naing-II Dam	Lab Entry No.	SS/6557/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15-03-2016
		Reporting Date	29.03.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	1.28
2	pH		8.0
3	Bicarbonate (HCO_3) Meq/l	"	2.60
4	Chloride (Meq/l)	"	5.0
5	Sulfate (Meq/l)	"	5.2
6	Calcium + Magnesium (Meq/l)	"	5.0
7	Sodium (Meq/l)	"	8.1
8	SAR	"	5.74
9	ESP	"	6.73

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
88.8	2.4	8.8	Sand

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SOIL ANALYSIS TEST REPORT

Client Sample ID	Qaim Tok Dam	Lab Entry No.	SS/6558/016
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15-03-2016
		Reporting Date	29.03.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	1.48
2	pH		8.0
3	Bicarbonate (HCO_3) Meq/l	"	3.5
4	Chloride (Meq/l)	"	6.5
5	Sulfate (Meq/l)	"	4.8
6	Calcium + Magnesium (Meq/l)	"	6.0
7	Sodium (Meq/l)	"	9.6
8	SAR	"	5.54
9	ESP	"	6.47

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
87.2	4.0	8.8	Loamy sand

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SOIL ANALYSIS TEST REPORT

Client Sample ID	Gabol Dam	Lab Entry No.	SS/6559/016
Client Name & Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15-03-2016
		Reporting Date	29.03.2016

Sr. #	Parameters	Reference Method	Results
1.	E.C (ds/m)	Standard Methods, Hand Book 60	1.17
2	pH		7.5
3	Bicarbonate (HCO_3) Meq/l	"	2.8
4	Chloride (Meq/l)	"	5.0
5	Sulfate (Meq/l)	"	3.9
6	Calcium + Magnesium (Meq/l)	"	4.8
7	Sodium (Meq/l)	"	7.73
8	SAR	"	4.98
9	ESP	"	5.74

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
52.8	24.4	22.8	Sandy Clay Loam

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SOIL ANALYSIS TEST REPORT

Client Sample ID	Tikho-1 Dam	Lab Entry No.	SS/6585/016
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	1.11
2	pH		7.6
3	Bicarbonate (HCO_3) Meq/l	"	2.0
4	Chloride (Meq/l)	"	6.0
5	Sulfate (Meq/l)	"	3.0
6	Calcium + Magnesium (Meq/l)	"	4.8
7	Sodium (Meq/l)	"	5.30
8	SAR	"	3.42
9	ESP	"	3.64

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
74.4	20.0	5.6	Sandy Loam

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SOIL ANALYSIS TEST REPORT

Client Sample ID	Sureshi Dam	Lab Entry No.	SS/6587/016
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	2.51
2	pH		7.8
3	Bicarbonate (HCO_3) Meq/l	"	7.0
4	Chloride (Meq/l)	"	12.0
5	Sulfate (Meq/l)	"	6.05
6	Calcium + Magnesium (Meq/l)	"	8.5
7	Sodium (Meq/l)	"	14.29
8	SAR	"	6.93
9	ESP	"	8.22

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
70.4	14.0	15.6	Sandy Loam

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SOIL ANALYSIS TEST REPORT

Client Sample ID	Uper mole-II	Lab Entry No.	SS/6589/016
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	0.76
2	pH		7.8
3	Bicarbonate (HCO_3) Meq/l	"	2.5
4	Chloride (Meq/l)	"	3.51
5	Sulfate (Meq/l)	"	1.57
6	Calcium + Magnesium (Meq/l)	"	2.7
7	Sodium (Meq/l)	"	3.89
8	SAR	"	3.35
9	ESP	"	3.55

Soil Texture:

Sand (%)	Silt (%)	Clay (%)	Texture Class
84.8	9.6	5.6	Loamy Sand

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WATER QUALITY TEST REPORT

Client Sample ID	Bhansar Dam, Kolhi Village	Lab Entry No.	WQL/KHI/5254		
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	11150
5.	pH	APHA	6.5-8.5 (WHO)	7.16

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	560
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	296
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	1540
5	Potassium (mg/1)	APHA	12 (EC)	29
6	TDS (mg/1)	APHA	1000 (WHO)	7136
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	2.768
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.011
9	Phosphate (PO_4)	APHA	NGVS	3.36
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	10

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)	61
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	180

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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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Bhansar Dam, Kolhi Village	Lab Entry No.	WQL/KHI/5254		
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	3	5	5	0/100ml	900
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2°C	2	4	5	0/100ml	220

2. F-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	56

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WATER QUALITY TEST REPORT

Client Sample ID	Bhansar Dam, Village Bhansar	Lab Entry No	WQL/KHI/5253		
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	27300
5.	pH	APHA	6.5-8.5 (WHO)	7.29

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	450
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	1020
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	3850
5	Potassium (mg/1)	APHA	12 (EC)	62.8
6	TDS (mg/1)	APHA	1000 (WHO)	17472
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	2.170
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	1.565
9	Phosphate (PO_4)	APHA	NGVS	6.7
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	20

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	3.8
2	Chemical Oxygen Demand (COD)	mg/l	APHA, 20th Edition	150 (NEQS, 2000)	192
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	407

NGVS No Guideline Value Set **WHO** World Health Organization **APHA** American Public Health Association
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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Bhansar Dam, Village Bhansar	Lab Entry No.	WQL/KHI/5253		
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	3	5	5	0/100ml	900
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2°C	0	4	5	0/100ml	130

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	44

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WATER QUALITY TEST REPORT

Client Sample ID	Tikho Dam, Village Barejo	Lab Entry No	WQL/KHI/5256		
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)	**7.30**

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)	**104**
4	Hardness as $CaCO_3$(mg/1)	APHA	500 (WHO)	**500**
5	Potassium (mg/1)	APHA	12 (EC)	**10.1**
6	TDS (mg/1)	APHA	1000 (WHO)	**1466**
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	**2.299**
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	**0.069**
9	Phosphate (PO_4)	APHA	NGVS	**0.71**
10	Arsenic (ppb)	Merck Kit Method	50(PSQCA)	**05**

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)	**02**
3	Total Suspended Solids (TSS)	mg/l	APHA, 20th Edition	200 (NEQS, 2000)	**35**

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WATER QUALITY TEST REPORT

Client Sample ID	Sureshi Dam, Village Nabi Bux Barejo	Lab Entry No.	WQL/KHI/5250		
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	**1553**
5.	pH	APHA	6.5-8.5 (WHO)	**8.18**

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/l)	APHA	NGVS	**430**
2	Carbonate (mg/l)	APHA	NGVS	**Nil**
3	Calcium (mg/l)	APHA	75 (PSI)	**40**
4	Hardness as Ca CO_3(mg/l)	APHA	500 (WHO)	**160**
5	Potassium (mg/l)	APHA	12 (EC)	**4.4**
6	TDS (mg/l)	APHA	1000 (WHO)	**994**
7	Nitrate (NO_3)(mg/l)	APHA	10 (WHO)	**1.238**
8	Nitrite (NO_2) (mg/l)	APHA	0.020 (PSQCA)	**0.026**
9	Phosphate (PO_4)	APHA	NGVS	**0.22**
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	**3.8**
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)	**169**

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WATER QUALITY TEST REPORT

Client Sample ID	Uper Mole-II Dam, Motal Khan Goth	Lab Entry No.	WQL/KHI/5248		
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	1047
5.	pH	APHA	6.5-8.5 (WHO)	7.53

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	310
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)	310
5	Potassium (mg/1)	APHA	12 (EC)	3.9
6	TDS (mg/1)	APHA	1000 (WHO)	670
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	6.691
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.027
9	Phosphate (PO_4)	APHA	NGVS	0.57
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	4.3
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)	246

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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Uper Mole-II Dam, Motal Khan Goth	Lab Entry No.	WQL/KH1/5248		
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	5	5	0/100ml	240
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2°C	1	3	4	0/100ml	33

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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WATER QUALITY TEST REPORT

Client Sample ID	Nali Dam, Village Muhammad Ali Jamali (400ft)	Lab Entry No.	WQL/KHI/5224		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	1390
5.	pH	APHA	6.5-8.5 (WHO)	7.67

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	230
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	56
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	340
5	Potassium (mg/1)	APHA	12 (EC)	3.9
6	TDS (mg/1)	APHA	1000 (WHO)	890
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	2.638
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.027
9	Phosphate (PO_4)	APHA	NGVS	0.24
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	3.4
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)	14

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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Nali Dam, Village Muhammad Ali Jamali(400ft)	Lab Entry No.	WQL/KHI/5224		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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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WATER QUALITY TEST REPORT

Client Sample ID	Nali Dam, Village Muhammad Ali Jamali (300 ft)	Lab Entry No.	WQL/KHI/5225		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	1475
5.	pH	APHA	6.5-8.5 (WHO)	7.51

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	220
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	68
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	370
5	Potassium (mg/1)	APHA	12 (EC)	3.3
6	TDS (mg/1)	APHA	1000 (WHO)	944
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	2.429
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.021
9	Phosphate (PO_4)	APHA	NGVS	0.82
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)	69

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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Nali Dam, Village Muhammad Ali Jamali (300 ft)	Lab Entry No.	WQL/KHI/5225		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	2	2	5	0/100ml	90

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. NazlaSattar)
Asst. Sci. Officer

Lab. Incharge: (Dr. Ghulam Murtaza)
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WATER QUALITY TEST REPORT

Client Sample ID	Qasim Tok Dam, Village Murad Jamali (100ft)	Lab Entry No.	WQL/KHI/5229		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	682
5.	pH	APHA	6.5-8.5 (WHO)	7.75

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/l)	APHA	NGVS	230
2	Carbonate (mg/l)	APHA	NGVS	Nil
3	Calcium (mg/l)	APHA	75 (PSI)	44
4	Hardness as Ca CO_3(mg/l)	APHA	500 (WHO)	260
5	Potassium (mg/l)	APHA	12 (EC)	2.7
6	TDS (mg/l)	APHA	1000 (WHO)	436
7	Nitrate (NO_3)(mg/l)	APHA	10 (WHO)	1.701
8	Nitrite (NO_2) (mg/l)	APHA	0.020 (PSQCA)	0.025
9	Phosphate (PO_4)	APHA	NGVS	0.38
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	4.3
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)	21

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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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Qasim Tok Dam, Village Murad Jamali (100ft)	Lab Entry No.	WQL/KHI/5229		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	5	5	0/100ml	900
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2°C	2	3	5	0/100ml	140

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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WATER QUALITY TEST REPORT

Client Sample ID	Naing-II Dam, Village Nigawal (120ft)	Lab Entry No.	WQL/KHI/5230		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	1528
5.	pH	APHA	6.5-8.5 (WHO)	7.33

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	150
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	92
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	470
5	Potassium (mg/1)	APHA	12 (EC)	7.2
6	TDS (mg/1)	APHA	1000 (WHO)	978
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	3.192
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.008
9	Phosphate (PO_4)	APHA	NGVS	0.44
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)	997

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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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Naing-II Dam, Village Nigawal (120ft)	Lab Entry No.	WQL/KHI/5230		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	5	5	0/100ml	900
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2°C	2	4	5	0/100ml	220

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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WATER QUALITY TEST REPORT

Client Sample ID	Naing- II Dam, Nigawal(90ft)	Lab Entry No.	WQL/KHI/5226		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	991
5.	pH	APHA	6.5-8.5 (WHO)	7.25

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	220
2	Carbonate (mg/1)	APHA	NGVS	Nil
3	Calcium (mg/1)	APHA	75 (PSI)	92
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	380
5	Potassium (mg/1)	APHA	12 (EC)	5.4
6	TDS (mg/1)	APHA	1000 (WHO)	634
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	3.088
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.070
9	Phosphate (PO_4)	APHA	NGVS	0.20
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	4.4
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)	113

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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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Naing- II Dam, Nigawal(90ft)	Lab Entry No.	WQL/KHI/5226		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	2	3	5	0/100ml	140

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	35

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WATER QUALITY TEST REPORT

Client Sample ID	Gabol Dam, Hairdeen Gabol (80 ft)	Lab Entry No.	WQL/KHI/5227		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	700
5.	pH	APHA	6.5-8.5 (WHO)	7.59

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/1)	APHA	NGVS	220
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)	330
5	Potassium (mg/1)	APHA	12 (EC)	6.8
6	TDS (mg/1)	APHA	1000 (WHO)	448
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	5.179
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.029
9	Phosphate (PO_4)	APHA	NGVS	1.30
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	4.6
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)	365

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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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Gabol Dam, Hairdeen Gabol (80 ft)	Lab Entry No.	WQL/KH1/5227		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	2	5	0/100ml	70
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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WATER QUALITY TEST REPORT

Client Sample ID	Dhal Dhoro Dam, Village Dhal (100ft)	Lab Entry No.	WQL/KHI/5228		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	2600
5.	pH	APHA	6.5-8.5 (WHO)	7.04

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)	140
4	Hardness as Ca CO_3(mg/1)	APHA	500 (WHO)	710
5	Potassium (mg/1)	APHA	12 (EC)	8.7
6	TDS (mg/1)	APHA	1000 (WHO)	1664
7	Nitrate (NO_3)(mg/1)	APHA	10 (WHO)	4.304
8	Nitrite (NO_2) (mg/1)	APHA	0.020 (PSQCA)	0.031
9	Phosphate (PO_4)	APHA	NGVS	0.45
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)	250

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WATER QUALITY TEST REPORT(Microbiological)

Client Sample ID	Dhal Dhoro Dam, Village Dhal (100ft)	Lab Entry No.	WQL/KHI/5228		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	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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WATER QUALITY TEST REPORT

Client Sample ID	Dhal Dhoro Dam Village Dhall	Lab Entry No.	WQL/KHI/5223		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	2470
5.	pH	APHA	6.5-8.5 (WHO)	6.78

Chemical Parameters:

Sr. #	Water Quality Parameter	Reference Method	Permissible Limits	Results
1	Bicarbonate (mg/l)	APHA	NGVS	200
2	Carbonate (mg/l)	APHA	NGVS	Nil
3	Calcium (mg/l)	APHA	75 (PSI)	112
4	Hardness as Ca CO_3(mg/l)	APHA	500 (WHO)	400
5	Potassium (mg/l)	APHA	12 (EC)	5.8
6	TDS (mg/l)	APHA	1000 (WHO)	663
7	Nitrate (NO_3)(mg/l)	APHA	10 (WHO)	2.683
8	Nitrite (NO_2) (mg/l)	APHA	0.020 (PSQCA)	0.037
9	Phosphate (PO_4)	APHA	NGVS	0.59
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	4.8
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)	99

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

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

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

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

Senior Research Officer
Incharge (Labs)
Pakistan Council of Research
In Water Resources (PCRWR) 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(Microbiological)

Client Sample ID	Dhal Dhoro Dam, Village Dhall	Lab Entry No.	WQL/KHI/5223		
Client Name &Address	M/S Sindh Resilience Project (SRP)	Receiving Date	15.03.16	Reporting Date	30-03-16

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	5	5	0/100ml	900
Fecal Coliform/100ml	APHA, 9221, 9222	EC at 44±0.2 °C	1	4	5	0/100ml	170

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

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

Terms andConditions

- The results of the laboratory analysis reported by PCRWR are verified as accurate and authentic only for the parameters tested. Analysis report is not valid for court use or business publicity. In case of any dispute in connection with authenticity of the report, the laboratory record of the analysis will be considered final.
- **PCRWR** does not accept any responsibility regarding accuracy of sample collection procedures if collected by the client.
- **PCRWR** will not be responsible for loss or damage to samples in its possession for reasons beyond its control.
- **PCRWR** reserves the rights to accept or reject samples for analysis without assigning any reason.

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

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

Senior Research Officer
Incharge (Labs)
Pakistan Council of Research
In Water Resources (PCRWR) Karachi

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		

ANNEXURE: IV SCREENING CRITERIA TO DETERMINE ENVIRONMENTAL CATEGORY OF SUB PROJECTS

Section- A: Basic Information

Title of Sub-project: Gabol Dam

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department, Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 5 -6 number of trees located within reservoir area of Gabol Dam.
- There are no settlement near the proposed dam site
- There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.
- During construction some natural habitats might be disturbed.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.13 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.12 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	

Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	
Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Waterways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Naing-II Dam

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department, Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 35 - 37 number of trees located within reservoir area of Naing-II Dam.
- There are no settlement near the proposed dam site
- There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.
- During construction some natural habitats might be disturbed.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.32 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.18 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	
Involuntary resettlement	No	

OP/BP 4.12		
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Nali Dam

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department, Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 45 - 50 number of trees located within reservoir area of Nali Dam.
- There are no settlement near the proposed dam site
- There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.
- During construction some natural habitats might be disturbed.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.13 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.23 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	
Involuntary resettlement	No	

OP/BP 4.12		
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Qasim Tok

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department, Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There is no any tree located within reservoir area of Qasim Tok Dam.
- There are no settlement near the proposed dam site
- There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.
- During construction some natural habitats might be disturbed.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 1.36 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.10 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	
Involuntary resettlement	No	

OP/BP 4.12		
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Bhansar Rathi

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 04 trees located within reservoir area of Bhansar Rathi Dam.
- There are no settlement near the proposed dam site
- There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 2.98 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 1.65 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	
Involuntary resettlement OP/BP 4.12	No	

Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Dhal Dhoro Dam

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 3 to 4 trees located within reservoir area of Dhal Dhoro Dam.
- There are no settlement near the proposed dam site
- There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.10 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.08 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	

Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Sureshi Dam

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department, Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 10 – 12 number of trees located within reservoir area of Sureshi Dam.
- There are no settlement near the proposed dam site
- The proposed dam site of Sureshi is located in Khirthar National Park, for which NOC will be obtained from Sindh Wildlife department Govt: of Sindh. During construction some natural habitats might be disturbed.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.15 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.12 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	

Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Tikho-II Dam

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department, Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 35 - 40 number of trees located within reservoir area of Tikho-II Dam.
- There are no settlement near the proposed dam site
- The proposed dam site of Tikho-II is located in Khirthar National Park, for which NOC will be obtained from Sindh Wildlife department Govt: of Sindh. During construction some natural habitats might be disturbed.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard.

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.14 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.08 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	

Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	
Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

Section- A: Basic Information

Title of Sub-project: Upper Mole-II

Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment

Duration:12 Months

Client Project: Irrigation Department, Govt: of Sindh

Funded by: World Bank

Section: B Assessment

Environmental Issues

- There are 03 trees located within reservoir area of upper Mole-II Dam.
- There are no settlement near the proposed dam site
- The proposed dam site of Upper Mole-II is to be constructed is located in Khirthar National Park, for which NOC will be obtained from Sindh Wildlife department Govt: of Sindh. During construction some natural habitats might be disturbed.
- There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.
- No any forests observed near the dam site.
- Ambient Air quality is clear and noise level is under SEPA standard

Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.

Type of Project: Water Management, Dams, Irrigation, and Flood Protection

Type of Project	Category	Applicable (Yes/No)	Comments
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.17 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq-km	Schedule-I	Yes, the proposed dam has surface area of 0.13 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA

Section D: World Bank Operational Policies that Might Apply

Safeguard Policies	Triggered (Yes/No)	Explanation
Environmental Assessment OP/BP/GP 4.01	Yes	
Natural Habitats OP/BP 4.04	Yes	
Forest OP/BP 4.36	No	
Pest Management OP/BP/4.09	No	
Physical Cultural Resources OP/BP 4.09	No	
Involuntary resettlement OP/BP 4.12	No	
Safety of Dams OP/BP 4.37	Yes	

Project in International Water ways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

ANNEXURE: V Copy of NOC from SINDH WILDLIFE DEPARTMENT

SINDH WILDLIFE DEPARTMENT

OFFICE OF THE CONSERVATOR WILDLIFE SINDH
SINDH CENTRE BUILDING, M.D.M WAFAI ROAD
OPP. PIA BOOKING OFFICE KARACHI
Phone No. 99204951 – 52, Fax No. 99204959

No. CW/GEN/ NOC/2018/-

3rd December, 2018

To,

Project Director
PMT (Irrigation Component)
SRP, Irrigation Department
Government of Sindh.

SUBJECT: PERMISSION FOR CONSTRUCTION OF SMALL RAIN WATER RECHARGE DAMS IN JAMSHORO DISTRICT UNDER SINDH RESILIENCE PROJECT.

With reference to your office letter dated 30th October 2018, it is to inform you that, Sindh wildlife Department is the key stakeholder taking initiatives to protect and conserve the wildlife resources in the province, Khirthar National Park is the only National exist in the Sindh province and declared as protected Area under Sindh Wildlife Protection Ordinance 1972 Amended 2001, as per provision in the Ordinance Section (13) following Acts shall be prohibited in the National Park:

- ***"Clearing or breaking up any land for cultivation, mining or for any other purpose is prohibited."***
- ***"Polluting water flowing in and through the National park."***

Accordingly with the approval of Competent Authority i.e Additional Chief Secretary Forest & Wildlife Government of Sindh, Karachi , Sindh Wildlife Department have no objection on the project titled **"Construction of Small Rain Water Recharge Dams in Janshoro District under Sindh Resilience Project"** Irrigation Department Government of Sindh, but the Concern Authorities may ensure to keep the above mentioned Acts prohibited in the National Park, as the location of Project site as per (**coordinates, Google Map**) provided by your Department out of nine Sites three (03) falls in the limits of Protected Area (Khirthar National Park).

The office of the project Director, SRP Irrigation Department will not be allowed to sublet this permission to any other organization, department or individual without prior permission of this department nor will it use this authority for any business or financial benefit.

Sindh Wildlife Department reserves the rights to cancel this permission in case of any proven misuse of this authority and empowers its field staff to visit and monitor the project site in case of any complain.

(TAJ MOHAMMAD SHAIKH)
CONSERVATOR WILDLIFE, SINDH
KARACHI

Office of the Project Director SRP Hyd. No: 720 Date: 03/12/18

ANNEXURE: VI ENVIRONMENTAL CODE OF PRACTICES (ECoPs)

Introduction

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

ECoP 1: Waste Management
ECoP 2: Fuels and Hazardous Substances Management
ECoP 3: Water Resources Management
ECoP 4: Borrow Areas Development and Operation
ECoP 5: Air Quality Management
ECoP 6: Noise and Vibration Management
ECoP 7: Protection of Flora
ECoP 8: Protection of Fauna
ECoP 9: Road Transport and Road Traffic Management
ECoP 10: Construction Camp Management
ECoP 11: Cultural and Religious Issues
ECoP 12: Workers Health and Safety

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

ECOP 1: WASTE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Contractor shall: o Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste.) prior to commencing of construction and submit to ESMU PMT and PISSC for approval. o Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. o Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. o Segregate and reuse or recycle all the wastes, wherever practical. o Collect and transport non-hazardous wastes to all the approved disposal sites. o Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. o Provide refuse containers at each worksite. o Request suppliers to minimize packaging where practicable. o Place a high emphasis on good housekeeping practices. o Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	The Contractor shall: o Collect chemical wastes in 200 litre drums (or similar sealed container), appropriately labelled for safe transport to an approved chemical waste depot. o Store, transport and handle all chemicals avoiding potential environmental pollution. o Store all hazardous wastes appropriately in bunded areas away from water courses. o Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. o Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. o Construct concrete or other impermeable flooring to prevent seepage in case of spills

ECOP 2: FUELS AND HAZARDOUS SUBSTANCE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels, oil, lubricants, paints and other hazardous substance.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous substance on-site, and potential spills from these goods may harm the environment or health of construction workers.	The Contractor shall: o Prepare spill control procedures and submit the plan for PISSC and SID for approval. o Train the relevant construction personnel in handling of fuels and spill control procedures. o Store dangerous goods in bunded areas on a top of a sealed plastic sheet away from water course. Refuelling should occur only within bunded areas. o Make available MSDS for chemicals and dangerous goods on-site. o Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by Sindh EPA. o Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. o Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. o Make sure all containers, drums, and tanks that are used for storage are in good condition and are labelled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. o Store hazardous materials above flood plain level. o Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area should preferably slope or drain to a safe collection area in the event of a spill. o Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of a spill or leak. o Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. o Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.

ECOP 3: WATER RESOURCES MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	The Contractor shall: ○ Follow the management guidelines proposed in ECoPs 1 and 2. ○ Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns, including infiltration and storage of storm water. The change in hydrological regime leads to increased rate of runoff and in sediment and contaminant loading, increased flooding and groundwater contamination.	The Contractor shall: ○ Divert runoff from undisturbed areas around the construction site ○ Stockpile materials away from drainage lines ○ Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot ○ Wash out transit mixture and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each construction vehicle to ensure the local roads are kept clean.
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall: ○ Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion ○ Ensure that roads used by construction vehicles are swept regularly to remove sediment. ○ Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	The Contractor shall: • Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary • Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers • Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. • Reduce infiltration of contaminated drainage through storm water management design • Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.
Drinking water	Groundwater at shallow depths might be contaminated and hence not suitable for drinking purposes.	The Contractor shall: • Control the quality of groundwater to be used for drinking water on the bases of NEQS and World Bank standards for drinking water. Safe and sustainable discharges are to be ascertained prior to selection of pumps. • Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination
	Depletion and pollution of groundwater resources	• Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor and report on the water quality and water levels. • Protect groundwater supplies of adjacent lands

ECOP 4: SOIL QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of fuel and toxic chemicals	Spillage of fuel and toxic chemicals will contaminate the soils	The Contractor shall: • Strictly manage the wastes management plans proposed in ECoP1 and storage of materials in ECoP2 • Construct appropriate spill contaminant facilities for all fuel storage areas. • Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals • Train personnel and implement safe work practices for minimizing the risk of spillage • Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site • Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results.
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall: • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

ECOP 5: BORROW AREAS DEVELOPMENT AND OPERATION/RESTORATION

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of borrow areas	In case, the borrow pits developed by the Contractor, there will be impacts on local topography, landscaping and natural drainage.	The Contractor shall: • Reuse excavated or disposed material available in the project area to the maximum extent possible • Identify borrow pits in consultation with the local governments and PISSC as well as PMT. • Obtain the borrow material from: • barren land or land without tree cover outside the road reserve; • Do not dug the borrow pits within 5m of the toe of the final section of the road embankment. • Dig the borrow pits continuously. Ridges of not less than 8 m widths shall be left at intervals not exceeding 300 m and small drains should be cut through the ridges to facilitate drainage • Borrow areas should not exceed 0.6 m (2ft.) in depth. • Slope the bed level of the borrow pits, as far as possible, down progressively towards the nearest cross drain, if any, and do not lower it than the bed of the cross-drain, to ensure efficient drainage. Follow the below for restoration of borrow areas are: • Return stockpiled topsoil to the borrow pit if is used for agriculture; • Return stockpiled topsoil to the borrow pit and all worked areas to be stabilized through re-vegetation using local plants. • Control at each site by ensuring that base of the borrow pit drains into a sediment trap prior to discharging from the site.

ECOP 6: AIR QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor shall: • Operate the vehicles in a fuel efficient manner • Cover haul vehicles carrying dusty materials moving outside the construction site • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions • Control the movement of construction traffic • Water construction materials prior to loading and transport • Service all vehicles regularly to minimize emissions • Limit the idling time of vehicles not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	The Contractor shall: • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Focus special attention on containing the emissions from generators • Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites • Carryout effects monitoring on monthly basis to control the emissions from construction machinery. • Service all equipment regularly to minimize emissions • Engage all vehicles that are physical fit for the work. • Obtain fitness certificate of vehicles/equipment from third party certification.
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	• Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds) • Minimize the extent and period of exposure of the bare surfaces • Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site • Restore disturbed areas as soon as practicable by vegetation/grass-turfing • Store the cement in silos and minimize the emissions from silos by equipping them with filters.

ECoP 7: Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	The Contractor shall: • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours. • Make sure that all operator are trained and are having third party operator certificates.
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall: • Appropriately site all noise generating activities to avoid noise pollution to local residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures • Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment.
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall: • Notify adjacent residents prior to any Typical noise event outside of daylight hours • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate • Notify affected people if noisy activities will be undertaken, e.g. blasting • Plan activities on site and deliveries to and from site to minimize impact • Monitor and analyse noise and vibration results and adjust construction practices as required. • Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas and in National Park.

ECOP 8: PROTECTION OF FLORA

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	The Contractor shall: • Reduce disturbance to surrounding vegetation of Khirthar National Park. • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. • Get approval from supervision consultant for clearance of vegetation especially in case of working in Khithar National Park. • Make selective and careful pruning of trees where possible to reduce need of tree removal. • Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads. • Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. • Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. • Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible. • Ensure excavation works occur progressively and re-vegetation done at the earliest • Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction • Supply appropriate fuel in the work caps to prevent fuel wood collection

ECOP 9: PROTECTION OF FAUNA

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,	The Contractor shall: • Limit the construction works within the designated sites allocated to the contractors especially working in Khirthar National Park • check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal
	Impact on migratory birds, its habitat and its active nests	The Contractor shall: • Not be permitted to destruct active nests or eggs of migratory birds • Minimize the tree removal during the bird breeding season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests • Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds.
Vegetation Clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	The Contractor shall: • Restrict the tree removal to the minimum required. • Retain tree hollows on site, or relocate hollows, where appropriate • Leave dead trees where possible as habitat for fauna • Fell the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition.
Construction Camps	Illegal poaching	• Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

ECOP 10: CONSTRUCTION CAMP MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of Construction Camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall: • Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. • Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Submit to the PMT for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. • Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters. • Code of Conduct to be prepared by the Contractor, signed by his workers and approved by the PMT of SRP.
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	Contractor shall provide the following facilities in the campsites: • Adequate housing for all workers • Safe and reliable water supply. Water supply from tube wells that meets the national standards • Drinking water should be checked on monthly basis through monthly effects monitoring. • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. Female toilets should be clearly marked in language understood by the persons using them to avoid miscommunication. The minimum number of toilet facilities required is one toilet for every ten persons. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor shall: • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment's/vehicles needed. • Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition. Cover the bed of the pit with impervious layer of materials (clayey, thin concrete) to protect groundwater from contamination. • Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odour likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites. • Contractor should made an agreement / got a NOC from near union council for disposal of solid waste in municipal facility.
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	The Contractor shall: • Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. • Make available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protecting of biodiversity in the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	There will be a potential for diseases to be	The Contractor shall: • Provide adequate health care facilities within construction sites.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	transmitted including malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	• Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide anti-venom injection at site dispensary to cope any emergency in case of snake bite. • Provide ambulance facility for the labourers during emergency to be transported to nearest hospitals. • Initial health screening of the labourers coming from outside areas • Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work • Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis • Complement educational interventions with easy access to condoms at campsites as well as voluntary counselling and testing • Provide adequate drainage facilities throughout camps to ensure that disease vectors habitats (stagnant water bodies, puddles) do not form. Regular mosquito repellent sprays in monsoon. • Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	• The Contractor shall: • Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. • Maintain register to keep track on a head count of persons present in the camp at any given time. • Encourage use of flameproof material for the construction of labour housing/site office. Ensure that these houses/rooms are of sound construction and capable of withstanding storms/cyclones. • Provide appropriate type of fire fighting equipment suitable for the construction camps • Display emergency contact numbers clearly and prominently at strategic places in camps. • Communicate the roles and responsibilities of labourers in case of emergency in the monthly meetings with contractors.
Site Restoration	Restoration of the construction camps to	The Contractor shall: • Dismantle and remove from the site all facilities established within the construction camp

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	original condition requires demolition of construction camps.	including the perimeter fence and lockable gates at the completion of the construction work. • Dismantle camps in phases as the work decreases (do not wait for completion of the entire work. • Give prior notice to the labourers before demolishing their camps/units • Maintain the noise levels within the national standards during demolition activities • Different contractors should be hired to demolish different structures to promote recycling or reuse of demolished material. • Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site by PMT. • Handover the construction camps with all built facilities as it is if agreement between both parties (contactor and land-owner) has been made so. • Restore the site to its original condition or to an agreed condition with the landowner defined prior to the commencement of the works (in writing). • Not make false promises to the labourers for future employment in O&M of the project.

ECOP 11: CULTURAL AND RELIGIOUS ISSUES

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Activities near Religious and Cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	The Contractor shall: • Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. • Do not block access to cultural and religious sites, wherever possible • Restrict all construction activities within the foot prints of the construction sites. • Stop construction works that produce noise (particularly during prayer time) should there be any mosque/religious/educational institutions close to the construction sites and users make objections. • Take special care and use appropriate equipment when working next to a cultural/religious institution. • Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the PMT. • Provide separate prayer facilities to the construction workers. • Show appropriate behaviour with all construction workers especially women and elderly people • Allow the workers to participate in praying during construction time • Resolve cultural issues in consultation with local leaders and supervision consultants • Establish a mechanism that allows local people to raise grievances arising from the construction process. • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters
Best Practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site	The Contractor shall: • An Occupational, Health and Safety Plan shall be prepared by the Contractor and submitted to ESU of PISSC and ESMU of PMT for review and approval. The plan shall be approved by the ESU of PISSC. The OHS shall include a job hazard analysis and safety precautions (like PPEs, barriers, change to design) and make ensure use of the PPEs and other measures during construction time. • The contractor will train his workers and project management staff in (not limited to) first aid and basic infection control at work, transportation and handling of hazardous

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), (ii) risk factors resulting from human behaviour (e.g. STD and HIV) and (iii) road accidents from construction traffic.	wastes, use of PPEs, fire safety etc. • Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labour Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national acts and rules of the Government of Sindh • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters.
	Child and pregnant labour	The Contractor shall: • Not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Pakistani Labour Laws and Employment of Child Act (1977).
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	• The contractor will arrange first aid facilities at the site. A trained first-aider should be present at the site and arrangements made with a local doctor to be available on call. Appropriately equipped first-aid stations should be easily accessible throughout the place of work • Contact numbers and location of the nearest healthcare/emergency centre should be displayed at the worksite. • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 14 Construction Camp Management: • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECoP:2 • Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for trainings • Security fence at least two m height. • Sick bay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	• The contractor shall provide toilets at the construction sites. • Location of toilet facilities should be at least six meters away from storm drain system and surface waters. These toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. Alternatively, each toilet facility should have septic tank and soaking pit. • Contractor should provide clean drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community: • ECoP Fuels and Hazardous Substance Management • ECoP Air Quality Management • ECoP Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall: • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. • Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counselling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counselling and testing.

ECOP 12: WORKER HEALTH AND SAFETY

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best Practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), (ii) risk factors resulting from human behaviour (e.g. STD and HIV) and (iii) road accidents from construction traffic.	The Contractor shall: • An Occupational, Health and Safety Plan shall be prepared by the Contractor and submitted to ESU of PIC and ESMU of PMU for review and approval. The plan shall be approved by the ESU of PIC. The OHS shall include a job hazard analysis and safety precautions (like PPEs, barriers, change to design) and make ensure use of the PPEs and other measures during construction time. • The contractor will train his workers and project management staff in (not limited to) first aid and basic infection control at work, transportation and handling of hazardous wastes, use of PPEs, fire safety etc. • Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labour Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national acts and rules of the Government of Sindh • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters.
	Child Labor	The Contractor shall: • Not hire children of less than 14 years of age in accordance with the Pakistani Labour Laws and Employment of Child Act (1977).

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	Gender Based Violence	• The contractor shall: • Train the workers regarding (Gender Based Violence GBV) and also train workers about sexual harassment, child abuse, human trafficking for reducing the risk of GBV. • The contractor will also raise awareness among workers regarding coordination with local law enforcement and code of conduct.
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	• The contractor will arrange first aid facilities at the site. A trained first-aider should be present at the site and arrangements made with a local doctor to be available on call. Appropriately equipped first-aid stations should be easily accessible throughout the place of work • Contact numbers and location of the nearest healthcare/emergency centre should be displayed at the worksite. • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP: Construction Camp Management: • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECoP 2 • Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for trainings • Security fence at least two m height.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Sick bay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	• The contractor shall provide toilets at the construction sites. • Location of toilet facilities should be at least six meters away from storm drain system and surface waters. These toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. Alternatively, each toilet facility should have septic tank and soaking pit. • Contractor should provide clean drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community: • ECoP : Fuels and Hazardous Substance Management • ECoP : Air Quality Management • ECoP : Noise and Vibration Management • ECoP : Road Transport and Road Traffic Management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall: • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. • Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counselling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counselling and testing.