ENVIRONMENT IMPACT ASSESSMENT REPORT

OF

REVAMPING AND RESTORATION OF STORM WATER DRAINS (MEHMOODBAD, GUJJAR & ORANGI ALONG WITH MALIR AND LIYARI RIVERS) OF DRAINAGE SYSTEM OF KARACHI

VOLUME I OF II: EIA REPORT

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EXECUTIVE SUMMARY

National Disaster Management Authority (NDMA) manages the whole Disaster Management Cycle (DMC) which includes Preparedness, Mitigation, Risk Reduction, Relief and Rehabilitation. A National Disaster Management Plan (NDMP) is prepared and is followed towards provision of better services to the affected ones. In response to the recent urban flooding in Karachi. NDMA has initiated the project "**Revamping and Restoration of Storm Water Drains of Karachi".** The proposed project will improve the infrastructure of Karachi in an event of disaster, especially at flood risk. The overall environment of the area will improve when the drain will be cleaned up from the solid waste and sewerage. The health and safety issues of the residents will also be resolved as the open drains are a falling hazard for young children and adults.

Salient Features of the Project	
Proponent	Mr. Kamran Adalat (Director CKTP), bearing CNIC No. 37405-1885554-3, is the Authorized Representative as Project Proponent from National Disaster Management Authority (NDMA).
Project Location	Gujjar, Orangi and Mehmoodabad Nullahs Malir and Lyari River
Components	• Cleanup of solid waste from the stormwater drains • Separation of sewerage lines from the storm water drains. • Widening of drain after removing encroachments from the sideline's • Construction of 15- & 30-feet paved roads and 3 feet high parapet walls on the sides of drains • Construction RCC Bridges / culverts crossings for Traffic and Electrification and replacement of other utilities along the roadside. • Rehabilitation/resettlement of peofple displaced due to removal of encroachments. • Current scenario of treatment plant at Malir and Lyari River

Before 27 August 2020, the monsoon season had brought much less rainfall to Karachi. However, on that unfortunate day we had more rainfall in one day than the past 92 years. Entire settlements were washed out.

Karachi's storm water drains connect to two seasonal rivers, the Lyari and the Malir. Both rise in the foothills of the Kirthar range and run parallel to each other, 14-20 kilometers apart. Fifty-eight storm water drains (Nullahs) carry water from their catchment areas to these two rivers. Over 600 smaller drains feed into these Nullahs.

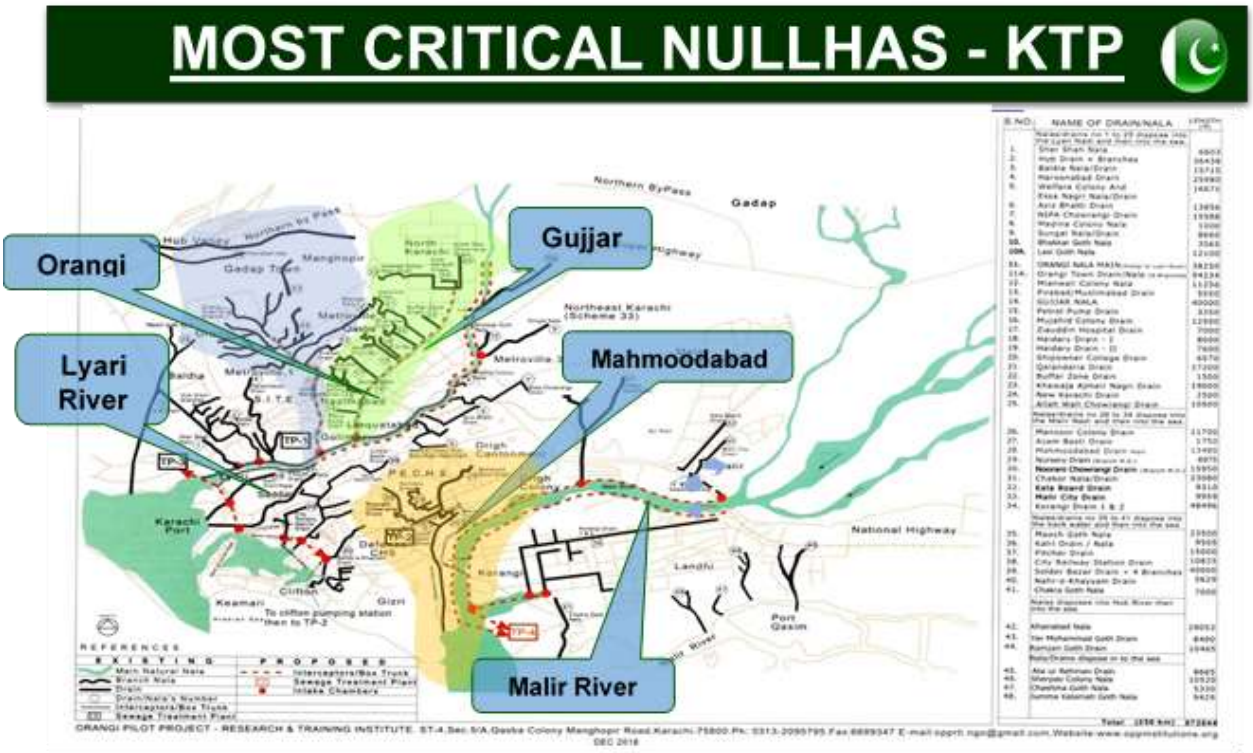
The Greater Karachi Resettlement Plan of 1958 created two satellite towns some 20 kilometers from Karachi. Sewage treatment plants were planned for but never constructed and their sewage flowed (and still flows) into the sea and/or the Nullahs. Due to lack of housing, informal settlements developed along the Nullah – into where sewage was discharged. After the mid-1960s formal sectors also began using Nullah for disposal. Sludge from sewage clogged the Nullah and their tributaries, and during the heavy rains of 1978-79, much of the housing along the Nullah was washed away.

After that, informal settlement residents started to informally purchase solid waste from the municipal authorities and compact it along the Nullah edges to secure them and to create land for their homes. Nullah widths decreased substantially from 20-40 meters to less than ten, and four to five metres in some places.

In response to this situation, the NDMA has agreed to provide assistance to the Government of Sindh (GoS) — the objective is to revamp the existing storm water drains of Karachi. The project aims to improve the flow of the storm water channels in order to prevent any flood risks due to extraordinary rainfall event. For this purpose, the storm drains are to be separated from the sewerage line, as well as to be cleaned up from any existing solid waste deposits. The drains are to be brought back to its original width by removing any encroachments on its sidelines. 30-feet paved roads will be built on the sidelines and 3-feet tall parapet walls will be built to stop people from throwing solid waste in the drains.

The baseline conditions of the project area were studied based on the results of the investigations conducted by the field study team as well as through studying available materials and literature.

This Environmental Impact Assessment document is aimed to provide a description of existing environmental situation in the project areas, identification of the relevant legal and administrative framework; revealing the potential beneficial and environmental impacts associated with project implementation and defining the measures that are appropriate to enhance the potential beneficial impacts and to prevent, mitigate or minimize potential environmental impacts.



Layout map of Nullahs and Rivers

Sindh Environmental Protection Act (SEP Act) was legislated in 2014. Section 17 of SEP Act 2014 requires that every new project has to be preceded by an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) depending upon the size and severity of impacts anticipated on commissioning of the project. Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014 have been notified under section 37 of SEPA 2014. These Regulations categorize projects in Three separate schedules which requires either an IEE (Schedule-I) or an EIA (Schedule-II) or Environmental Checklist (Schedule III) where provisions of Section 17 shall apply. Oil and gas gathering system, separation and storage have been placed in Schedule – II, Category B4, thus requiring

an EIA.

The project is not expected to have long-term significant or irreversible negative environmental impacts neither at the construction, nor at operation phases. Strict measures will be required for the environmentally friendly operations of the drainage system. There are no specially protected areas or threatened or endangered endemic species in the project area.

The likely environmental impacts during the construction phase will include the following: degradation of soil, landscape and soil erosion due to improper disposal of excavated materials and construction waste; spillage of oil and other substances from machinery and vehicles during the construction; pollution of water resources and soil by construction run-offs; temporary air pollution related to increased truck traffic during the construction, release of dust from digging -loading works and heavy machinery operation; noise and vibration disturbances; safety hazards during implementation of construction works, if recommended mitigation measures will not be ensured.

The mitigation measures specifically developed for the construction phase of the project include: proper storage of construction materials, compact the top surface of access roads and work sites to facilitate water runoff and avoid flooding the area; conduct dust-depressing measures aimed at prevention of air pollution; use closed/covered trucks for transportation of loose construction materials; regular check of proper technical conditions of machinery and equipment; disposal of excavated materials and construction waste in agreed disposal sites; ban disposal of waste into waterways. Where possible; restoration to original conditions of landscape after completion of construction works; use of appropriate safety equipment by personnel involved in construction works. To ensure the execution of resettlement of affectees as agreed by the stakeholders and in the light of decision of Honorable Court.

The EIA study concludes that the likely environmental impacts from the project activities which will be carried out on the project sites, can be prevented and minimized by timely and due implementation of mitigation measures provided in the study and the adherence to Environmental Management Plan (EMP).

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Chapter 1: INTRODUCTION

1.1 General

This report presents the findings of the Environmental Impact Assessment (EIA) study conducted by Pak Green Enviro-Engineering Pvt. Ltd for the proposed Revamping & Restoration of existing Storm water drain of Karachi initiated by National Disaster Management Authority of Pakistan (NDMA), Islamabad. The EIA study has been conducted in compliance with the mandatory requirements of Section 17 of Sindh Environmental Protection Act 2014 and the rules & regulations framed thereunder.

Environmental Impact Assessment is a planning tool accepted as an integral component of sound decision making. The purpose of EIA is to give environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activities before action is taken. Early identification and characterization of critical environmental impacts allows the public and the government to form a view about the environmental acceptability of the proposed developmental project and what conditions should apply to mitigate, reduce or compensate those risks and impacts.

Field surveys and lab analysis were conducted in the study area by Pak Green Enviro-Engineering Pvt. Ltd team which included environmentalist, sociologist and ecologist. Field data collection included observational surveys; consultations and meetings for data collection with government departments, industries; and ground verification of available secondary information. Secondary information was collected from proponent, in-house sources, Government Departments and NGOs. Applicable international guidelines, conventions and environmental assessment procedures prepared by the Pakistan EPA have been gone through while preparing this document.

1.2 Need of Environmental Impact Assessment

Environmental Impact Assessment (EIA) of the Project has been carried out in compliance with the mandatory requirement of Section 17 of Sindh Environmental Protection Act (SEPA), 2014 which requires that:

"No Project shall commence construction or operation unless it has filed with the Agency an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) and has obtained from Agency approval in respect thereof. SEPA shall review the IEE & EIA and accord approval subject to such terms and conditions as it may prescribe or require."

This Environmental Impact Assessment report presents the evaluation of environmental impacts of the construction and operation of a project namely "Revamping & Restoration of existing Storm water drain of Karachi".

1.3 Background of the Project

Karachi is the largest city of Pakistan and the only megacity in the country. As the country's main financial center and seaport, it contributes up to 15% of national GDP while serving as a major source for tax revenues. It is one of the fastest growing cities in the country, with an average growth rate of 3.5%. Its population grew from 9 million 1998 to an estimated 16 million today, primarily through migration. Although Karachi's poverty rate is low (9%), the absolute number of poor people is high: one-tenth of all poor in Sindh live in Karachi. The rapid population increase has led to significant changes in the ethnic composition of the city, with major impacts on its politics, social fabric, and governance. Urban sprawl due to in-migration and development resulting in shortages of housing has led to unregulated urban growth and the development of unauthorized colonies. Currently, large sections of the city's population are living in unplanned katchi abadis

Karachi's growth rate and high level of economic development make it an attractive destination for employment and the city has attracted migrants from all over the country. However, the rapid uncontrolled growth of the city which has put a tremendous pressure on the existing infrastructure, has adversely affected the quality of life. According to the 2018 Global Livability Index, Karachi now ranks fourth among the world's most unlivable cities. The megacity has moved from 134th position last year to the 137th spot this year in the list of 140 cities.

Before 27 August 2020, the monsoon season had brought much less rainfall to Karachi. However, on that unfortunate day we had more rainfall in one day than the past 92 years. Entire settlements were washed out.

Karachi's storm water drains connect to two seasonal rivers, the Lyari and the Malir. Both rise in the foothills of the Kirthar range and run parallel to each other, 14-20 kilometers apart. Fifty-eight storm water drains (Nullahs) carry water from their catchment areas to these two rivers. Over 600 smaller drains feed into these Nullahs.

The city's sewage system mostly consisted of underground earthenware pipes, and sewage biologically treated at the gutter baghicha (gutter garden). The treated effluent was used for growing vegetables, flowers for religious ceremonies and fruit trees. The gutter garden covered just over 1,000 acres (404.7 hectares).

The Greater Karachi Resettlement Plan of 1958 created two satellite towns some 20 kilometers from Karachi. Sewage treatment plants were planned for but never constructed and their sewage flowed (and still flows) into the sea and/or the Nullahs. Due to lack of housing, informal settlements developed along the Nullah – into where sewage was discharged. After the mid-1960s formal sectors also began using Nullah for disposal. Sludge from sewage clogged the Nullah and their tributaries, and during the heavy rains of 1978-79, much of the housing along the Nullah was washed away.

After that, informal settlement residents started to informally purchase solid waste from the municipal authorities and compact it along the Nullah edges to secure them and to create land for their homes. Nullah widths decreased substantially from 20-40 meters to less than ten, and four to five metres in some places.

In response to this situation, the NDMA has agreed to provide assistance to the Government of Sindh (GoS) — the objective is to revamp the existing storm water drains of Karachi. The project aims to improve the flow of the storm water channels in order to prevent any flood risks due to extraordinary rainfall event. For this purpose, the storm drains are to be separated from the sewerage line, as well as to be cleaned up from any existing solid waste deposits. The drains are to be brought back to its original width by removing any encroachments on its sidelines. 30-feet

paved roads will be built on the sidelines and 3-feet tall parapet walls will be built to stop people from throwing solid waste in the drains.

1.4 Analysis of the Desirability of the Project

The proposed project will improve the infrastructure of Karachi in an event of disaster, especially at flood risk. The overall environment of the area will improve when the drain will be cleaned up from the solid waste and sewerage. The health and safety issues of the residents will also be resolved as the open drains are a falling hazard for young children and adults.

The proposed Project is also not anticipated to result in unmanageable adverse and residual impacts.

1.5 Project Proponent

National Disaster Management Authority (NDMA) is the lead agency at the Federal level to deal with the whole spectrum of Disaster Management activities. It is the executive arm of the National Disaster Management Commission (NDMC) which has been established under the Chairmanship of the Prime Minister as the apex policy making body in the field of Disaster Management. In the event of a disaster, all stakeholders including Government Ministries/Departments/Organizations, Armed Forces, INGOs, NGOs, UN Agencies work through and form part of the NDMA to conduct one window operations. It is established under the National Disaster Management Act – 2010 and functions under the supervision of National Disaster Management Commission (NDMC) which is headed by the Prime Minister of Islamic Republic of Pakistan. NDMA manages the whole Disaster Management Cycle (DMC) which includes Preparedness, Mitigation, Risk Reduction, Relief and Rehabilitation. A National Disaster Management Plan (NDMP) is prepared and is followed towards provision of better services to the affected ones. The Terms of References between the Client and Consultant are attached as **Annexure-A**. The CNIC and Authority Letter in favor are attached as "**Annexure-B".**

Mr. Kamran Adalat (Director CKTP), bearing CNIC No. 37405-1885554-3, is the Authorized Representative as Project Proponent from National Disaster Management Authority (NDMA).

1.6 The Project at a Glance

Following activities are involved in the project;

- Cleanup of solid waste from the stormwater drains;
- Separation of sewerage lines from the storm water drains;
- Widening of drain after removing encroachments from the sidelines;
- Construction of 30 feet paved roads and 3 feet tall parapet walls on the sides of drains;
- Rehabilitation/resettlement of people displaced due to removal of encroachments.

1.7 Project Location

The project will be initiated at Mehmodabad, Orangi and Gujjar Nullah and their tributaries as well as Malir and Lyari River.

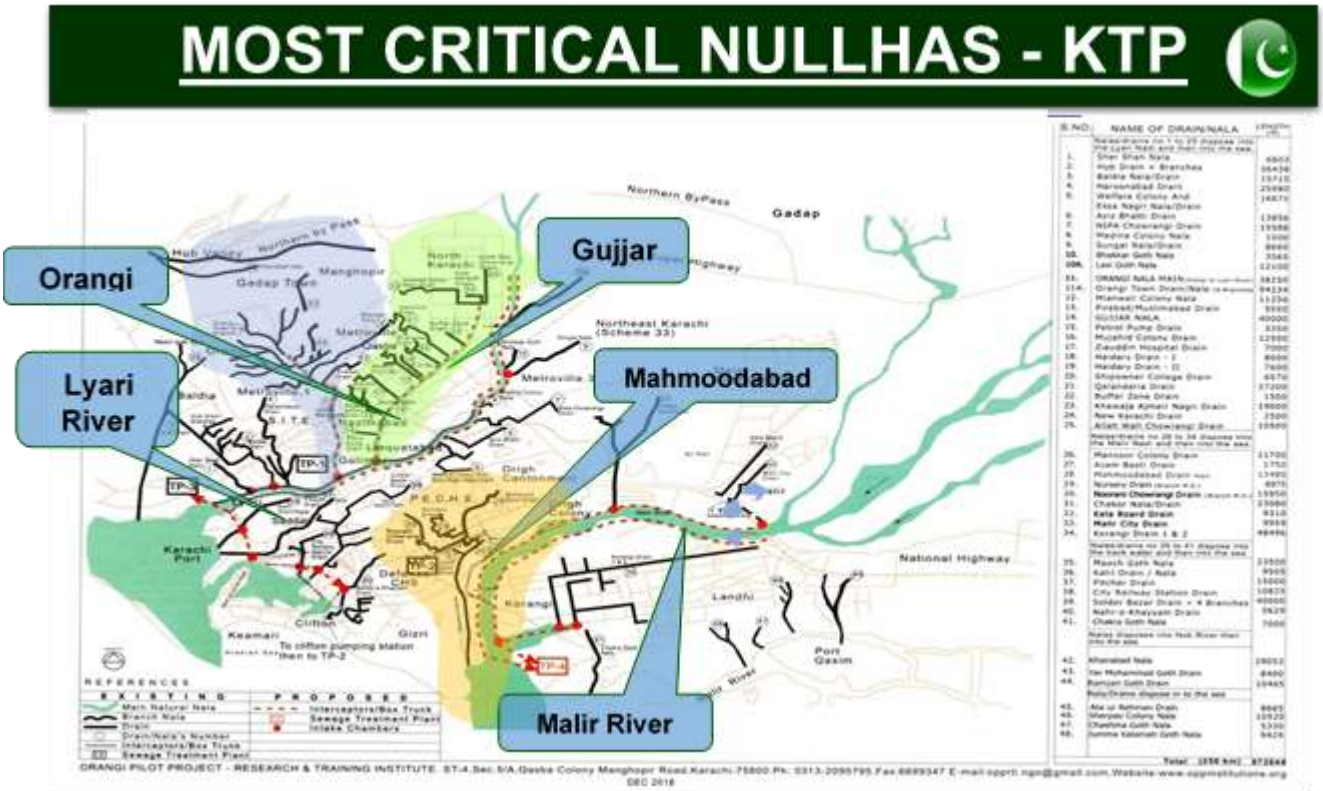


Figure 1-1 Layout map of Nullahs and Rivers

The details of the Location are as follows;

Table 1-1: Project Location details

Name of the Drain	Location Details

Mehmodadbad Nullah	Mehmoodabad Nullah is a natural drainage Nullah which starts from Fire Station near Shaheed-e-Millat Expressway and terminates at Ayesha Mosque in Defense Housing Society (Phase VII). The Nullah passes through thickly populated area of Mehmoodabad, Manzoor Colony, Jonejo Town, Defense View, KPT Flyover, Akhtar Colony, Kashmir Colony and Defense Housing Society then discharges into Malir River to Arabian Sea.
Orangi Nullah	Orangi Nullah is a small ephemeral stream which starts from Sector 14E of Orange town and ultimately flows into Lyari River. The total length of Orangi Nullah is about 11.25 Km it flows in the thickly populated areas, Orangi Town Sectors 15-D, Sector 15-C, Sector 12, Sector 9, Sector 6, Paposh Nagar and Pak colony of Karachi and ultimately discharge in the Lyari river
Gujjar Nullah	Gujjar Nullah is a natural drainage channel which starts from North Karachi Sector 11-D and falls into Lyari River near Mureed Goth. The Nullah passes along Godra Camp crosses Shah Walliullah Road passes near Peoples Colony, Landhi Kotal chowrangi, Musa colony, Syed Altaf Barelvi Road near Khamosh colony then joins Lyari River near Mureed Goth.

1.8 Objective of EIA

The main objectives of the Environmental Impact Assessment (EIA) study are to:

- Describe the key components of the microenvironment & macro environment of project area.
- Identify, analyze and evaluate the type and extent of potential environmental and social impacts with emphasis on significant/beneficial/adverse effects the proposed project will cause on the existing biological, physical and socio-economic environments of the project area.
- Recommend mitigation measures and strategies to minimize or avoid environmental impacts.
- Social impacts including monitoring plans for implementation of the mitigation measures.
- Assist planners and decision-makers in evaluating the project's feasibility based on its potential environmental impacts.
- Describe the project & all the activities to be carried out during the life of the project.
- Design, construction, operation, maintenance or any other activities relating to the project.

1.9 Project Categorization

Sindh Environmental Protection Act (SEP Act) was legislated in 2014. Section 17 of SEP Act, 2014 requires that every new project has to be preceded by an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) depending upon the size and severity of impacts anticipated on commissioning of the project. Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014 have been notified under section 37 of SEPA 2014. These Regulations categorize projects in three separate schedules which require either an IEE (Schedule-I) or an EIA (Schedule-II) or Environmental Checklist (Schedule III), where provisions of Section 17 shall apply. Flood Protection have been placed in Schedule – II, Category F3, thus requiring an EIA.

1.10 Methodology of EIA

Environmental Impact Assessment (EIA) is a systematic process that identifies and evaluates the potential impacts (positive and negative) that a proposed project may have on the biophysical and socio- economic environment. It identifies mitigation measures that need to be implemented in order to avoid, minimize or reduce the negative impacts, and also identifies measures to enhance positive impacts. The EIA is not fully a linear process, but one where several stages are carried out in parallel and where the assumptions and conclusions are revisited and modified as the project progresses. The following sections provide additional detail regarding the key stages in this EIA process. These stages are:

- Scoping Phase;
- Specialist Study Phase; and
- Integration and Assessment Phase.

1.10.1 Obtaining Project Specific Data

This was the very first step to embark on the study initiated through meetings held with the officials of NDMA. In the meetings, discussions were made to clarify the nature and extent of project in environmental perspectives. Basic information on the form of raw input received from the proponent was analyzed by the experts to comprehend the project & to assess its influence on the environment.

1.10.2 Literature Review

While the project details were being acquired, desktop study was also initiated simultaneously to draft environmental baseline information of the project area. The desktop study comprised of literature review, collection of updated authenticated published/printed data on the physical ecological and social environment related to the focused area. The same was also used to delineate the scope of surveys which would then form the basis of environmental assessment.

1.10.3 Stakeholder Consultation

Stakeholder consultations were held to involve the public in the decision-making process and to have a fair interaction with all community groups and assuring them that every attempt would be made to reduce the negative impacts of the project, and that adequate remedial measures would be taken to recompense the loss of the affected persons, if any.

1.10.4 Reconnaissance and Detailed Surveys

Preliminary surveys of project location were organized by in which experts visited the area and assessed the physical scenario in order to plan various detailed studies. The relevant surveys were carried out under the supervision of environmental experts. Preliminary socio-economic evaluation was also undertaken. This was followed by detailed and comprehensive surveys which were carried out in order to investigate various domains of environment and socio-economic sector to highlight various issues, and concerns that may lead to the identification of aspects and subsequent assessment of impacts.

Detailed environmental baseline survey was conducted to collect primary data in the Project surrounding to help identify sensitive receptors. The primary data were examined and compared with secondary data available from earlier environmental studies in the region. The scope of survey included collection of environmental and social baseline information on following key aspects:

- Climate and Rainfall
- Air Quality
- Noise Quality
- Soil
- Geology
- Hydrology
- Vegetation
- Fauna
- Administrative Division
- Nearby settlements
- Socio-Economic Activities
- Land use
- Infrastructure & Social Services

1.10.5 Aspects Identification

The EIA process requires development of an inventory of all possible environmental and socio-economic aspects, which provides the basis of categorization and evaluation of impacts and their likelihood to occur due to the materialization of the project. Aspects are those which are the causes of positive and negative impacts. Those aspects are primarily associated with activities performed during construction and operation phases of the project.

1.10.6 Impact Assessment & Mitigation Measures

Based on the developed aspects inventory, experts analyzed the aspects for their logical outcome as potential impacts on the physical, ecological and social environment. These impacts have been identified, assessed and weighed for different activities during construction, commissioning and operational phases of the project. Mitigation measures were also proposed for various activities of projects in order to minimize the potential impacts during the life span of the project.

1.10.7 Environmental Management & Monitoring Plan

In the light of impacts identified and mitigations proposed, an Environmental Management Plan (EMP) has been developed which has a pivotal role in assigning tasks to personnel for the environmental management and implementation of mitigation measures as well as to monitor its effectiveness throughout the life cycle of the project. It also provided monitoring plans/procedures to be followed for checking and compliance maintenance of environmental quality and legal requirements through suggested mitigation measures.

1.10.8 Documentation Review & Conclusion

This is the final step to complete the environmental assessment and compile all the work done in shape of a report. Report writing started just after the initiation of environmental assessment. The report has been written by experts of PGEE and compiled by the office staff in coordination with the experts. At the end of the study, the entire report is reviewed by the team leader followed by recommendations and conclusion in the light of the assessment.

1.10.9 Report Structure

The EIA report has been structured on the standard format, prescribed by the EPA. The Report has been presented in the following sections:

Chapter 1: Provides an introduction and overview of the project

Chapter 2: Details the project description, its objective, location of the facilities and construction & operation details including analysis of alternatives along with proposed schedule for implementation

Chapter 3: Gives an overview of policy and legislation along with international guidelines relevant to the project

Chapter 4: Provides description of the microenvironment and macro environment of the project area. This chapter contains the description of the physical environment, socio-economic condition and built environment of the area.

Chapter 5: Provides details of stakeholder consultation and the issues and concerns raised by the stakeholders and interested parties.

Chapter 6: Describes the potential environmental and social impacts of the proposed Project. General and project specific guidelines were used to assess the potential environmental impacts at the various stages - designing, construction and operations of the project.

Chapter 7: Presents the Environmental Management Plan and Monitoring Program for the project

Chapter 8: Summarizes the report and presents its conclusions.

1.11 Study Team

Table 1-2: List of EIA Study Team

Sr. No.	Designation	Name/Qualification	Experience
1.	Chief Environmentalist/ Lead Environmental Professional	Abdul Hafeez Nasir PhD Scholar Environmental Management	12 Years' Experience as Environmentalist
2.	Senior Environmentalist/ Environmental Professional	Iftikhar Ahmed M.Phil. Environmental Sciences	10-Year Experience as Environmentalist
3.	Environmental Impact Assessment Expert	Ms. Hira Roohani MS Environmental Science	2-year Experience

4.	Associate Environmental professional	Ms. Iqra Amjad M.Phil. Lahore School of Economics, Lahore	3-year Experience
5.	Junior Environmental professional	Ms. Mariam Javed MSc. Environmental Science	1-year Experience
6.	Junior Environmental professional	Ms. Faiza Anjum MS Environmental Science	1-year Experience
7.	Chief Analyst	Mr. Umair Rasheed BS Environmental Sciences	7-year Experience
8.	Senior Chemist	Ms. Qurat Ul Ann M.Sc. Chemistry	5-Year Experience

Chapter 2: PROJECT DESCRIPTION

2.1 The Project

Heavy rains in Monsoon of 2020 had caused urban flooding and disruption of Civic Life in Karachi, causing infrastructure damage to the residents, limiting the mobility of the Citizens and Commercial activities. Restoration of Storm Water Drains of Karachi being one of the components of Karachi Transformation Plan aims to mitigate the effects of flooding through clearance of 44 x Nullahs (including 3 x Most Critical Nullahs) and 02 x Rivers (Malir and Lyari). The proposed project will revamp & restore Karachi's existing Storm Water Drains and consequently avoid any future flood risk. The clean-up of drains will improve the overall environment of the area. The construction of parapet walls at the sidelines of drains will stop people from throwing further waste in the drains and also remove the falling hazard of children and adult into the drain.

2.2 Project Location

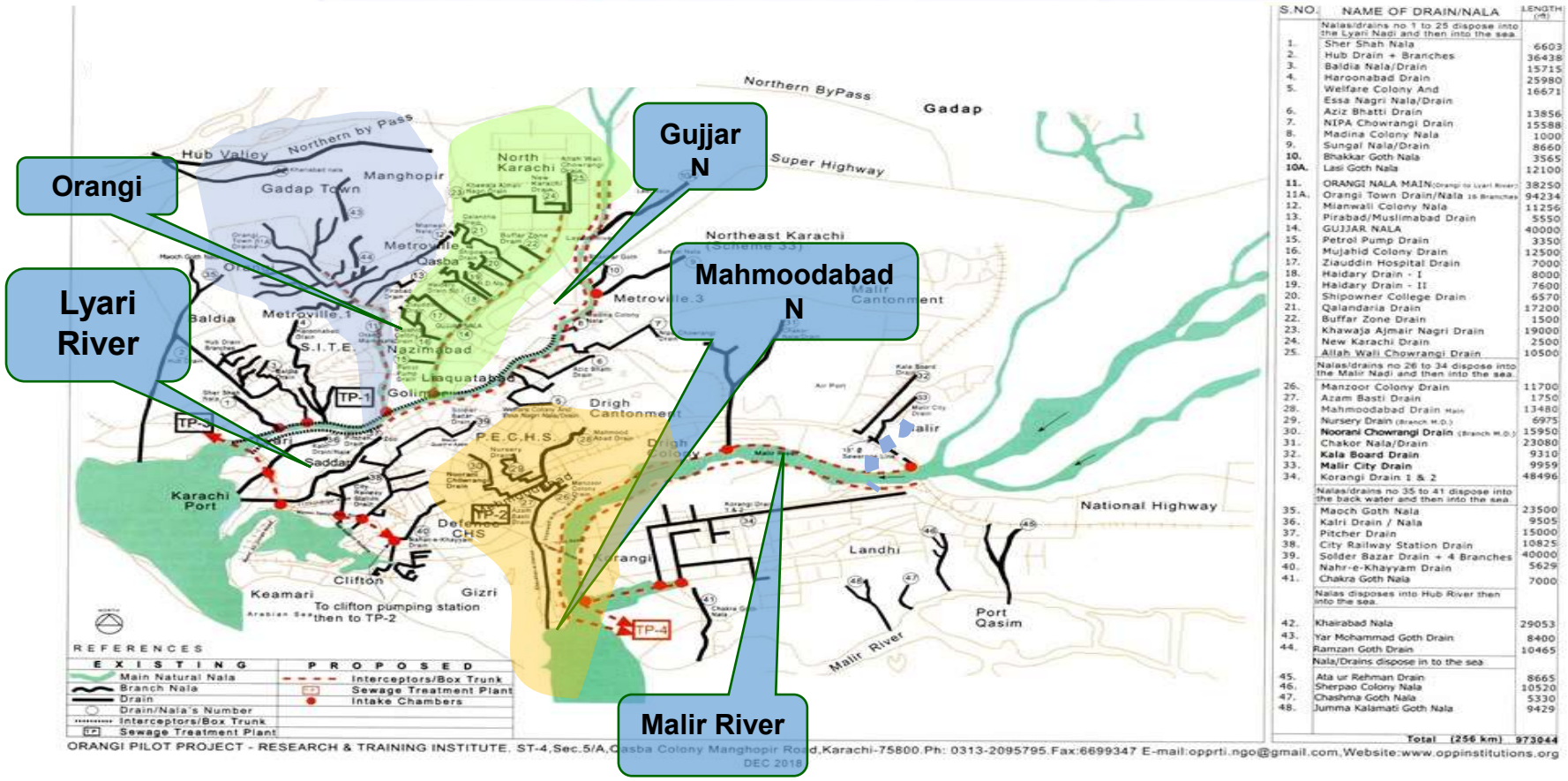
The project will be initiated at Mahmoudabad, Orangi and Gujjar Nullah and their tributaries as well as Malir and Lyari River.

The drains pass through the main city and the areas are encroached. There is high encroachment around the area of Orangi Nullah. The waste and polluted water in the drains is unhealthy and can impact the health of surrounding populations, adversely.

Map below is showing the detailed location of Nullahs and rivers. The map is also attached as "**Annexure-C".**

Figure 2-1 Existing status of Gujjar, Orangi and Mehmodabad Nullah

MOST CRITICAL NULLHAS - KTP



S.NO.	NAME OF DRAIN/NALA	LENGTH (m)
	Nalas/drains no 1 to 25 dispose into the Lyari Nadi and then into the sea	
1.	Sher Shah Nala	6603
2.	Hub Drain + Branches	36438
3.	Baldia Nala/Drain	15715
4.	Haroonabad Drain	25980
5.	Welfare Colony And Essa Nagri Nala/Drain	16671
6.	Aziz Bhatti Drain	13856
7.	NIPA Chowrangi Drain	15588
8.	Madina Colony Nala	1000
9.	Sungal Nala/Drain	8660
10.	Bhakkar Goth Nala	3565
10A.	Lasi Goth Nala	12100
11.	ORANGI NALA MAIN (Orangi to Lyari River)	38250
11A.	Orangi Town Drain/Nala 15 Branches	94234
12.	Mianwali Colony Nala	11256
13.	Pirabad/Muslimabad Drain	5550
14.	GUJJAR NALA	40000
15.	Petrol Pump Drain	3350
16.	Mujahid Colony Drain	12500
17.	Ziauddin Hospital Drain	7000
18.	Haidary Drain - I	8000
19.	Haidary Drain - II	7600
20.	Shipowner College Drain	6570
21.	Qalandaria Drain	17200
22.	Buffar Zone Drain	1500
23.	Khawaja Ajmair Nagri Drain	19000
24.	New Karachi Drain	2500
25.	Allah Wali Chowrangi Drain	10500
	Nalas/drains no 26 to 34 dispose into the Malir Nadi and then into the sea	
26.	Manzoor Colony Drain	11700
27.	Azam Basti Drain	1750
28.	Mahmoodabad Drain Main	13480
29.	Nursery Drain (Branch M.D.)	6975
30.	Noorani Chowrangi Drain (Branch M.D.)	15950
31.	Chakor Nala/Drain	23080
32.	Kala Board Drain	9310
33.	Malir City Drain	9959
34.	Korangi Drain 1 & 2	48496
	Nalas/drains no 35 to 41 dispose into the back water and then into the sea	
35.	Maoch Goth Nala	23500
36.	Kalri Drain / Nala	9505
37.	Pitcher Drain	15000
38.	City Railway Station Drain	10825
39.	Solder Bazar Drain + 4 Branches	40000
40.	Nahr-e-Khayyam Drain	5629
41.	Chakra Goth Nala	7000
	Nalas disposes into Hub River then into the sea.	
42.	Khairabad Nala	29053
43.	Yar Mohammad Goth Drain	8400
44.	Ramzan Goth Drain	10465
	Nala/Drains dispose in to the sea	
45.	Ata ur Rehman Drain	8665
46.	Sherpao Colony Nala	10520
47.	Chashma Goth Nala	5330
48.	Jumma Kalamati Goth Nala	9429
	Total (256 km)	973044

Figure 2-2: Layout map of Nullahs and Rivers

Table 2-1: Project Location Details

Name of the Drain	Location Details
Mehmodadbad Nullah	Mehmoodabad Nullah is a natural drainage Nullah which starts from Fire Station near Shaheed-e-Millat Expressway and terminates at Ayesha Mosque in Defense Housing Society (Phase VII). The total length of Mehmoodabad Nullah is about 3.58 Km. The Nullah passes through thickly populated area of Mehmoodabad, Manzoor Colony, Jonejo Town, Defense View, KPT Flyover, Akhtar Colony, Kashmir Colony and Defense Housing Society then discharges into Malir River to Arabian Sea.
Orangi Nullah	Orangi Nullah is a small ephemeral stream which starts from Sector 14E of Orangi town and ultimately flows into Lyari River. The total length of Orangi Nullah is about 11.287 Km it flows in the thickly populated areas, Orangi Town Sectors 15-D, Sector 15-C, Sector 12, Sector 9, Sector 6, Paposh Nagar and Pak colony of Karachi and ultimately discharge in the Lyari river
Gujjar Nullah	Gujjar Nullah is a natural drainage channel which starts from North Karachi Sector 11-D and falls into Lyari River near Mureed Goth. The total length of Gujjar Nullah is about 12.25 Km. The Nullah passes along Godra Camp crosses Shah Walliullah Road passes near Peoples Colony, Landhi Kotal chowrangi, Musa colony, Syed Altaf Barelvi Road near Khamosh colony then joins Lyari River near Mureed Goth.

2.3 Project components

Component 1: Cleanup of solid waste from the stormwater drains

The existing drains are clogged with solid waste that is hinders the storm water flow through them. In August 2020, NDMA along with FWO was able to remove 30,000 tons of solid waste from 40 choking points on 42 different spots of three nullahs.1 Since then, more solid waste has thrown into the drains as they people from surrounding area are habitual of throwing waste into Nullahs. NDMA plans to clear these Nullah completely of all the solid waste and construct embarkments on the side of the drains to stop the future disposal of waste into the drains. The success of the project is dependent upon the regular maintenance and Solid Waste Management by Government of Sindh.

Component 2: Separation of sewerage lines from the storm water drains

The sewerage is being discharged directly into the Nullah. The drain is full of silt and garbage, during Monsoon rain the storm water spill over the Nullah and floods into the surrounding areas. NDMA plans to separate the sewerage line from the storm water drains. This will be done by laying separate sewer pipeline & manholes along the Nullah on both sides for proper disposal of sewerage coming from surrounding areas.

Component 3: Widening of drain after removing encroachments from the sidelines

The Orangi Nullah is approximately 11.287 Km in length and while the width varies between 6m to 30m due to encroachment all along the Nullah. The Mehmodabad Nullah is 3.58 Km in length. The entire length of drain has been encroached upon to the extent that the existing width of the drain has been reduced to 3m or less at some places. The Gujjar Nullah is about 12.25 Km in length and serves as Storm water and Sewage drainage disposal. The width of Nullah is 5m to 13m in different segments of length. NDMA plans to remove encroachments from the sides of the drains to widen them to their original length to improve the flow of storm water and avoid overflow and flooding during monsoon season. Hydraulics and Hydrological Analysis of Mehmoodabad drain and Geotechnical Investigation Report for revamping of Mehmoodabad Nala from Malir Bund attached are attached as Annexure D and E respectively.

[1] https://www.dawn.com/news/1573148

Component 4: Construction of 15- & 30-feet paved roads and 3 feet high parapet walls on the sides of drains

After the removal of Encroachments NDMA plans to construct 15 feet paved road on both sides of Mehmoodabad Nullah & 30 feet wide paved road with 3 feet wide footpath for pedestrians. 3 feet high parapet walls will also be constructed along the sides of the drains to avoid any future falling hazards and to stop people from throwing waste into the drain in future. Layout Drawing of Civil Works are attached as Annexure F.

Component 5: Construction RCC Bridges / culverts crossings for Traffic and Electrification and replacement of other utilities along the roadside.

NDMA plans to build RCC Bridges/ culverts crossings on the drains to allow traffic to cross over the drains to the other side. Any Electricity poles and transmission lines along the side of the road will be moved during the removal of encroachment and widening activities. Similarly other utilities like gas pipelines and communication lines will also be replaced. Hydraulics and Hydrological Analysis of Mahmoodabad drain and Geotechnical Investigation Report for revamping of Mehmoodabad Nala from Malir Bund attached are attached as Annexure D and E respectively.

Component 6: Rehabilitation/resettlement of people displaced due to removal of encroachments.

A number of residential and commercial encroachments have been built over the sides of drain through the course of time. Some residents have taken legal permit from *Sindh Katchi-Abadi Authority* but most of them are living illegally on the allocated land of the drains. According to Sindh Government Compensation policy the following is the pattern of compensation to the dwellers along the sides of Nullahs.

- A person whose house has to be damaged 30% or more is eligible for compensation.
- Compensation will be given for both leased and un-leased residential properties damaged over 30%. The money will be given as a pay order. The pay orders will be signed by ADC-I of Commissioner House and the KMC metropolitan commissioner.
- Compensation will come in the shape of 2 years of rent calculated as Rs. 15,000 a month. This will be Rs. 90,000 for six month's rent.
- This Rs90,000 will be paid to the people every six months for two consecutive years.

- This means people will get a total of Rs. 360,000 in two years.

Component 7: Current Scenario of treatment plant at Malir and Lyari River

Karachi the largest industrial city of Pakistan has about 5000 registered and hundreds of unregistered industrial units in Karachi. There are two main rivers in Karachi Lyari and Malir. Three forth of these industries are discharging their effluents into the Lyari river and the rest into different channels including Malir river and both the rivers enter into the sea. Lyari the most important waste water channel become a river when it enters the suburbs of Karachi as an open drain. Lyari river passing through various parts of the city discharges at Gulbai before entering into the sea. Lyari river is a seasonal river and has become a drainage system which has connection with branches of industrial effluent and domestic wastewater. The water flowing in it originates from domestic sewerage and industrial effluent. The latter is discharged by various industries in the SITE area comprising of 4000 acres and 300 major industries and almost 3 times as many small units. Sixty percent of these are textile mills while the other deals with chemicals, detergents, vegetable oil, beverages and food products. There is an untreated impact of about 200mgd wastewater discharged by Lyari River. Enormous quantities of untreated municipal and industrial wastes are being drained into the sea resulting in serious degradation of marine environment and adjoining coastal areas. Industrial effluent when discharged without treatment leads to serious environmental consequences. The waste generated from the industries and other sources contain organic and inorganic pollutants. The effluent affects agricultural lands and adjoining rivers areas creating secondary pollution. The industrial waste water contains heavy metals and are real problem to marine and terrestrial ecosystems because they do not biodegrade and remain in the ecosystem.

So the proponent aims to make the water of Liyari and Malir rivers clean but constructing and installing waste water treatments plants on both rivers. The Storm water drain system of karachi is full of waste and sewerage waste which has a lot of effects on environmental conditions and human health.

2.4 Labor Requirement

At the peak of construction activities, up to a number of workers are likely to be employed for the works at project. The details are as follows

Table 2-2: Labour requirement details

Name of the Drain	Type of employment	No. of workers
Mehmodadbad Nullah	Direct	100-200
	Indirect	2500
Orangi Nullah	Direct	200-350
	Indirect	3800
Gujjar Nullah	Direct	200-300
	Indirect	3000

2.5 Project Schedule

The project is expected to be implemented within the following schedule;

Table 2-3: Project implementation schedule

Name of the Drain	Project Duration
Mehmodadbad Nullah	6 months
Orangi Nullah	6-12 months
Gujjar Nullah	6-12 months

* Subjected to timely removal of encroachments and release of funds.

2.6 Project cost

The project cost for the restoration and rehabilitation of drains is as follows;

Table 2-4: Project cost

Name of the Drain	Project Cost (in Million PKR)
Mehmodadbad Nullah	8657.42

Orangi Nullah	8671.67
Gujjar Nullah	9570.93

2.7 Management of Construction waste

The main types of waste expected to be generated and requiring disposal include:

a) Fuel, oils, and chemicals;
b) Sewage;
c) Medical waste;
d) Demolition waste;
e) Packing waste; and,
f) Excess construction material.

Table 2-5: Waste Management Collection and Disposal Techniques

Activity	Best practices
Generation of construction material	• Implement resource conservation, and encourage staff (through training) to reduce waste, reuse waste and recycle waste wherever possible. • Prohibit staff from fouling the site
Disposable of recyclable waste	• Sell recyclable waste to local vendors
Disposal of construction material	• Do not burn materials which may lead to the release of toxic or hazardous substances. • Do use burn on site when surrounding vegetation is dry and combustible.
Disposal of hazardous	Handover to specialized and certified disposal contractor
Generation of construction waste	Reduce construction waste by reusing waste as a fill material (prior to testing to confirm

2.8 Machinery Used

It is estimated that the following equipment will be required to complete the different project engineering activities.

Excavator, Dredger, Dumper, Dozer (if necessary) and other equipment as per site requirement

2.9 Water requirement and its source

The estimated amount of water required for the project is 20,000 gallons. Water required during the study will be fulfilled through private water tanker companies.

2.10 Analysis of Alternatives

The objective of screening out alternatives during the EIA exercise, is to identify options that most effectively meet the project's environmental objectives, either by enhancing the environmental benefits of the proposed activity, or through reducing or avoiding potentially significant negative impacts.

For the proposed project, alternatives were assessed for feasibility:

1. Project Alternative
2. 'No project' alternative

2.10.1 Project Alternative

The following alternatives have been identified for the project:

- **Option I: No Project Option**
- **Option II:** Revamping & Restoration of existing Storm water drain (Mehmoodabad, Gujjar and Orangi along with Malir and Liyari Rivers) of Karachi

An analysis of all above alternatives is as follows:

Option I: No Project Option

Description

The "No project option" considers continuation of utilizing existing storm water drains system of Karachi as the Nullahs are already available for the said purpose of managing rain and storm water to avoid flooding in Karachi. There will be no Revamping & Restoration of existing Infrastructure of Storm Water Drains of Karachi.

Advantages:

The drains system is already available. Only the money will be saved and can be utilized in any other potential Project.

Disadvantages:

No project option may result in flooding of storm water drains as there is tones of Solid Waste stuck in those Nullahs, which lowers the flow rate of exiting drains thus causing flooding in surrounding areas. The heaps of solid waste put a major threat on environmental and health of population and young kids which usually play on these packs of waste.

Hence, no project option will further deteriorate the condition and people of the area will continue to suffer socially and environmentally.

Conclusion:

For the No-project option, the analysis reveals that the weaknesses and threats far outweigh the potential strengths and opportunities. Therefore, the "No project option" is not recommended.

Option II: Revamping & Restoration of existing Storm water drain (Mehmoodabad, Gujjar and Orangi along with Malir and Liyari Rivers) of Karachi

Description

This option will help to improve the environmental conditions of environment and surroundings. The project will start from cleanup of storm water drains and then revamping and restorations. There will be 15 to 30 feet wide roads on both sides of Nullahs. The sewerage lines will be separated from the drain and put under both roads. The 3 Feet footpath will be added for pedestrians.

Advantages:

This option will help to improve the existing solid waste conditions of Karachi and to avoid the flooding like previous year. The project aims to accelerate the flow rate in Drains undertaken in this project. The project will help to enhance and improve the environmental conditions of Mehmoodabad, Gujjar and Orangi Nullahs which are currently doesn't even meet the living standards of an area. The Nullahs and their nearby areas are highly affected by these Solid waste mismanagements and dumping so the project if executed helps to improve the health conditions as well.

Disadvantages:

This project will only give benefit to society and environment. A little disadvantage could be in form of psychosocial effects.

Conclusion:

This alternative is envisaged to be most environmentally and socially feasible as it involves lesser land acquisition and resettlement compared to the other Alternative. Therefore, this alternative is recommended.

2.11 Comparison Analysis of Alternatives

The comparison between three possible alternatives based on the environmental, health, safety, social and economic impacts is described in **Table 4-1** below.

Table 2-6: Comparison Analysis of Alternatives

	Option 1	Option 2
Impacts	No Project option	Revamping & Restoration of existing Storm water drains (Mehmoodabad, Gujjar and Orangi Nullahs along with Malir and Liyari Rivers) of Karachi
Environment, Health and Safety	•Air pollution and dust will increase with passage of time due to deterioration of road; • Longer travel times due to the longer distance of alternative route; • Seasonal flooding of area and	• Lesser air pollution, dust, noise and vibration during construction as the new road is of small distance. • Improved Storm Water Drains systems in place to manage

	destruction of physical features • Increased and mis-managed Solid waste dumping on these sites will affect the environment and health of public • More wear and tear of vehicle • The ecological status of the area will remain unchanged.	seasonal rain water • Improved Road infrastructure to making easy accessibility to roads and clean environment • No accessibility of Public to Nullahs because of construction of walls around Nullah, this will improve the health and safety conditions
Socioeconomic	Nearby villages will remain difficult to access • Access to better educational and health facilities will also remain limited. • Improvement in tourism, trade and development will also remain slow. • Limited access for rescue in case of emergency/disasters;	• Land acquisition and resettlement will be lesser as the Nullah already exists at most of the places and only a few location the land will be undertaken after proper settlement. • Generation of employment opportunities. • Improved access to main city • Better business opportunities, trade and development. • Better access to educational and health facilities • Ease in access for rescue in case of emergencies/disaster

2.12 Selected Option

After analyzing all the considered alternatives, the most environmentally sound and most economical alternative considered is Option-II is considered the most viable option for construction of road to improve the physical and environmental features of City Karachi. Option II will help to improve road and solid waste conditions as well and thus promoting economic development. This proposed project will also facilitate the local inhabitants leading to a healthy and better environmental condition along with improved Storm water drains system and Sewerage lines. The option II will help to avoid the flooding events which happened in year 2020 thus saving assets and lives.

Chapter 3: GENERAL POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Overview

This section outlines and reviews the existing legislations, policies and institutions involved and identifies requirements as well as gaps and conflicts of the relevant legal and institutional arrangements that would hinder or guide the development of the project in line with the national and international laws applicable to this project. Pakistan being a signatory to various international conventions and laws, it's important that national projects are in line with these laws and as such some of the relevant international conventions are reviewed in this Section. A copy of relevant laws is attached as Annexure G.

3.2 Applicable National Policies and Legislation

3.2.1 Constitution of Pakistan (1973)

3.2.1.1 Protection of the Rights of Individuals to Private Property

The Constitution includes provisions to protect the rights of individuals to private property, and also sets principles under Article 23 of the constitution establishes the right of every citizen to acquire, hold and dispose of his or her property in any part of Pakistan and Article 24 of the constitution relates to the protection of property rights and has direct relevance to the Project.

3.2.1.2 Labour Rights in the Constitution

The Constitution of Pakistan contains a range of provisions with regards to labour rights found in Part II: Fundamental Rights and Principles of Policy.

- Article 11 of the Constitution prohibits all forms of slavery, forced labour and child labour;
- Article 17 provides for a fundamental right to exercise the freedom of association and the right to form unions;
- Article 18 proscribes the right of its citizens to enter upon any lawful profession or occupation and to conduct any lawful trade or business;
- Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone;

- Article 37(e) makes provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.

3.2.2 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The Act is applicable to a broad range of issues and extends to socioeconomic aspects land acquisition, air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. The powers of the federal and provincial Environmental Protection Agencies (EPAs), established under the Pakistan Environmental Protection Ordinance 1983, have also been considerably enhanced under this legislation and they have been given the power to conduct inquiries into possible breaches of environmental law either of their own accord, or upon the registration of a complaint.

3.2.3 Guidelines for Public Consultation (1997)

The Pakistan Environmental Protection Act 1997 requires public participation during the review of an EIA (section 12 (3)). The "policy and procedure for the filing, review and approval of environmental assessments" requires the proponents to consult with the affected community and relevant NGO's during the preparation of an environmental report.

3.2.4. Land Acquisition Act (1894)

In Pakistan, the governing legislation for land acquisition and compensation is the Land Acquisition Act (LAA) of 1894 with successive amendments, which regulates the land acquisition process and enables the federal and provincial governments to acquire private land for public purposes. Land acquisition is a provincial subject and each province has its own interpretation of the Act, and some have their own province specific implementation rules.

The law deals with the matters related with acquisition of private land and other immovable properties existing on the land for the public purpose. The public purpose, *inter alia*, includes the construction of development projects of public interest. The LAA specifies a systematic approach for acquiring and compensation of land and other properties for development projects. It stipulates various sections pertaining to notifications, surveys, acquisition, compensation and apportionment

awards and disputes resolution, penalties and exemptions. A few relevant sections were synthesized from the LAA Act 1894 are summarized below.

Key Sections Salient Features of the LAA (1894)

- Section 4 Publication of preliminary notification and power for conducting survey.
- Section 6 The Government makes a more formal declaration of intent to acquire land.
- Section 7 The Land Commissioner shall direct the Land Acquisition Collector (LAC) to take order the acquisition of the land.
- Section 8 The LAC has then to direct the land to be marked out, measured and planned.
- Section 9 The LAC gives notice to all APs that the Govt. intends to take possession of the land and if they have any claims for compensation that should to be made to him at an appointed time.
- Section 10 Delegates power to the LAC to record statements of APs in the land or any part thereof as co-proprietor, sub-proprietor, mortgagee, and tenant or otherwise.
- Section 11 Enables the Collector to make enquiry into measurements, value and claim and issue the final "award". Included is the land's marked area and valuation of compensation.
- Section 16 When the LAC has made an award under Section 11, he will then take possession and the land shall thereupon vest absolutely in the Government, free from all encumbrances.
- Section 18 In case of AP's dissatisfaction with the award who may request the LAC to refer the case onward to the court for decision. This does not affect the taking possession of the land.
- Section 23 The award of compensation for the owners for acquired land is determined at its market value plus 15% in view of compulsory nature of the acquisition for public purposes.
- Section 28 Relates with determining compensation values and interest premium for land acquisition.
- Section 31 The Section 31 provides that the LAC can, instead of awarding cash compensation in respect of any land, make any arrangement with a person having an interest in such land, including the grant of other lands in exchange.

The LAA prescribes provisions for fair and adequate compensation for land acquired involuntarily, however, its enforcement marred with many lacunas due to the bureaucratic ineptness and the whole process from notification to compensation and grievance resolution often encumbered with

inordinate delays and under the guise of eminent domain the state coercively acquires the citizens property and agonizing and pushing them in impoverishment with a little recourse. In addition, the LAA procedures do not entail the consultation and participation of affected people but leave the entire process to the discretion of the revenue department and implementing agency.

The framework of the LAA is generally considered to be constricted in scope and inadequately take into account the rehabilitation and resettlement of displaced populations and restoration of their livelihoods. The LAA also does not specifically provide any assistance for the poor, vulnerable or severely PAPs, nor does it cover for livelihood losses or resettlement costs for rehabilitation. Generally, it is limited to a cash compensation policy for the acquisition of land and built-up property, and damage to other assets such as crops, trees, and infrastructure. Consequently, a National Resettlement Policy and Resettlement Ordinance in 2002 with a wider scope of eligibility and entitlements had been drafted. However, the national policy and ordinance have yet to be officially approved, notified and enacted. In order to fill the vacuum, currently some transient measures are taken to compensate adversely affected non-titled people, non-registered tenants, businesses and wage workers under project specific arrangements for their rehabilitation, payment of resettlement costs and assistance for livelihood restoration.

For different range of infrastructural and developmental functions, land acquisition laws are applied. Land Acquisition Act of 1894 allows the various government departments KW&SB, KMC and DMCs authorities to apply to relevant Boards of Revenue or other authorities for acquisition of land for generation, distribution and transmission.

3.2.5 Antiquity Act, (1975)

The Antiquities Act relates to the protection, preservation and conservation of archaeological/historical sites and monuments. 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."

The act prohibits new construction in the proximity of a protected antiquity and empowers the government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance. Under this act, the proponents are obligated to ensure that no activity is undertaken in

the proximity of a protected antiquity, and during the course of the project if an archaeological discovery is made, it should be reported to the Department of Archaeology accordingly

3.2.6 The Criminal Law (Third Amendment, Act 2011)

The Criminal Law (Third Amendment) Act 2011 was passed by the Parliament in 2011 and assented by the President on 16th December 2011. The Act amended relevant sections in the Pakistan Penal Code and Code of Criminal Procedures. The Amendment criminalized a number of customary practices such as giving women or girls in marriage for settling a dispute), forced marriage, marriage with the Holy Quran and depriving women of inheriting property. All these offences are made non-compoundable and non-bailable under this Act.

3.2.7 Employment of Child Act, (1991)

Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows the child labour in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth year of age. The ECA states that no child shall be employed or permitted to work in any of the occupation set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act are carried out.

3.2.8 Factories Act (1934)

The Factories Act, 1934 concerns regulation of labor in factories and addresses issues regarding labor, wages, working hours and health and safety. The Factories Act also briefly refers to environmental issues. Section 14 deals with the disposal of industrial wastewater and states that "effective arrangements shall be made in every factory for the disposal of wastes and effluents due to the manufacturing process carried on therein." The Factories Act statesthat "the Provincial Government may make rules prescribing the arrangements to be made under sub-section (1) or requiring that the arrangements made in accordance with that subsection shall be subject to the approval of such authority as may be prescribed. The Allows provincial governments to establish rules for factories, whose operation exposes persons to "serious risk of bodily injury, poisoning, or disease."

3.2.9 The National Drinking Water Policy

The National Drinking Water Policy provides a framework for addressing the key issues and challenges facing Pakistan in the provision of safe drinking water to the people. Drinking water is the constitutional responsibility of the provincial governments and the specific provision function has been devolved to specially created agencies in cities and Town and Municipal corporations under the Local Government Ordinance 2001. Therefore, this policy framework is intended to guide and support the provincial and district governments in discharging their responsibility in this regard.
Pakistan's national policies relevant to the Karachi water sector include the National Water Policy, the National Drinking Water Policy, and the National Sanitation Policy. The vision that forms the foundation of Pakistan's National Water Policy is summarized as:
By 2025, Pakistan should have adequate water available, through proper conservation and development. Water supplies should be of good quality, equitably distributed and meet the needs of all users through an efficient management, institutional and legal system that would ensure sustainable utilization of the water resources and support economic and social development with due consideration to the environment, quality of life, economic value of resources, ability to pay and participation of all stakeholders.

The overall goals of the National Drinking Water Policy are:

- To ensure safe drinking water to the entire population at an affordable cost in an equitable, efficient, and sustainable manner, and
- To ensure reduction in the incidence of mortality and morbidity caused by water borne diseases.

Pakistan's National Sanitation Policy acknowledges that only about 42 percent of the total population has access to sanitation facilities, and aims to create a framework for providing adequate sanitation coverage for improving quality of life of the people of Pakistan and to provide the physical environment necessary for healthy life".

At the Provincial level, Sindh Sanitation Policy was approved in 2017 the target for urban areas includes improving of waste water treatment 75 percent by 2025.Water Supply Policy has been drafted based on the national policy. However, the policy is currently under review by a Technical Review Committee constituted by Government of Sindh (GoS) and are thus yet to come into force.

3.3 Applicable Provincial Policies and Legislation

3.3.1 Sindh Environmental Protection Act (2014)

The main focus of the law is on sustainable development, protection, conservation, rehabilitation, and improvement of environment. It instructs the provincial government to establish the Sindh Environmental Protection Council. Under the law, EIA/IEE is essentially required for all the projects before commencing any construction activity. It prohibits specified discharges and emissions. Sindh Environmental Quality Standards are an essential part of the law. The SEPA empowers the provincial government to issue notices and to enforce the Act for the protection of the environment. The environmental and social legal and regulatory systems are considered to be adequate to address environmental and social risks. After the 18th Constitutional Amendment, environmental management has been delegated to the provincial governments.

3.3.2 Sindh Local Government Act (2013)

In 2013, the Sindh Government passed the Sindh Local Government Act (SLGA) providing a framework for the reinstatement of elected local governments for the first time in the province since 2010. This law provides a multitude of powers to the Provincial Government, giving them strong control over the functions of the LGs. It aims to establish an elected local government system to devolve political, administrative and financial responsibility and authority to the elected representatives of the local governments; to promote good governance, effective delivery of services and transparent decision making through institutionalized participation of the people at local level; and, to deal with ancillary matters. In the nutshell, the local governments are administered by this act which defines their composition, functions, scope and other related matters. Metropolitan governance in Karachi is framed by the SLGA 2013, with a metropolitan entity for the entire city area and district-level municipal entities under it. Newly elected local governments (LG) for Karachi came into office in August 2016 after a gap of six years. The

3.3.3 The Sindh Local Government (Amendment) Act, 2017

The Sindh Assembly has adopted the Sindh Local Government Amendment Bill 2017 amending Section 27 of the Sindh Local Government Act 2013. The new law is aimed at preventing the councilors from no-confidence votes against the chairmen and vice chairmen of their respective union councils and committees in the province.

3.3.4 Sindh Public Property (Removal of Encroachment) Act, 2010

The Act, has been passed by the Provincial Assembly to avoid encroachment and provides measures for removal of encroachment from public property. The law specifies:
powers to intervene, grievance redress and review mechanisms, eviction and recovery of cost of eviction in case of non-compliance, punishment for aiding and abetting the act of encroachment, rewards for outstanding performance in removal of encroachment, and setting up of grievance redress tribunals. The City Government will provide continuous oversight and reinforcement to facilitate that public spaces remain free from illegal encroachments as outlined in the Sindh Public Property (Removal of Encroachment) Bill, enacted in 2010.

3.3.5 Sindh High Density Development Board Act 2010

The Act promulgated to ensure coordinated and integrated development of high-density zones in the urban centers of the province including Karachi. The Law empowered the board to identify and mark high density zones keeping in view the general principles of the Karachi Strategic Development Plan 2020.

3.3.6 The Karachi Water and Sewerage Board (Amendment) Act, 2015

Karachi Water and Sewerage Board Act, 1996 was amended to provide and maintain the safe and secure water supply for drinking and domestic use to residents of Karachi. Under the new amended Act, a new section has been be included "14-A. (1) If any person who – (a) canals, pumping stations, conduits, siphons, reservoirs and chambers of the Board for any purpose including selling of water or taking illegal connections; (b) establishes illegal hydrant for industrial, commercial or residential use; and (c) encroaches upon the land of the Board; shall be punished with imprisonment of either description for a term which may extend to ten years and with fine which may extend to rupees one million or with both.

3.3.7 Sindh Katchi Abadis (SKAA), Act 1987

Under the Sindh Katchi Abadi Act (SKAA) 1987, settlements can be declared as official *katchi abadis* and allows the right of urban squatters to rehabilitations. The SKAA envisages the regularization and provision of infrastructure to all squatter settlements on government land which were established before 23 March 1985. The SKAA was tasked to coordinate the process of

awarding leases to the residents and to provide infrastructure and other basic services. It is a provincial wide agency that operates in other towns and cities as well as Karachi. The Act stipulates the transfer of government owned land to the urban squatters or allocates funds for cash assistance. The Act need to be updated and should include all de-facto land titleholders and ownership of the all existing settlements. Based on this SKKA 1987 the KWSSIP can provide rehabilitation compensation to encroachers or squatters affected by the project.

3.3.8 The Sindh Solid Waste Management Board Act, 2014

The Sindh Solid Waste Management Board Act, 2014 was adopted by the provincial assembly paving the way for establishing a centralized provincial authority for overseeing solid waste management affairs of the major urban centers while divesting these powers back from the municipal bodies. The "Sindh Solid Waste Management Board" for the collection and disposal of solid and other waste in the Province of Sindh.

3.3.9 The Sindh Differently Able Persons (Employment, Rehabilitation and Welfare (Amendment) Act, 2017

The Act provides for the employment, rehabilitation, and welfare of differently able persons. The definition of "differently able" is any persons who on account of injury, disease, or congenital deformity, is challenged for undertaking any gainful profession or employment in order to earn his livelihood and includes a person who is blind, deaf, physically challenged or mentally challenged. In the Sindh Differently Able Persons (Employment, Rehabilitation and Welfare) Act, 2014 was amended and job quota was increased from two percent to five percent. The Act also waived admission fees at public educational institutions for people with disabilities as well as 75% of tuition fee, along with establishing reserved seats. Pakistan is a signatory of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD).

3.3.10 Sindh Bonded Labour (Abolition) Act 2015

The Act is gender sensitive, an anti-discrimination clause is added to each new proposed Law in accordance with ILO requirement *viz*: "No discrimination shall be made on the basis of sex, religion, political affiliation, sect, color, caste, creed, ethnic background in considering and disposing of issues relating to the enforcement of this Act". In all proposed Laws the cognizance has been

changed from that of the Judicial Magistrate to the Presiding Officer Labour Courts who is a Session Judge.

3.3.11 Sindh Factories Act 2015

The Sindh Factories Act 2015 deals with regulations related to project area, workers and workplace Environment Health and Safety (EH&S) requirements. The Factories Act also provides regulations with provision for general health and safety of the work force in their work area. Conditions are specified for clean work place, toilets, waste handling, provision of drinking water quality, worker health and hygiene etc. As construction activity is classified as 'industry', these regulations will be also applicable to the project & construction contractors' scope of work.

Under the new Sindh Factories Act 2015, No occupier of a factory shall be allowed to start manufacturing process unless he has obtained factory registration certificate from the Directorate of Labor. The Act does not allow a child below the age of 14 years to work in a factory in any case. The new Law restricts the employment of contractual labor in manufacturing process.

3.3.12 Sindh Minimum Wages Act, 2015

The Laws relating to the minimum wages, i.e., the minimum Wages for Unskilled Workers Ordinance 1969, Minimum Wages Ordinance 1961, Cost of Living Allowance, and Sindh Employees Special Allowance have been merged in the Sindh Minimum Wages Act 2015.

3.3.13 Sindh Payment of Wages Act, 2015

Under the Act, all wages shall be paid to the employed persons in current currency through crossed cheque or through bank transfer of any Scheduled Banks or commercial Banks along with pay slip showing the details. Notwithstanding anything contained in any other law for the time being in force, the dues of workers in case of closure, insolvency, winding up and liquidation, shall be recovered from the amount of proceedings of such closure insolvency, winding up and liquidation. Earlier there was no compensation to worker for delayed wages, new proposed Law extends compensation up to ten times as it is for deducted wages.

3.3.14 The Sindh Occupational Safety and Health Act (2017)

The Sindh Cabinet has approved the Sindh Occupational Safety and Health Bill, 2017, following the incidents like *Baldia* factory fire which claimed 259 precious lives besides burn injuries to several

others. The Sindh Occupational Safety and Health Act 2017 to make provisions for occupational safety and health conditions at all workplaces in the province for the protection of workers during work. Under the Act, an Occupational Safety and Health Council will be established in Sindh with secretary of Sindh government's Labour and Human Resources Department as its chairperson. The proposed council lays down penalties in case of death and injury due to violation.

In case of death sub-section 01 of section 38 will accord 2 years imprisonment or a fine of PKR 100,000 or both. Similarly, in case of injury the imprisonment may extend to six months or a fine up to PKR 20,000 or both.

These laws and regulations apply in any project situation where labor rights and protections are enforced. These laws are applicable to construction contractors and will be included in the bidding documents of the contractors.

3.3.15 The Sindh Transparency and Right to Information, 2016

The purpose of this Act to provide transparency and freedom of information to ensure that all citizens have better access to public information, to make the government more accountable to citizens, to enforce the fundamental right to information in all matters of public importance, to ensure transparency in all Government matters. Transparency and access to information are essential principles of democracy which not only enable the citizens to hold the Government and their institutions accountable but also help in improving the system of governance.

3.3.16 Sindh Solid Waste Management Board (SSWMB) Act, 2014

The SSWMB Act, 2014 enacted to establish a board for collection and disposal of all solid waste, to arrange effective delivery of sanitation services, to provide pollution free environment and to deal with other relevant matters. The Board established under the Act headed by the Chief Minister or his nominee and constitutes of thirteen other ex-officio members of other relevant departments.

3.3.17 Sindh Cultural Heritage (Preservation) Act, 1994

Sindh Cultural Heritage (Preservation) Act of 1994 was passed by the Provincial Assembly in February 1994 and was enacted in April 1994. This act aims to preserve and protect ancient places and objects of architectural, historical, archaeological, artistic, ethnological anthropological and national interest in the Province of Sindh.

The act enables the Government to declare any premise or object of architectural, historical, archaeological or national value, after consultation with the Advisory Committee. The act also states that if it is apprehended, the act enables the Government if apprehends that a protected heritage is in danger of being destroyed, injured or allowed to fall into decay, Government may Acquire it under the provision of the Land Acquisition Act, 1894, as if the preservation of a protected heritage were a "public purpose" within the meaning of that Act.

The Committee is responsible to maintain and preserve every protected heritage in respect of which Government has acquired any of the rights mentioned in section 7 or which the Government has acquired under section 12 of the Act.

The Act also mentions that if any person including the owner destroys, removes, injures, alters, defaces a protected heritage maintained by Government under this act or in respect of which an agreement has been executed under section 8 of the act, shall be punishable with fine which may extend to on lakh rupees, or with imprisonment which may extend to three years, or with both.

3.3.18 Karachi Strategic Development Plan 2020

The Karachi Strategic Development Plan – 2020 (KSDP-2020) has been prepared with the aim to transform Karachi into a world class city and an attractive economic center with a decent life for Citizen of Karachi. Karachi Strategic Development Plan 2020 had been approved by the City District Council Karachi in 2007, which aimed to set out a strategic framework and overall development direction and future pattern of the city over the year up to 2020 and beyond. The strategic plan, the first ever approved development plan, has now a legal status under Section 40 of the Sindh Local Government Ordinance, 2001.

According to the Local Government Department that Karachi that there are approximately 20 different land-owning agencies operating in Karachi under the federal and Sindh governments, therefore the plan is partially being implemented. The cases which are being forwarded to the Master Plan Group of offices, CDGK by the Board of Revenue of Sindh Government for their opinion as per zoning under the scrutinizing also part of strategic plan.

Besides, with a view to decongest the inner-city area, under CDGK projects, about 2250 acres of land has also been reserved in Karachi Strategic Development Plan-2020 for shifting of wholesale market, etc., the same was reserved by the land utilization department of Sindh government Under the plan, different agencies were contacted at the time of launching their projects.

3.3.19 Sindh Strategy for Sustainable Development (2007)

The Sindh Strategy for Sustainable Development proposes a ten-year sustainable development agenda for Sindh level. Its purpose is to highlight the ecological, economic and social issues of the province and to provide recommendations and strategic actions to address them. The strategy promotes the sustainable use of natural resources to achieve the objectives of poverty alleviation and social development through the participation of the people of Sindh.

3.4 Institution Responsible for Planning, Policies and Regulations

The institutional setting in Karachi has traditionally comprised various agencies at federal, provincial and local government levels with separate land areas, separate legal and administrative frameworks, and engaging in little institutional coordination. The resulting poor governance and regulation in Karachi affects not only the quality of city planning, infrastructure development and public and municipal services, but also impacts adversely on the country's economic growth and development prospects.

3.4.1 Sindh Environmental Protection Agency (SEPA) 2012

Implementation of SEPA 2012 is the mandate of the Sindh Environmental Protection Agency (Sindh EPA). Sindh EPA is headed by a Director General, and sections are headed by directors, i.e., Director Technical, Director Administration and Finance, and Director Laboratory. Sindh EPA has established District Environment Offices in a few districts.

In the past Sindh EPA issued many Environmental Protection Orders to industries for environmental standards compliance. Many textile mills, tanneries, sugar mills etc. in response started cleaner production and wastewater treatment activities. Sindh EPA issued notices to Karachi Port Trust based on public complaints against coal dust pollution. In the last 15 years almost all the multinational industries have installed treatment plants under the enforcement campaign of the Sindh EPA.

3.4.2 Environment Section in Planning & Development Department, Sindh

Environmental Section in Planning & Development Sindh Directorate works under Additional Chief Secretary-Development. It is headed by Senior Chief-Environment. Sindh Planning & Development Department in collaboration with the technical assistance of IUCN Pakistan prepared its Sindh State

of the Environment Report and Development 2004, and Sindh Strategy for Sustainable Development (SSSD) in 2007. Major functions of the Environmental Section are: appraisal and processing of environment sector development schemes, preparation of environmental plans, and contributions in policy both at the Provincial and Federal levels.

3.4.3 Karachi Metropolitan Corporation (KMC)

Karachi Metropolitan Corporation (KMC) is a public corporation and governing body to provide municipal services in Karachi. The key functions include planning, development and maintenance of 28 main roads in Karachi, bridges and storm water drains. The SLGO 2013 allows KMC to collect the fire tax, drainage tax, market fee, tolls on roads and bridges owned and maintained by KMC, entertainment tax, drainage tax, charged parking on roads maintained by KMC, and the fee on licenses.

KMC is responsible for the collection, conveyance and disposal of storm water, and for maintenance and channelization of major storm water infrastructure within the City. The director of solid waste management in KMC has the responsibility for supervising the existing designated dump sites of KMC. KMC is also responsible for providing transportation support to the DMCs for solid waste collection all over the City. For this purpose, KMC provides trucks, tractors, and dumpers to DMCs. KMC also look after the maintenance and repairs of all transportation vehicles.

3.4.4 District Municipal Corporations (DMCs)

Karachi is divided into six districts, each of which has a District Municipal Corporation (DMC), which are headed by Chairmen and Deputy Chairmen. Each district is further divided into Union Committees (UCs) which are headed by Chairmen and vice chairmen. Each Union committee is further sub divided into four wards. The Local government elections directly elect the UC chairmen/vice chairmen panel and the 4 ward members of each UC. The chairman of a Union committee belongs to the City Council/KMC and elects the Mayor/deputy mayor, while the Vice Chairman of Union Committee elects the chairman/Vice chairman of DMC and works in District municipal corporation office.

The Sindh government transferred the functions of secondary roads, street lights, parks, basic health, education and local taxes from the KMC to the six DMCs in the city. DMCs are responsible for the associated roadside drainage totaling about 176 Km in length. Other roads are the responsibility of

the town councils. DMCs have also the responsibility to maintain proper garbage and sewerage systems to keep the city clean and ensure environmental safety.

3.4.5 Karachi Water and Sewerage Board

KW&SB is one of the biggest water and wastewater utility in Pakistan. Water is being supplied to Karachi from a considerably distant located water source through bulk conveyance system comprising of a complex network of canals, conduits, siphons, multi-stage pumping and filtration.

The Karachi Water and Sewage Board comes under the Provincial Government of Sindh but operates as an independent organization. It is responsible for sewage disposal for the city of Karachi and is involved in initiatives for improved sewage disposal. It is also responsible for provision of water to the city of Karachi. The KW&SB is a vertically-integrated entity, with functions including wholesale supply and treatment, transmission and distribution of water, wastewater collection, treatment/disposal, and revenue collection.

KW&SB was established under the KW&SB Act, 1996 as an autonomous body with its own Board of Directors, and a Managing Director who was also a Board Member. The 'Board' is controlled directly by the provincial government. The chairman and vice chairman of the Board were directly appointed by the provincial government. The managing director, however, continued to enjoy the status of chief executive officer of the Board, along with the usual administrative authority in running the organization.

The KW&SB divides Karachi into 6 water Circles and 20 towns based upon population and the outlet and inlet points of the existing water pipeline network in the city. The KW&SB provides intermittent water to some part of the city. However, many parts of City particularly *Katchi Abadis* face extreme water shortage. To supplement the water supply, KW&SB also supplies water tankers on request only in formal settlements.

3.4.6 Sindh Solid Waste Management Board (SSWMB)

Government of Sindh has established Sindh Solid Waste Management Board (SSWMB) under the Sindh Solid Waste Management Board Act 2014. SSWMB is responsible for the collection and disposal of solid and other wastes in the Province of Sindh. Some of the key functions of SSWMB are:

(i) collect and charge fees or impose fines for collection and disposal of solid waste against the rules prescribed;

(ii) construct, improve, maintain the buildings, sites and machinery relating to the operation of solid waste management;

(iii) make rules and regulations for operational, administrative, human resource management and finance for regulating the operation of solid waste management from time to time;

(iv) review the existing schemes or prepare new schemes relating to solid waste management and undertake execution; and

(v) regulate control or inspect the source points of generation, accumulation, transfer, recycling, trading of the solid waste;

(vi) employ third party to take over management of solid waste on behalf of the Board.

Chapter 4: DESCRIPTION OF ENVIRONMENT

This chapter describes the environmental baseline of the entire area for the proposed project including physical, biological, socioeconomic conditions and cultural aspects relevant to the project.

4.1 Physical Environment of Karachi

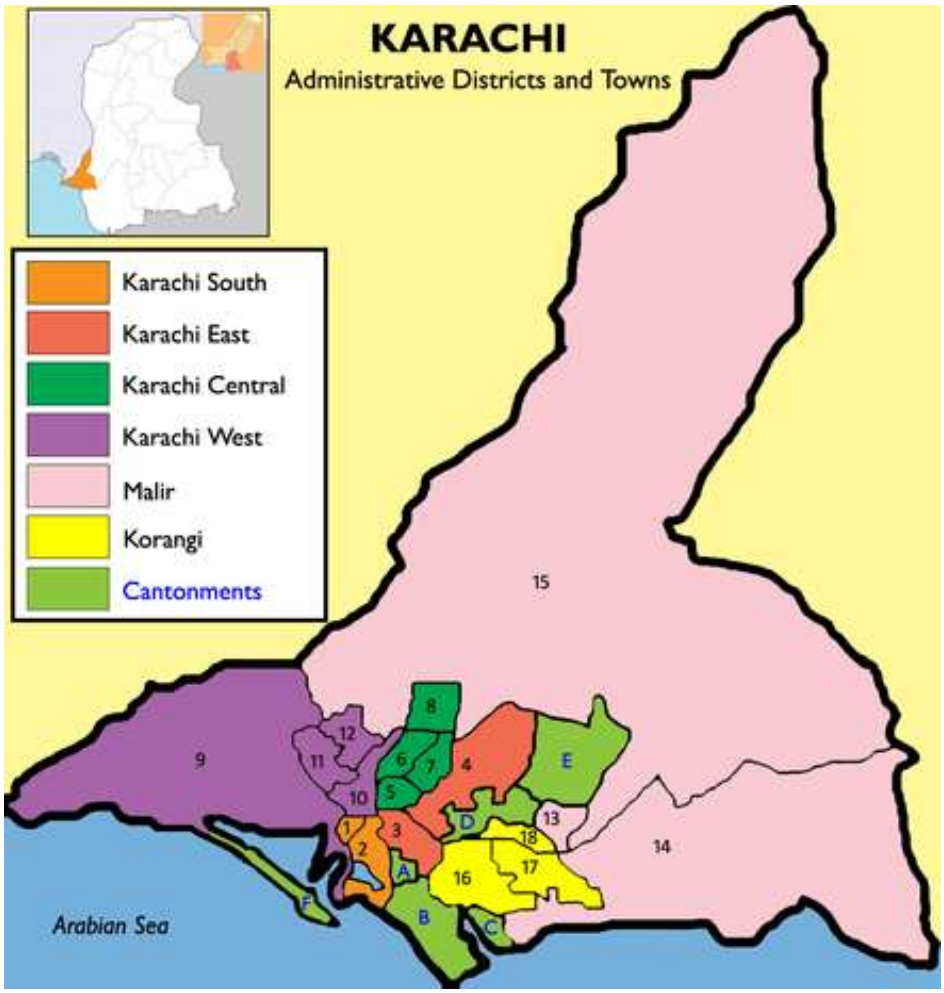


Figure 4-1: Map of Karachi

4.1.1 Climate

Karachi is located just above the tropical zone on the coast of the Arabian Sea at 24º45" to 25º15" north, and 66º37" to 67º37" east at about 20 m above sea level (airport weather station). Karachi is bounded by Hub-River (Baluchistan Province) on West, Badin District on East, Dadu District on North and Arabian Sea on South. The climate of the Karachi can be characterized by dry, hot and humid conditions and in general terms it is moderate, sunny and humid. There is a minor seasonal intervention of a mild winter from mid-December to mid-February followed by a long hot and humid summer extending from April to September, with monsoon rains from July to mid-September. The level of precipitation is low for most of the year. Karachi also receives the monsoon rains from July to September. The humidity levels usually remain high from March to November, while very low in winter as the wind direction in winter is North Easterly.

4.1.2 Temperature

The maximum temperature range is 24 – 37 ^{o}C. The average temperature range is 21 - 34 ^{o}C. The minimum monthly temperature range is 17 – 30 ^{o}C.

April to November are the hot months whereas cold months are December to March.

Table 4-1:**Maximum, Minimum and Average Temperature in Karachi** (2016-2020).

Year	**Month's Temperature C^{o}**											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2016												
Max	**26**	**29**	**32**	**34**	**35**	**36**	**33**	**33**	**32**	**33**	**32**	**29**
Avg	**22**	**24**	**27**	**29**	**31**	**31**	**30**	**30**	**28**	**28**	**27**	**24**
Min	**19**	**20**	**24**	**25**	**28**	**28**	**29**	**28**	**26**	**25**	**23**	**21**
2017												
Max	**25**	**29**	**32**	**35**	**37**	**35**	**32**	**32**	**32**	**34**	**30**	**27**
Avg	**21**	**24**	**27**	**30**	**32**	**32**	**30**	**29**	**29**	**30**	**26**	**23**

Min	**18**	**21**	**23**	**26**	**28**	**29**	**28**	**27**	**27**	**27**	**23**	**20**
2018												
Max	**26**	**28**	**31**	**35**	**37**	**34**	**32**	**30**	**30**	**35**	**34**	**29**
Avg	**22**	**24**	**27**	**30**	**33**	**31**	**30**	**28**	**27**	**33**	**32**	**26**
Min	**19**	**21**	**24**	**26**	**29**	**29**	**28**	**27**	**26**	**30**	**28**	**23**
2019												
Max	**27**	**27**	**30**	**34**	**35**	**36**	**33**	**31**	**32**	**34**	**30**	**27**
Avg	**25**	**24**	**28**	**32**	**33**	**34**	**31**	**30**	**31**	**32**	**28**	**24**
Min	**21**	**20**	**23**	**27**	**28**	**29**	**28**	**27**	**27**	**28**	**24**	**20**
2020												
Max	**24**	**30**	**30**	**34**	**35**	**35**	**35**	**-**	**-**	**-**	**-**	**-**
Avg	**21**	**27**	**27**	**32**	**33**	**33**	**33**	**-**	**-**	**-**	**-**	**-**
Min	**17**	**21**	**21**	**25**	**27**	**29**	**29**	**-**	**-**	**-**	**-**	**-**

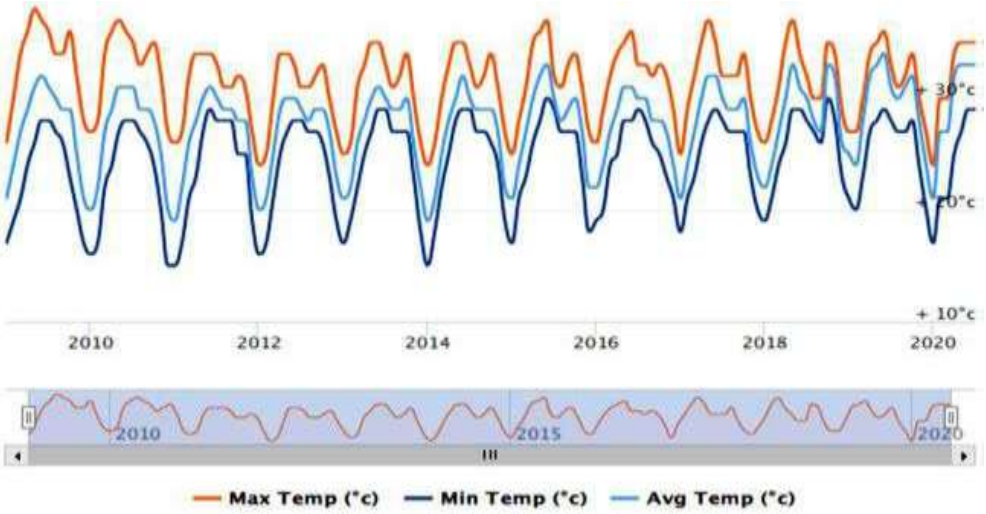


Figure 4-2: **Maximum, Minimum and Average Temperature in Karachi**

4.1.3 Rainfall

As this region falls in the semi-arid climatic zone, the rainfall in Karachi is extremely low and erratic.

Table 4-2 **Monthly Average Rainfall (mm) and Number of Rainy Days of Karachi**

Year	Month's Average Rainfall (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	2.63	0.0	3.9	0.11	0.09	9.71	10.23	41.09	1.2	0.01	0.0	0.1
2017	5.61	0.03	0.1	0.01	0.06	3.47	20.4	27.17	16.92	0.0	0.14	0.22
2018	0.01	0.0	0.04	0.53	0.0	5.92	11.86	14.31	2.53	0.0	0.0	0.4
2019	13.7	4.8	3.2	18	0.8	2.9	61	118.9	16.1	12.6	5.6	3.3
2020	3.0	0.0	2.1	0.1	0.7	3.9	32.1	-	-	-	-	-

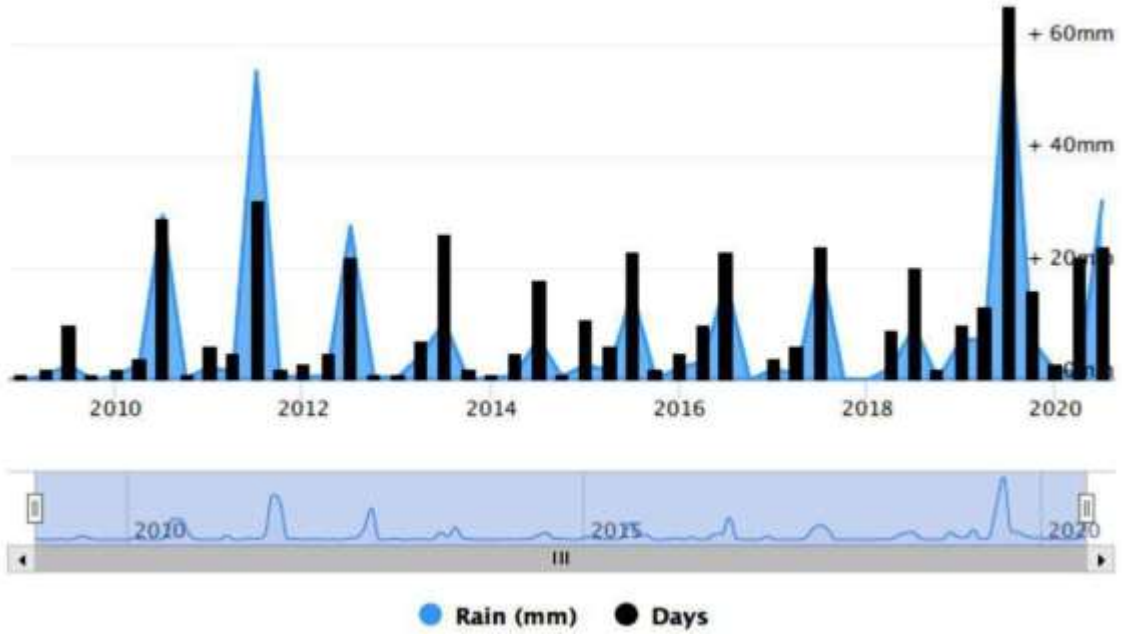


Figure 4-3**: Monthly Average Rainfall (mm) and Number of Rainy Days of Karachi**

4.1.4 Humidity

Despite arid conditions, humidity is relatively high throughout the year.

Table 4-3**: Average Humidity (%) of Karachi (mm)**

Year	Month's Average Humidity (%)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	48	33	49	54	66	67	72	73	71	63	39	44
2017	37	29	49	52	63	68	74	72	69	55	38	25
2018	42	45	50	51	52	69	73	75	72	47	37	35
2019	42	39	47	50	58	66	72	76	70	53	40	31
2020	38	37	48	58	67	70	69	-	-	-	-	-

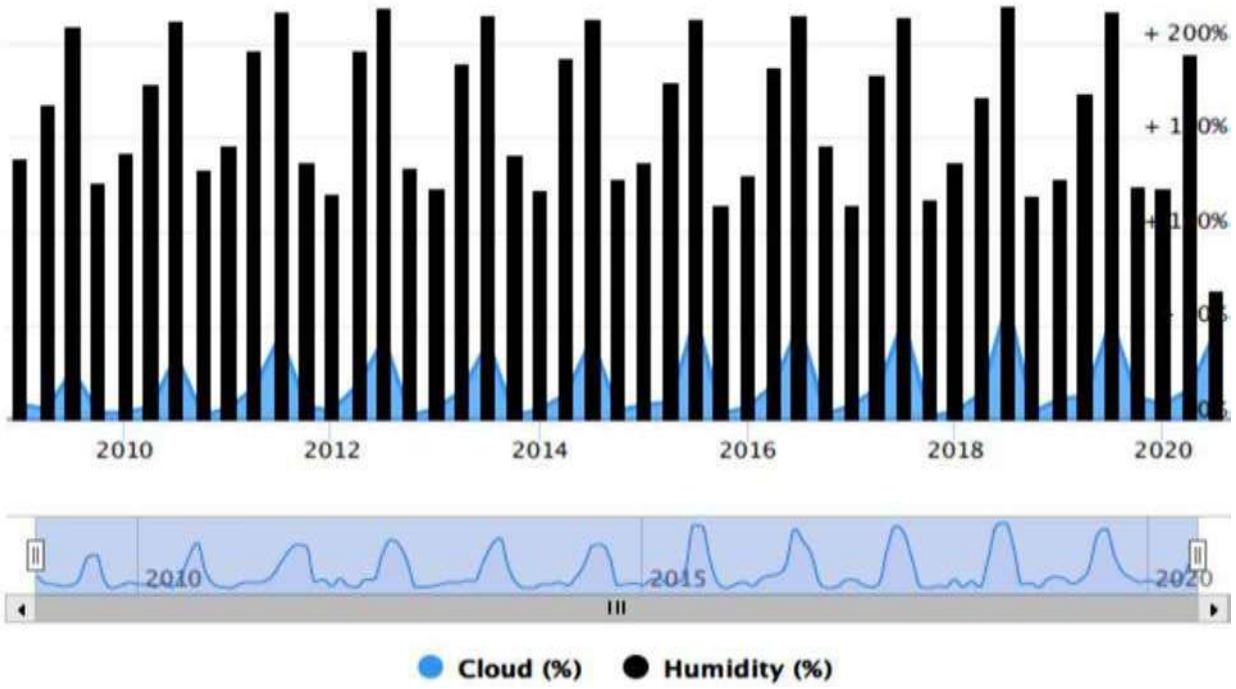


Figure 4-4**: Average Humidity and Clouds (%) of Karachi**

4.1.5 Wind

Karachi weather is considered pleasant and is famous for its breeze from the sea. The onshore winds from the Arabian Sea contribute to humid conditions. The wind speed has highest velocities during the summer months, when the direction is south-west to west. During winter, the wind blows from north to northeast, shifting southwest to west in the evening hours. The wind usually carries sand and salt resulting in severe wind erosion and corrosion. Tropical cyclones are formed in the Arabian Sea in the pre-monsoon season, mostly in the month of June.

Table 4-4**: Maximum and Average Wind Speed (kmph) of Karachi**

Year	Month's Wind Speed (kmph)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016												
Max	10.1	11,7	16.3	19.1	24.5	24.2	24	21.6	23.7	15.3	10.2	10.1
Avg	10.1	11.7	16.3	19.1	24.5	24.2	24	21.6	23.7	15.3	10.2	10.1
2017												
Max	13.3	13.5	16.2	20.4	23.6	23.8	26	23.8	19.4	14.4	10.7	13.3
Avg	13.3	13.5	16.2	20.4	23.6	23.8	26	23.8	19.4	14.4	10.7	13.3
2018												
Max	10.3	11.6	16.7	18.9	21.6	25	25.2	24.7	22.1	20.6	17.5	17.8
Avg	10.3	11.6	16.7	18.9	21.6	25	25.2	24.7	22.1	13.9	11.4	12
2019												
Max	18.6	23.3	24.1	29.5	32.8	29.7	34.7	28.8	25.6	20.9	20.4	21.4
Avg	12.3	16.3	16.8	22.7	26.2	23.8	30.6	24	20.4	14.8	15	15.0
2020												
Max	24.2	21.7	26.6	29.4	33.3	28.9	31.9	-	-	-	-	-
Avg	17.3	14.1	17.6	20.9	25.7	23.1	25.8	-	-	-	-	-

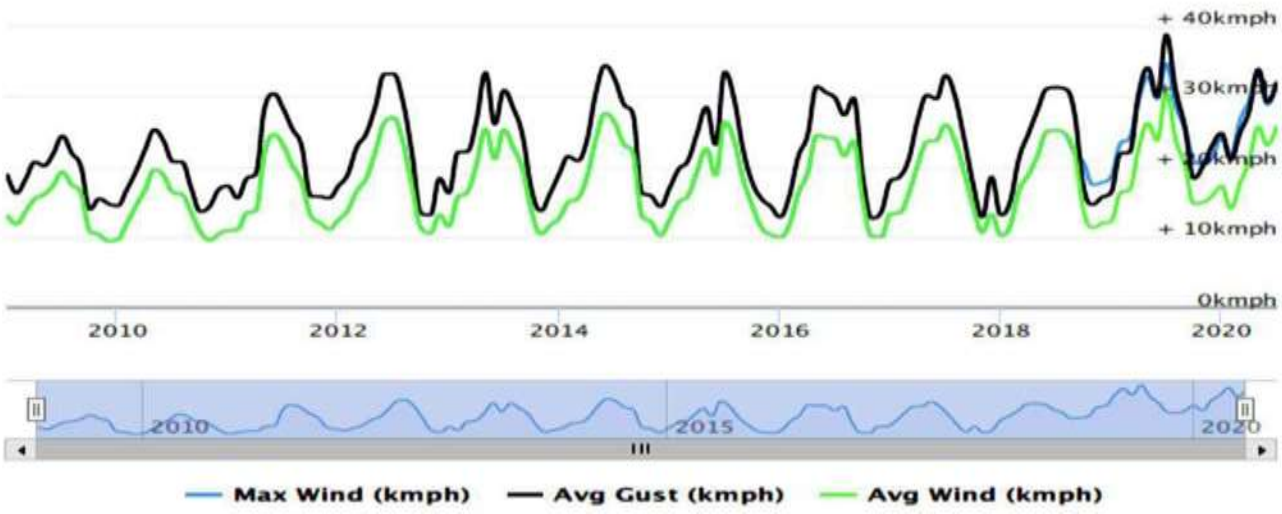


Figure 4-5**: Monthly Average and Maximum Wind Speed and Gust (kmph) of Karachi**

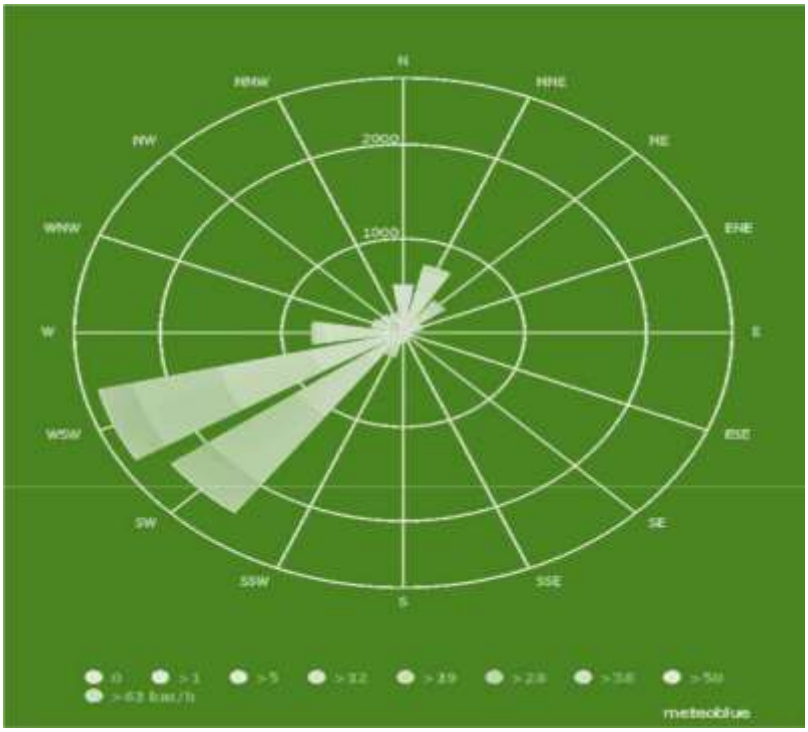


Figure 4-6**: Wind Rose of Karachi**

4.1.6 Ambient Air Quality

World Health Organization (WHO) included Karachi amongst the top 20 polluted cities of the world with respect to outdoor ambient air pollution levels measured as PM10 and PM2.5. Annual mean concentrations of PM10 and PM2.5 in Karachi are 273 µg/m^3 and 117 µg/m^3, respectively.[27] WHO

revised standard for safe concentration levels for PM10 is 20 µg/m^3 and for PM2.5 is 10 µg/m^3. In Karachi, PM10 concentration level is about 14 times and PM2.5 concentration level is about 12 times higher than the WHO standards. Highest level of PM2.5 concentration happens during November to February due to reduced wind speed. During this period, PM2.5 concentrations reach in the range of 120–180 µg/m^3 (12-18 times the WHO standards). In 2007, Encyclopedia of Earth, ranked Karachi as the most polluted city in terms of Total Suspended Particulates (TSP), and fourth most polluted mega city according to the multi-pollutant index ranking.[28] In Karachi, the concentration levels of carbon monoxide (CO), oxides of nitrogen (NOx), and sulfur dioxide (SO2) are within the permissible limits established by US EPA. The concentrations of hydrocarbons (HC) are higher than the permissible limits (0.25-2.8 as compared to 0.24 permissible limits).[29] Higher level of air pollution has resulted in substantial increase in respiratory tract infection. Major contributors towards air pollution in Karachi are vehicular traffic, industry and ambient dust.

Ambient air quality was monitored at the project site. Reports are annexed as **Annexure-H.**

4.1.7 Noise Level Monitoring:

During the measurement following conditions were prevailed on site. Reports are annexed as **Annexure-H.**

Metrological Conditions:

During the noise level monitoring weather was dry and sky was clear. Air was blowing at normal speed.

Monitoring Instrument:

The description of the instrument used for the noise level monitoring is given below:

Name: Digital sound level meter

Model: AR824

Company: Intel Instruments plus

Methodology adopted:

Figure 4-7: Noise Meter

Noise level measurements were carried out at four points of the project site. Major source of noise generation is vehicular traffic along the

main road. Noise levels were at the boundary walls of the project site. The noise level results were within the SEQS Limits at all boundaries during the monitoring hours. Lab reports are annexed as **Annexure-H.**

4.1.8 Ground Water Analysis

Tap water was taken as a ground water sample and analyzed in the Laboratory. The water analysis results are annexed as **Annexure-H.**

4.1.9 Topography

Karachi is located in the south of Sindh, on the coast of the Arabian Sea. It covers an area of approximately 3,600 km^2, comprised largely of flat or rolling plains, with hills on the western and northern boundaries of the urban sprawl. The city represents quite a variety of habitats such as the sea coast, islands, sand dunes, swamps, semi-arid regions, cultivated fields, dry stream beds, sandy plains, hillocks. The hills in Karachi are the off shoots of the Kirthar Range. All these hills are devoid of vegetation and have wide intervening plains, dry river beds and water channels.

Classified according to physiographic features, Karachi City District can be divided into three broad categories: Hilly Region (Mountain Highland), Alluvial Plain (Piedmont Plain) and Coastal Areas (Valley Floor). The greatest height of the region is 76 m that gradually decreases to 1.5 m above sea level along the coastline. The Karachi Harbor is a sheltered bay to the south-west of the city, protected from storms by the Sandspit Beach, the Manora Island and the Oyster Rocks.

The Arabian Sea beach lines the southern coastline of Karachi. Dense mangroves and creeks of the Indus delta can be found towards the south east side of the city. Towards the west and the north is Cape Monze, an area marked with projecting sea cliffs and rocky sandstone promontories.

Karachi is the part of major synclinorium stretching from Ranpathani River in the east to Cape Monze in the west, Mehar and Mole Jabal (Mountains) in the north. Within the synclinorium, a number of structures such as Pipri, Gulistan-e-Jauhar, Pir Mango and Cape Monze are exposed. The presence of concealed structures under the Malir River valley, Gadap and Maripur plains can fairly be deduced. Rock aggregates, sand, limestone and clay are some of the potentials for gainful utilization. Gulistan-e-Jauhar, member of the Gaj formation, offers groundwater potential for limited use. The area is underlain by rocks of sedimentary origin ranging in age from Eocene to Recent.

A large portion of the Karachi area consists of vacant land including the area dedicated to the Kirther National Park. The vacant land accounts for only 7% of all land and housing is the biggest user of land (with about 37% of the total), while roads and open spaces are also significant. Most of the developed areas are concentrated in the inner ring towns of Saddar, Jamshed, Lyari, Liaquatabad, Gulshan-e-Iqbal and Gulberg. These towns contain the diverse mix of land uses and include most of the governmental and regional-scale industrial and commercial activities.

4.1.10 Solid Waste Management

The solid waste management (SWM) sector in Karachi is divided into three operational segments, namely front-end collection, middle-end services and back-end services, managing more than 12,000 metric tons of municipal solid waste every day. The sector's infrastructure consists of two dumpsites, Gond Pass and Jam Chakro located approximately 30 kilometers West and North-West from the city center, and ten transfer sites located around the city. The capacity of the existing infrastructure is insufficient to properly serve Karachi and over time alternative solutions need to be identified to enable the city to manage solid waste.

The institutional structure of the SWM sector is fragmented. Key institutions include the SSWMB as the primary service delivery agency within the sector, and DMCs which have a more limited role. SSWMB was formed in 2014 under an Act of the provincial assembly. The Board is empowered to manage solid waste issues for the province of Sindh as a whole, and has the right to recommend a cess, tariff or other charge to the government for the management of solid waste; to construct and manage sites and buildings for solid waste management and disposal; and to make rules and regulations for the same etc. The Board is also empowered to manage a Fund, known as the Sindh Solid Waste Management Fund, in which charges, rates and fees may be deposited; in addition to other grants and loans made to the Board.

Front-end collection services, which involve collection of solid waste from primary collection points (bins or kachra kundis) and moving it to designated transfer stations, are divided between the SSWMB which provides services in three of the six districts, and DMCs for the remaining three districts. SSWMB and DMCs are also using different operational models. DMCs provide these services using sanitary staff who are regular employees of the DMC, and equipment that is DMC-owned and operated. In contrast, the SSWMB uses a private sector led model through front-end collection contracts.

The SSWMB has sole responsibility for the remaining segments of the value chain till disposal for the entire city, and operation and maintenance (O&M) infrastructure such as transfer stations and the disposal sites and manages these functions through contracting arrangements with the private sector as well.

4.1.11 Water Resources

The description of the water resources of Karachi is as under:

a)Surface Water

Indus River and Hub Dam on Hub River are the two major sources of surface water for Karachi.

1. **Indus River**

The Indus River, the main source of water for Karachi, is severely constrained by dry season demand, but has abundant wet season discharges. Except during the summer flood season, very little water escapes to the sea. Water from the Indus River is distributed over the Sindh Province through three barrage systems, namely, Guddu, Sukkur and Kotri. Urban and industrial water for Karachi is taken from the Kotri Barrage and discharged through the Kalri Baghar Feeder Upper (KB Feeder Upper) to Kinjhar Lake. Kotri Barrage is the lowest barrage on the River Indus. Kinjhar Lake is a natural reservoir, the storage of which has been increased by constructing nearly 20 km of embankments having a maximum height of 9 m. The lake has a catchment area of 910 km. The supply from the River Indus comes via canals from Kinjhar, Haleji, Gharo and through conduits to the Dhabeji pumping station. The water is then distributed via conduits and distribution mains.

2. **Hub Dam**

The Hub Dam is a multi-purpose dam (municipal, industrial and irrigation purposes) constructed on the Hub River approximately 50 km to the north-west of Karachi city. The construction of the dam started in September 1963 and completed after 18 years in September 1981. The catchment area of the dam extends across two provinces namely Sindh and Balochistan, covering a total area of 8,730 km. There has been an agreement between the two provinces that, at the Regulator located at the end of the Hub Main Canal, 63.3% of the total flow from the dam will be diverted to the Karachi Water Supply Canal (Sindh) while 36.7% to the Lasbela Canal (Balochistan).

3. Groundwater

Ground water resources in Karachi are limited. Small amount of groundwater is extracted for private use in the Karachi area. The aquifers close to the coastal belt are mostly saline and unusable for domestic purposes. Aquifers near the Hub River are well developed and serve as sources of water for agriculture and domestic use. The aquifers are estimated to lie at depths of 50-100 m. Dumlottee Well Field, located on the banks of Malir River in the Dumlottee area about 30 km to the northeast of the city supplies water for few months after the rainy season. The system is almost dry in the rest of the year.

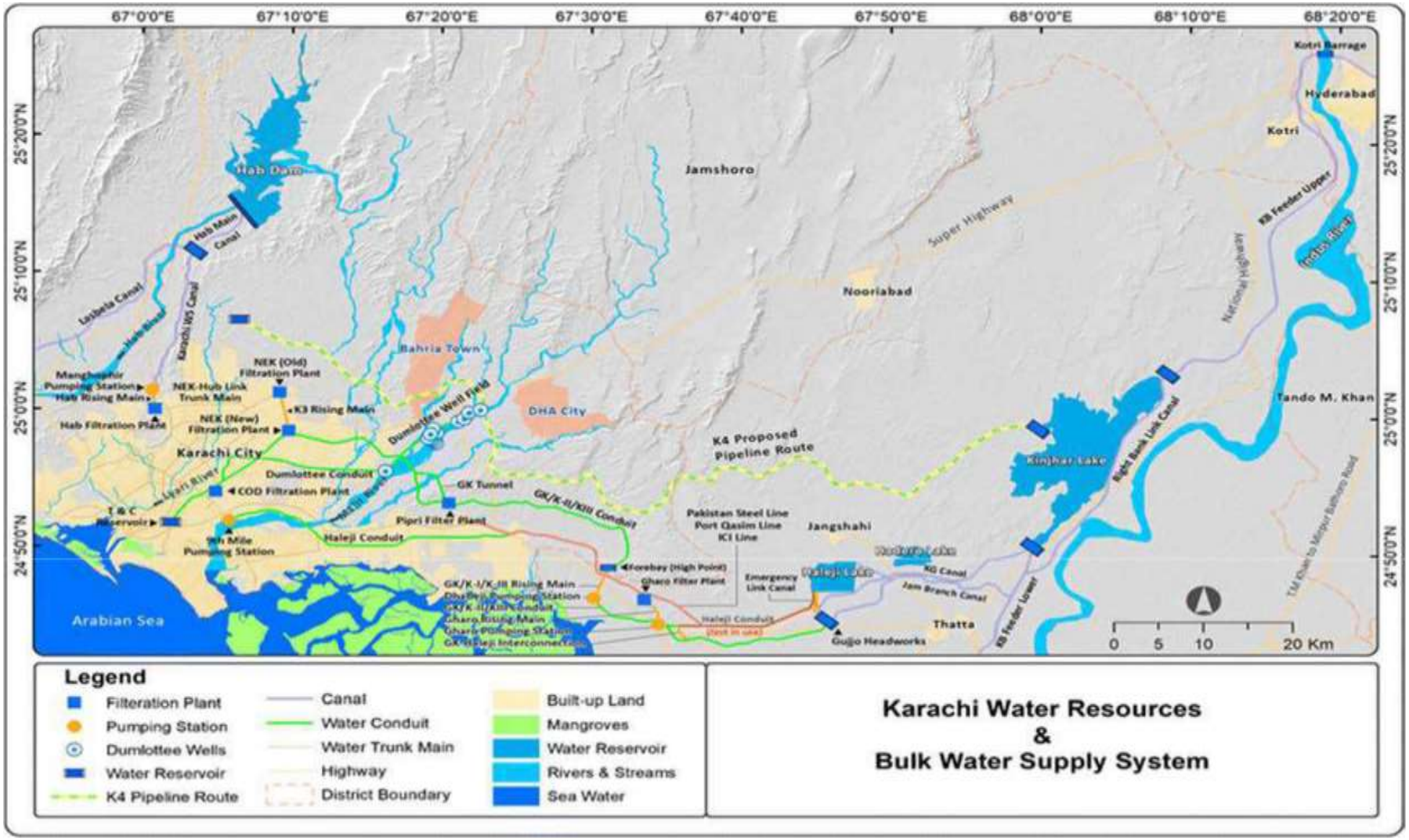


Figure 4-8: Water Resources & Bulk Water Supply System of Karachi

b) Groundwater Recharge Sources

Five possible water-sources are contributing to the groundwater recharge in Karachi. The first possible source is the rainfall. As the city of Karachi suffers from deficit of precipitation (only rainfall), the contribution to shallow groundwater storage from rain is very little. However, rainfall in the hinterlands and other areas surrounding Karachi may significantly contribute to the groundwater flow-system. The two freshwater sources are the Hub Lake/Hub Dam and the Indus River. Water from Hub Dam and the Indus River is piped to various residential zones in Karachi for drinking and irrigation purposes. The spring water discharges into Malir River and Layari River and the municipal/industrial 4waste effluents added to these rivers are also contributing to groundwater storage. Seawater intrusion along Karachi coast is another possible source.

During the past several years, a number of pumping wells has been installed to meet requirements for the irrigation-water supply (to serve vegetable and fruits cultivation, dairy and poultry) and drinking-water supply for Karachi. Excessive pumping of groundwater and continuous lowering of water-table is likely to result in intrusion of seawater into the Malir Basin under natural seepage conditions and under artificially induced conditions of recharge of saline seawater in the coastal aquifer(s) of Karachi.

Groundwater Quality

Physico-chemical data of shallow groundwater (depth less than 30 meters) shows that the shallow wells, located in the vicinity of coast and in the proximity of polluted rivers, have relatively higher values of electrical conductivity, salinity and population of coliform bacteria. The shallow groundwater is moderately saline, representing electrical conductivity values in the range of 1.1 to 1.9 mS/cm and salinity in the range of 1 ppt. The pH of shallow groundwater varies from mildly acidic (~6.3) to mildly alkaline values (~7.9). Areas with quite poor sanitary conditions have relatively low values of pH (~6.3 to 6.8). Shallow groundwater below 20 meters is slightly reducing. The dissolved oxygen is in the range of 1.5 to 7.9 mg/l. Turbidity of shallow groundwater varies between 3.6 NTU and 95 NTU. The concentration of HCO3 - (356 – 514 ppm, n=4), Cl- (82 - 169 ppm, n=4) and SO4-2 (38-117 ppm, n=4) in shallow groundwater is very reasonable.

In general, deep groundwater is mostly saline and has high electrical conductivity (range: 1.9-19.1 mS/cm) and salinity (range: 1.7-7.4 ppt), as compared to shallow groundwater. Based on hydro-chemical data of water samples collected from pumping wells, it is assumed that the shallow mixed deep groundwater discharged by large-scale pumping wells mainly represents the deep groundwater from confined aquifer.

The hydro-chemical and stable isotope results indicate that the confined aquifer hosts a mixture of rainwater from hinterlands and surrounding regions around coastal Karachi, as well as sea trapped water / seawater, through intrusion under natural infiltration conditions or under induced recharge conditions.

4.1.12 Water Supply System

Over the last three decades, Karachi consistently lagged behind in the maintenance and expansion of water supply system, bulk conveyance system, and distribution network as compared to the city demands due to high population growth rate (4 to 5% per annum), low capacity of institutions, and low level of financing. The consequence is the rationing of water supply currently in practice in most of the areas of the city. Water is supplied only once in every two or three days and for the duration of two to three hours at a time. People are obliged to spend money on ground-level tanks, booster pumps, roof-top storage tanks and water filters and even then, all drinking water is boiled. Many households are compelled to use secondary sources of water such as shallow wells or tanker supplies just to meet their basic needs.

The water supply system of the KWSB supplies bulk water to the citizen of Karachi City from the Indus River, Hub Dam and Dumlottee Wells through the Greater Karachi Bulk Water Supply System, Karachi Water Supply Canal and Dumlottee Conduit, respectively. About 33% of the total water supply is without filtration. From filtration plants and reservoirs, water is supplied through the water trunk mains and distribution pipelines.

Table 4-5: Water filtration plants

Location	Gharo		COD		Pipri			NEK Old	NEK New	Hub
Number of Plants	1	2	1	2	1	2	3	1	1	1
Year of Construction	1943	1953	1962	1971	1971	1978	2006	1978	1998	2006
Rated Capacity MGD	10	10	70	45	25	25	50	25	100	80

A total of 139 distribution pumping stations are being operated and managed by the KWSB. Some of the consumers install individual small suction pumps and suck water from distribution pipes forcibly. This is the one of reasons of serious water supply situation which makes low water pressure and water shortage, and also problems of water quality aggravation such as sewerage contamination caused by negative pressure in the pipes. There is no water meter on individual service connection. Consumers pay water tariff on the basis of plot size hence they pay no attention to any wastage. Awareness for the usage and storage of water is very less in many parts of Karachi. The areas which are not in the service area by any water supply or low service quality, water is supplied by Tank-Cars which belong to private sectors from 10 bases of Bowser Filling Stations in the city area.

4.1.13 Sewerage System

Four drainage systems are said to encompass Karachi city, the Lyari, the Malir, the Budnai, and small streams referred to collectively as the coastal basin. The Malir River Basin and the Lyari River Basin contribute about 80% of the surface runoff from the city. Thus, the natural drainage system of Karachi city includes mainly the tributaries of the Malir and Lyari Rivers. While these are perennial streams, in stream flow is intermittent, and fresh water inflow depends on rainfall

and runoff; both rivers also intercept discharges from sewer lines and outfalls and carry sewage to the sea from all parts of the city. The Budnai Basin and the Coastal Basin are minor basins. The Malir River flows from the east towards the south and center, and the Lyari River stretches from north of the city to the southwest ending in the Arabian Sea.

Drainage channels collect surface runoff through hundreds of small/large side channels and lined nullahs (drains) that serve as important components of the drainage network. These are generally dry built channels and streambeds that flow into the main rivers described above. Whenever a heavy rain takes place, the huge amount of runoff that course through these channels may cause the rivers to overflow their banks and spread over adjacent floodplains. In any event, the drainage network of the city is severely stressed due to increased runoff from paved surfaces, and encroachment on drainage channels.

The Lyari River is an ephemeral stream having a substantial catchment area starting from as far back as the Badra range of hills, some 100 km north of the city. Its catchment covers an area of 700 km2, out of which, approximately 150 km2 is in the metropolitan area. The river is the main contributor to an estimated amount of 200 MGD of sewage that enters the Arabian Sea. A large number of industries including leather tanning units, pharmaceuticals, petrochemicals, refineries, chemical, textile, paper and pulp, engineering works and thermal power stations, located along the river, regularly discharge their untreated industrial waste, including the waste flows from the SITE industrial estate in Orangi that flows via the Orangi Nullah to the Lyari and thence to the ocean.Malir River is shorter with a smaller drainage area. It is ephemeral and is constituted from two major tributaries, the Mol and Khadeji, as well as some minor tributaries. Khadeji is a perennial stream that originates at Khadeji falls and gains flow as it travels across the Malir Basin. The Malir and Khadeji River basins include dry hill torrents and flow depends upon precipitation during rains. Once the Malir enters urban space, it receives large amounts of industrial effluent from the Korangi industrial area, and discharges into the sea.

Table 4-6: **Wastewater Quality of Malir and Lyari Rivers**

Parameters	Malir	Lyari
(mg/l) except pH	(Mean Values)	
pH	7.41 - 8.45	7.49
Temperature ^{o}C	32-33	27
Total Dissolved Solids (TDS)	1,478 – 33,820	2,361
Biochemical Oxygen Demand (BOD)	180 – 320	343
Chemical Oxygen Demand (COD)	506 – 1,413	552
Zinc	0.6 – 1.39	0.32
Lead	2.19 – 6.77	0.23
Cadmium	1.71 – 2.6	0.12

The existing coverage of the sewerage system is only about 30% for the Karachi. The existing sewerage system has a number of problems. These include low sewage flows received at existing sewage treatment plants, resulting from the inadequate provisions of sewer trunk mains and the malfunctioning of pumping facilities, deterioration of water quality in rivers and canals, and clogging of waterways caused by damping of massive rubbish.

As per KSDP 2020, more than 380 MGD wastewater is discharged daily. Only 90 MGD is treated at existing wastewater treatment plants. According to KWSB sources, almost 441 MGD raw sewage gets into the sea without required level of treatment from Karachi via 11 drains. Existing sewerage facilities for sewage collection and its treatment are far from sufficient in quantity to serve the large population of Karachi city. Additional sewage collection system including branch sewers, trunk sewers and pumping stations need to be constructed to improve living environment of the citizen. In the same manner, existing sewage treatment plants need to be extended and new plant(s) has to be implemented to treat all the generated sewage to improve water qualities of public water bodies, especially of Arabian Sea.

4.1.4 Industrial Wastewater Pollution

Emission of untreated effluent from industries that do not meet the Sindh Environmental Quality Standards (SEQS) result in considerable environmental pollution and degradation. Untreated wastewater from most of the polluting industries does not comply with the SEQS. There are about 24 large and small industrial complexes in the province. The industrial estates of Karachi, namely Sindh Industrial Trading Estate (SITE), Landhi Industrial Trading Estate (LITE), Korangi Industrial Area (KIA), and West Wharf Industrial Area, among others, discharge effluents mainly into the Lyari and Malir rivers, which, passing through mangroves of Korangi Creek, finally drain into the Arabian Sea. SITE represents about 50% of the industrial discharges into sea.

Many of the above-mentioned industrial estates intend to or are in the process of establishing large scale effluent treatment plants. The larger industrial zones include SITE (north), Landhi Industrial Estate (east), Korangi Industrial Area (south), Hub (west, between Karachi and Gadani, administratively outside Karachi). The other fast growing industrial areas include Port Qasim Industrial Area, North Karachi Industrial Area, FB Industrial Area, SITE Superhighway etc., besides a number of industrial units operating in residential areas. Due to paucity of land, capital and technical resources, very few industrial units have installed individual wastewater treatment plants. Therefore, almost all of the industrial effluent goes into the sea practically untreated.

The major sources of pollution in coastal waters are indiscriminate discharges of untreated industrial and domestic effluent, shipping traffic, mechanized fishing fleet and oil terminals at Karachi harbor. An estimated 90,000 tons of oily discharge is pumped out within port limits annually. Currently, almost 100% of the country's shipping cargo is handled at the two ports of Karachi. Eight heavy metals (As, Cd, Co, Cr, Cu, Hg, Ni, Pb, Zn) have been found to be accumulating in coastal fauna.

Untreated wastewater is one of the major sources of surface and groundwater contamination. Major infectious diseases outbreaks were sourced by the contamination of fresh water resources. The drains in Sindh are part of an irrigation system and were specifically constructed to drain subsoil water, control waterlogging and salinity, and carry the surface runoff from surrounding

lands. They mostly discharge to the rivers and sea. Most sewage flows into the nullahs and rivers which run as open sewers through the urban area, causing highly obnoxious, insanitary conditions with serious health risks and unpleasant environment for the residents of adjoining neighborhoods.

There are numerous unauthorized settlements along most of the sewage channels where poor segments of society live. These are vulnerable to being exposed to water borne diseases, especially children. Besides causing health impacts, sewage overflow also damages already dilapidated infrastructure of Karachi, particularly roads.

Mangroves are under stress due to industrialization, decreased freshwater discharges, and urban sprawl. Major functions of mangroves are: protection of inland areas from the effects of climatic stress, breeding and spawning of marine fisheries, and livelihood to the coastal communities. Major issue is the depletion in mangrove cover, which is going down both in quantity and quality. The industrial units propping up along the coast, especially in the Port Qasim Industrial Area, often cut sizable numbers of mangroves. However, very low real effort is visible in alternative and compensatory plantation of mangroves, as promised by proponents during environmental approval process. Furthermore, with declining quality and quantity of fish catch, the fisher-folk is opting to other means of livelihood, thereby reducing their traditional economic reliance on mangroves. This results in cutting of mangroves by the local communities as well, especially during fuel shortage.

The heavy metal accumulation (especially Pb) in seafood is linked to anemia, kidney failure and brain damage in humans. Other major impacts of marine pollution as seen in Karachi include loss of biodiversity, dislocation of coastal communities, loss of livelihood, loss of fisheries, and degradation of beaches and recreational places.

4.1.15 Flooding

Climate of Karachi is semi-arid and rainfall is low and highly variable. Torrential rains and heavy rainfall mostly occur in the month of June under the effect of tropical storms. Torrential and heavy rains rarely affect coastal areas but cause flooding within the city. As the result of a tropical storm (6 June 2010) Karachi received 130 mm rain within a day which caused huge

surface runoff. The heavy monsoon rain mostly occurs in July and August and is the main cause of flooding in the city. However, its reoccurrence is estimated to occur at between about 3 to 5-year intervals. Frequency of floods has increased in the recent past due to more frequent heavy monsoon rains stated to be linked with impacts of climate change. Flood affected areas of the city and areas susceptible to flooding include the old city areas such as Kharadar, Mithadar, Bunder Road, Ram-swami and Arambagh.

In the month of August 2020, torrential monsoon rains resulted in urban flooding in the city. On Thursday (August 27, 2020), the city received more than 223 mm of rains in a 12-hour period, the highest seen in a single day since records began (Meteorological Department). More than 484 mm of rain was fallen in August, according to the data, more than 10 times the monthly average. At least 13 people killed in the city during this spell of torrential rains. Those killed include people who have killed drowned in their homes, been crushed under collapsing walls or electrocuted by short circuiting wires.

4.1.16 Seismology

Karachi is located in a moderate earthquake zone. Pakistan falls into three seismic zones. Zone-III is the most severe and Zone-I the least. The Karachi Building Control Authority has placed Karachi in Zone-II. Based on the actual events, past observations of fault movement and other geological activities, Karachi is situated in a region where moderate earthquakes may occur of magnitude 5.0 to 6.0 equivalent to intensity between VII and VIII on Modified Mercallis Scale (M).

On the basis of earthquakes experienced from 1970 to 2005, four seismically active zones have been identified in and around Karachi. One seismic zone lies to the west of Karachi, called Ornach Nal Fault merging into the regional Chaman Fault. The zone extends southwest into the Arabian Sea and is aligned with the submarine Murray Ridge; to the north it extends towards Uthal-Bela areas. No large earthquake is known historically on the Ornach Nal system.

The second seismic zone follows the south-eastern margin of Kirthar Range from the north to the south, swinging ultimately towards the southwest. This zone includes Thano Bula Khan, Lakhra, Jhimpir, Jungshahi, Thatta and areas further south. The third zone passes across the eastern

vicinity of Badin in the northeast-southwest direction along the eastern margin of the Indus Delta. The fourth seismic zone straddles the Pakistan-India border. Earthquakes of low to moderate magnitudes — 3.1M to 4.0M and 4.1M to 5.0M — dominate in these zones. Earthquakes of higher magnitudes (above 5.0M) take place to the southeast in the Rann of Kutch, which is a known high-risk area. Records show that earthquakes of low to moderate magnitudes have occurred in the zones of Murray Ridge-Sonmiani-Uthal, south-eastern Kirthar, and Badin. Moderate magnitude earthquakes in Jangshahi, Thatta, Jhimpir and Thano Bula Khan Area produce low to moderate intensity shocks in Karachi, as experienced in 1985.

The seismic zoning for Karachi was revised after the 2005 earthquake. Probabilistic Seismic Hazard Assessment (PSHA) carried out for revision of seismic provisions of the Building Code of Pakistan shows that Karachi falls in Zone 2B. The Zone 2B has Peak Ground Acceleration (PGA) in the range of 0.16 g to 0.24 g for a return period of 475 years and is considered to be at 'Moderate' risk of a major earthquake event.

4.2 Biological Environment

4.2.1. Flora

Karachi can be divided into following four sections with respect to flora and fauna of the area:

- Eastern Boundaries
- Southern Boundaries
- Northern Boundaries
- Western Boundaries

Figure 4-9: **Boundary Limits of Karachi**

Eastern Boundaries: Malir river and its adjoining sites in the east are densely populated with wide variety of vegetation in the form of natural foliage consisting of diversity bushes, shrubs, trees including agricultural products such as crops, vegetables, and fruits. This section is extended from Memon Goth till Shah Faisal Korangi vicinities besides Malir river. The wild Kekar, Neem and Oak trees are also found here.

Southern Boundaries: Southern boundaries of Karachi city are surrounded by rocky and barren mountains which are very hot in summer and are grown mostly by diversity vegetation characteristic of Sindh region including bushes, shrubs, and wild Kekar trees. Most vegetation is shade less trees which are selectively consumed by domesticated animals such as goats etc. At some areas, commercial vegetables are also grown but large areas are unproductive.

Northern Boundaries: Northern boundaries of Karachi city are surrounded by High Seas of Indian Ocean which starts from Bin Qasim area up to Manora, Keamari and consisting large variety of Mangrove vegetation in the coastal corridor. Mangroves are natural vegetation located usually besides shoreline in closed seas and are significant sanctuaries and breeding places for wide variety of aquatic organisms.

Western Boundaries: Western boundaries of Karachi city are surrounded also by High Seas of Indian ocean as well as stationery sea water referred to as closed sea. It virtually consisting of

West Wharf and nearby coastal areas including Hawksbay and Mauripur sections. Most of this region consisting large variety of Mangrove vegetation in the coastal corridor.

Ecological risk of high order has been induced by land clearance and removal of natural vegetation from the plains during the urban sprawl to make room for agriculture and urbanization. These zones include extensive flat alluvial plains, covered by relatively similar vegetation, mostly small trees and dwarf shrubs. Tall, clump-forming desert grasses are common. Signs of extensive drought damages done by land clearing activities are apparent and hence the natural vegetation that has survived in these areas has adapted to harsh conditions.

4.2.2. Fauna

Eastern Boundaries: No endangered fauna exist in this section, however, some avian fauna, sparrows of diversity genera, crows, cuckoos, and wild and domesticated pigeons exist. Street cats are more abundant species growing their population un-hindered and un-attendant at rural places. Limited farming for cows, goats and poultry exists. Among creeping fauna, snakes of few types also exist.

Southern Boundaries: The soil is sandy and rocky in appearance grown by wild Kekar trees and bushes having no valuable significance except cattle grazing for domesticated animals such as goats and cows. Some camels are also encountered grazing on elevated wild bushes and trees. Snakes of some variety are encountered. There is no characteristic avian fauna except Collard Dove and Wild pigeon is reported. No significant faunal regime exists in this region.

Northern and Western Boundaries: The High and closed seas of Karachi in the northern and western corridors are enriched with large variation of aquatic organisms in the form of large variety of fishes, shrimps, prawns, lobsters, crabs, turtles etc. Sea snakes are also encountered in closed sea sections. Among avian fauna Egret, Seagulls, and White Storks are most common species. Migratory faunal regimes are encountered in winter in closed sea sections or in isolated islands that mainly consisting of Flying Ducks, Pelicans and Flamingos.

The impoverished as well as degraded environment resulting from non-availability of surface as well as groundwater and discharge of untreated wastewater into Lyari and Malir Rivers has

irreversibly reduced the biodiversity of the indigenous as well as introduced vegetation and hence it offers very little chance for the survival/growth of fauna in Karachi.

Water availability is the main constraint for the distribution of many animal species. Large wild mammals are virtually absent in the areas within Karachi. There are a number of characteristic bird species that have adapted to the agricultural environment in the outskirts and suburban areas. These include Indian Roller, Common Mynah, Pigeon, and House Sparrow.

4.3 Overview of Socioeconomic Condition

The following sections provide a general overview of the existing socio-economic conditions of Karachi, as the project will serve, and will have its impacts on, the entire city. Site specific details of the socio-economic aspects will be included in the various instruments to be developed for individual interventions under this ESMF, e.g. ESIA and ESMPs (as required) – including a detailed social assessment focusing on the community of waste-pickers living on site – will be prepared for the development of the sanitary engineered landfill cell at Jam Chakro Dumpsite. The documents will be prepared, consulted on, cleared by the Bank and disclosed prior to issuing bid documents for the corresponding works.

The following sections help in identifying the issues and general mitigation actions for social impacts of the project. These actions will be tailored for individual interventions, based on specific site and sub-project design conditions. These sections will also inform other strategies and plans of the project, for example, the stand-alone Stakeholder Engagement Plan.

4.3.1 Population

As per the 2017 population census, the population of Karachi is around 16 million, including 14.9 million urban residents. Karachi's 2020 population is now estimated at 16,093,786. Karachi has grown by 1,804,626 since 2015, which represents a 2.41% annual change. These population estimates and projections come from the latest revision of the UN World Urbanization Prospects. It should be noted that many other sources put the actual figure of Karachi residents to be much higher than reported in the census.

Considering that the census boundaries of the city have not been increased since 1998, the population density is around 4,536/sq. km. The density is much higher in the downtown and metropolitan areas, where some sources depict as high as 24,000 people / km^2. The City is comprised of six urban districts with varying population distribution across the 6 districts. The 2017 Census, indicates much lower populations in Malir and Karachi South as compared to other districts. Karachi West and Central have the highest residential population densities.

Table 4-7:**Karachi Population Profile**

Karachi	**Population (Million)**		**Population % in Urban /Rural areas**		**Annual Growth Rate %**	**Sex Ratio**
	1998	2017	1998	2017	1998-2017	2017
Urban	9.45	14.91	95.9	92.9	2.43	110.7
Rural	041	1.14	4.1	7.1	5.56	113.5
Overall	9.86	16.05			2.6	108.2

As Karachi is bounded on the south by the sea and to the west by Hub River and Balochistan, the urban sprawl is more towards the east and north. Some key factors contributing to this preference, especially towards east, include a suitable flat terrain, connectivity through the National Highway (N-5) and the Super Highway (M-9), and proximity to industrial zones such as Korangi, Landhi and Port Qasim.

The increase in population is putting heavy pressures on the physical, infrastructural, financial and institutional systems of the city. A large segment of Karachi's population, roughly 40%, is afflicted with poverty. The living conditions of the deprived section and its economic wellbeing are major concerns.

4.3.2 Health

Large proportion of the city's population lives in katchi abadis or slums with very poor infrastructure and access to basic services. Due to high incidence of air, land, and water

(including marine) pollution that results from inadequate management of solid and hazardous waste including medical waste, raw sewage, industrial effluent, and vehicular pollution a large proportion of Karachi residents are prone to diseases linked to environmental pollution. Health costs related to air pollution in Karachi are estimated in the range of Rs. 30 billion–40 billion every year. The presence of high concentrations of pollutants in the air of Karachi causes multiple types of respiratory diseases among its residents. Open burning of industrial solid waste and the discharge of untreated liquid waste are serious hazards in Karachi.

It has been reported that 23% of the patients admitted in Civil Hospital were infected by respiratory tract infection.

Table 4-8: **Estimated Annual cases of Morbidity** from PM ambient Concentrations in 2009

Activity	Number of Incidences
Chronic Bronchitis	145,185
Hospital Admissions	26,686
Emergency Room Visits	523,498
Restricted Activity Days	81,838,293
Lower Respiratory Illness in Children	1,353,000
Respiratory Symptoms	260,459,264

Drinking water appears to be a major source of lead exposure. A World Bank study looking at 18 towns of Karachi city revealed blood lead concentration exceeding the WHO guideline in 89 percent of the sampled sources (World Bank 2010). Karachi also accounts for some 67.2% of all the registered HIV cases in Sindh (9,810 HIV patients in Karachi of the total 14,482 in Sindh).

In terms of health infrastructure, the city is served by some 165 major health facilities with a total of 14,350 beds. This includes 134 private hospitals, accounting for half the beds. Population served per doctor is 3,029 persons; per nurse is 7,282; and per bed is 1291. The presence of private sector health facilities has helped in improving health status of the city population. The

infant mortality rate under 5 years [per 1,000 live births] has improved to 59 and the maternal mortality to 180.

4.3.3. Education

Karachi's literacy rate was 87 percent in 2017. According to the Pakistan Bureau of Statistics (2010-11), the ratio of population of ten years and older that has ever attended school is 80% for Karachi – second highest in the country after Islamabad. The Pakistan Social & Living Standards Measurement Survey states that more than 74% children attend private schools.

However, literacy rate in Katchi Abadis exhibits a dismal picture. Overall literacy rate in Katchi Abadis is 71 % with a significant gender gap with 76 % for males and 66 % for females. The adult literacy rate in Katchi Abadis is low at 45 %, and ranges from 30 to 48 % in different areas with a primary enrollment rate at 54 %[40]

According to the District Wise Rankings in 2016 by Sustainable Development Policy Institute (SDPI) and Alif Ailaan, Karachi is ranked 43rd at the national while still the best in Sindh. This ranking is based on a complex arrangement of indicators providing independent scores on education, retention, enrolment, gender parity, and learning. The same report ranks the city at the 57th place (2nd place in Sindh) in terms of school infrastructure facilities.

4.3.4. Economy and Occupations

Karachi is the financial capital of Pakistan and plays a pivotal role in the nation's economic and industrial activities. Karachi Strategic Development Plan 2020 (KSDP-2020)[43] describes that Karachi generates about 20% of the national output, creates more than 30% of value added in manufacturing, and accounts for 25% of national tax revenues. More importantly, the city provides jobs for a large population – 40% of national employment in large-scale manufacturing is based in Karachi. One of the Karachi's key comparative advantages is the low cost of labor. The low wage work force lives primarily in Katchi Abadis. Many poor people work near where they live, which reduces commuting costs and helps keep wages low. Inflation in Karachi is the lowest among all of the large cities (population in excess of 500,000) in Pakistan with the exclusion of Faisalabad[44].

Karachi's economy has grown steadily in the past 18 years and per capita income has remained the highest in the country. Depending on the methodology used, Karachi's contribution to gross domestic product (GDP) is estimated to range from 11 to 20 percent. The city has a superior GDP per capita, higher per capita income and relatively high level of labor productivity.[45]

Karachi is home to Pakistan's premier port which handles almost 95% of all foreign trade - in 2001 alone the Karachi Port handled more than 29 million tons of cargo. Furthermore, being the financial hub of the country, Karachi hosts the head offices of the majority of Pakistan's public and private banks.

The manufacturing and trade sectors dominate employment in Karachi. They account for 63 percent of overall employment in the city. Public administration, transport and telecommunications, and health and education also account for notable shares of local employment.[46] One sample study in 2005 estimated that 81% of the total population is employed, out of which 50% are self-employed. However, a large proportion of the city population, up to 75%, is employed by the informal sector comprising of small scale or cottage industry, trade and provision of services including water, waste disposal, health, education and housing.[47]

4.3.5. Land Ownership and Use Pattern

Table 4-9: **Land Use of Karachi**

Group*	Category	Area (Sq. km)	Percent
Economic	Industrial	67	7.42
	Agriculture	50.9	5.63
	New industry	48	5.31
	Commercial	10.7	1.18
	New commercial centres	4.9	0.54
Infrastructure	Recreational	14	1.55
	Transport facilities	13.5	1.49
	Utilities	8	0.89
	Education	7.7	0.85
	Burial grounds	3.2	0.35
Residential	Planned residential	163.7	18.12
	Schemes to infill	98.8	10.94
	Low income settlements	82.7	9.15
	Unplanned residential	70.1	7.76
	Densification areas	47.8	5.29
	Urban renewal	11.2	1.24
Special purpose	Military areas	121.3	13.43
	Vacancy undeveloped	16.7	1.85
	Buffer areas	14.3	1.58
	Vacancy developed	1.9	0.21
	Flood plain	47.1	5.22
Total		903.5	100

*Groups and categories as defined by KDA (Source: Arsalan et al., 2006).

As is evident from the table, a little more than half of the city space is used for residential purposes. The site percentages allocated by the KBCA for different activities are rational and do produce a livable physical and social environment. However, communities close to the downtown, and in the low-income areas, have smaller plot / flat sizes and higher population densities than proposed by KBCA. This exacerbates the solid waste problem due to generation of higher quantum and lack of public space including that for amenities.

More than 50% of the city population lives in squatter settlements (GOP, 2000), which are locally called Katchi Abadis (English equivalent: unpaved settlements) or slums: two classified definitions by the local government based on the legal setting and physical characteristics. These settlements are one of the most important challenges for the authorities which are officially reported as 539 in number with approximately 415,000 housing units. On November 05, 2019, the daily Dawn quoted the Sindh Human Settlement Minister telling the provincial assembly that Karachi had 575 identified shantytowns and 469 of them had been notified. Social settings appear to be quite identical in both types of squatter settlements allied to low-quality housing, poverty (mainly because of unemployment), disruption of community cohesion and other deteriorating urban conditions that led to the poor health standards of the people.

Karachi is a city of migrants, with insufficient urban planning to absorb the exponential flow of people into anything near an adequate formal structure of housing and other services. Within migrant groups, partition migrants are perceived to have been favored above other cohorts that existed before or arrived later. Urban planning initiatives in Karachi have been inadequate in providing formal housing for most residents, and in some cases have exacerbated the problem by displacing residents to build physical infrastructure.

People prefer a place that could grow incrementally to house some of their children after marriage since they are aware that finding separate accommodation for them is not an affordable option. However, in building their homes initially, residents generally had not considered the additions that they would incrementally make as their needs increased. As a result, the houses are badly planned and ventilated and many neighborhoods have problems of congestion and in certain areas there are also social problems.

In the case of plot townships of 15 acres (6.07 hectares) or more, core houses (which can be added to) or plots of land on which people can build, are normally provided. Such land is on the periphery of the city and developers accept these conditions. Space for facilities and amenities are set aside as per KBCA regulations and are built upon by the government, the developer or by NGOs inducted into the planning process. Plots for apartment blocks and complexes are usually part of a larger KDA sector plan. The sector and its different neighborhoods have spaces allocated for social amenities such as commercial, educational, health and recreation. As such, the developer does not have to provide for these in the apartment complex plan. In addition, land is expensive in these locations and the developer would lose financially if he were to plan for incremental growth.[50]

Karachi's unplanned areas can be divided into three main subcategories: (i) katchi abadis that have been regularized or are awaiting regularization; (ii) slums, which are very dense inner-city areas with deficient infrastructure; and (iii) villages, or goths, which have become part of the urban sprawl. Often, these different types of unplanned areas are mixed together and recognized as katchi abadis. Only one-third of the 75,500 new housing units required in Karachi each year are provided by the formal private and public sectors. As a result, land agents have emerged as key players in Karachi's urban development[51]. As the demand for housing in Karachi has grown, informal land developers have become increasingly influential. Even though the informalization of formal processes has given low-income residents access to many affordable plots, these are usually far from their workplace or from the city center where better social facilities are available (Hasan et al. 2015).

4.3.6 Status of Civic Amenities

Water Supply

The water demand of 820 MGD is inadequately met by a water supply of 650 MGD which is filtered at various water filtration plants including COD, Pipri, NEK, Hub and Gharo through an extensive generation, filtration, pumping/boosting and piping system. In informal settlements and industries, most of the water demand is met through non-piped systems, including private water tankers. Almost 24 hydrants have been licensed to the private parties by KWSB. Out of

these 24 hydrants, only 10 are operational while the rest were closed as per a recent Supreme Court Order. Unregulated hydrants are rampantly spread across the city.

Solid Waste Management

Public opinion and perception of solid waste management system is characterized by irregularity and inefficiency of the collection system as well as poor monitoring of the private waste service providers by the local authorities. Many residents pay for waste management services to private waste pickers. Up to one-third of the city's solid waste is separated and recycled through informal processes. Overall, in Karachi, nearly 55,000 families are estimated as dependent on the informal solid waste recycling industry for their livelihood.

Power Supply

K-Electric has the monopoly to supply power to Karachi. The website of the privately-owned power utility says that it has its own generation units 'with installed capacity of 2,267 megawatts' and gets over 1,162 MW from external power producers - or IPPs as they are known, including 650 MW from the national grid, resulting in a total capacity of 3,479 MW. According to most estimates, Karachi's power demand is between 2,700 to 2,900 megawatts during the summer, which can jump to over 3,300 MW, especially during the heat wave. Power outages remain a common occurrence in Karachi. This indicates that there is a high percentage of electricity loss - this is primarily due to poor infrastructure but also collusion of KE's lower-tier employees with the consumers resulting in doctoring of electricity meters. According to one estimate, 45% of the electricity consumed in the city comes through illegal connections to the K-Electric network, provided by land agents or unofficial electricity suppliers to the city's vast informal settlements.

Transport

The informal sector also provides most of the transport infrastructure used by Karachi's residents. Over 90% of the Karachi's public transportation is comprised of privately owned buses and mini buses. The three major types of public transport include:

- Minibuses & Coaches
- Buses

- Taxis, Rickshaws & App-Based Ride-Sharing Services

Based on the vehicle registration data of 2011, the city has 15,807 mini buses (8,773 in 1998); 6,506 buses (14,854 in 1998); 47,165 Taxis (13,613 in 1998); and 105,684 rickshaw (29,337 in 1998). Given the always-increasing headcount in the city, and the need to commute swiftly and conveniently from one end of the city to another, the provincial government of Sindh and the federal government of Pakistan have initiated a mega transportation project named the Bus Rapid Transit (BRT). Currently, the BRT is under development, but once completed, it will have a significant impact on the overall condition of public transport in Karachi.

4.3.7 Ethnicities, Conflict and Vulnerabilities

Karachi is Pakistan's most diverse city in terms of ethnicity, linguistic identity, and religious affiliations. While most of the population belongs to Islamic sects, the city also houses a sizeable proportion of non-Muslim communities including Christians, Hindus, and Zoroastrians.

Karachi's population is a diverse mix of various ethnic groups. According to the 1998 Census, Mohajirs comprised of almost 48.5 % of the population of Karachi, followed by Punjabis (14%), Pakhtuns (11.42%), Sindhis (7.22 %) and Baloch (4.34%). Most of the Baloch in Karachi are third generation migrants and politically identify themselves with Sindhis. Others, comprising foreigners and illegal immigrants, constitute two percent of the population. Majority of Mohajirs live in planned areas, while over half of Punjabis, over two thirds of Pashtun and Sindhis, and three-fourths of Balochis live in katchi-abadis.

Ethnic identity has played an important role in shaping Karachi's geography and social fabric. It has also dominated political and economic activities as various ethnic groups compete for resources and power, with strong implications on social development and municipal service delivery.

Since the colonial era, and through partition to the present day, Karachi has dealt with a constant tension between formal and informal structures. As the demand for housing in Karachi has grown, informal land developers have become increasingly aggressive in their attempts to acquire land to be developed unofficially. The development of informal settlements has historically been linked to the city's informal economy, creating a political economy that has no

incentives to address informality. The proliferation of informal settlements has also led to the growth of informal service-delivery channels.

According to estimates, over 50 percent of Karachiites live in informal settlements of various types. Urban poverty has become a concern in Karachi. In katchi abadis, most of the inhabitants lack sufficient income, permanent jobs, tenure security, and access to services and infrastructure. Furthermore, poor living conditions and unhygienic environments have exposed them to ill health and low productivity, limiting their capacity to generate income and avail proper livelihoods (Mahbub ul Haq Human Development Centre 2014). Qualitative research led by local researchers shows that residents of katchi abadis have often expressed a sense of self-deprivation where they are stripped of their "rights to the city" and stuck in a cyclical poverty trap.

4.3.8 Gender Issues

Women face various gender inequalities and disadvantages in the social context of Karachi which often affect their access to municipal services, water and participation in community-based initiatives. Women are important stakeholders in municipal services rehabilitation subprojects, falling among both the affected and the beneficiaries. It is important to understand the gender dimensions of the project and its differential impacts on women so as to maximize project benefits. Failure to recognize the importance of gender in project implementation will have negative social impacts on women.

4.3.9 Land Acquisition and Resettlement Plan

The project location including the Mehmoodabad, Gujjar and Orangi Nullahs, all are encroached on both sides and there is a slight issue of Land Acquisition. But the M/s NDMA is compensating everyone whosoever has lease documents or not with Rs. 3,60,000 Compensation that will be given to the affected people over the period of 2 years.

Chapter 5: STAKEHOLDER CONSULTATION

5.1 Stakeholder Engagement

Social acceptability of the project and the area is a key to success. Stakeholder engagement is a process that involves project relevant stakeholders in decision-making and uses the input from stakeholders to make better decisions. Consultation with the stakeholders is a tool for managing two-way communication between the project proponent and the affected public. Its goal is to improve decision making and build understanding by actively involving individuals, groups and organizations, which have stake in the project. This involvement increases project's long-term viability and enhances its benefits to locally affected people and other stakeholders.

In order to evaluate the socioeconomic and environmental impacts, filed survey is an essential element. In addition to the surveys at the preliminary stage, consultation with the community and their active participation plays a vital role in successful implementation of the project. To identity the different types of stakeholders and ascertain their perceptions about the project, an initial environmental examination was conducted. Informal group discussions were also held as an additional tool for obtaining feedback from the stakeholders that are being discussed in the following pages.

There are certain types of stakeholders which are involved in decision making process or they are linked to the project directly or indirectly.
Stakeholder Consultation is conducted when the participation of individuals and groups is important in attaining the success of a project. It is also most important where there are vulnerable groups. These are people who are already so marginalized that without support they may not benefit from the development project. The Project identifies them to ensure that their needs are met in project planning and implementation.

5.2 Consultation in EIA Study

Participation of stakeholders in project planning, design and implementation is now universally recognized as an integral part of environmental and social impact assessment. Local communities, national and international NGOs and the civil society representatives may be

able to contribute to, and benefit from, the dialogue directed at identifying and resolving key project-related issues. Stakeholder consultation presents an opportunity for mutual information-sharing and dialogue between the project proponent and stakeholders. An effective public consultation processprovides concrete suggestions that can help improve project design resolve conflicts at an early stage, identify management solutions to mitigate potentially adverse consequences and enhance positive impacts, and develop guidelines for effective monitoring and reporting of project activities throughoutthe project cycle.

Providing the public with adequate reliable information of the planned project is of significant importance in creating public trust and acceptance. Moreover, experience reveals that unexpected project impacts on the local community generally give rise to significant issues and concerns. Such problems can be avoided if people are properly informed and consulted about the project and given theopportunity to raise their concerns.

This chapter provides an overview of the public consultation process and presents the findings of the stakeholder consultations.

5.3 Objectives of Stakeholder Consultation

The stakeholder consultation process followed for the proposed project is in line with the key objectives ofstakeholder consultation identified below:

- Provide information related to proposed project activities;
- Identify stakeholder interests and issues;
- Identify mitigation measure for these concerns and integrating them into project design, operations,and management;
- Identification of problems.
- Collaborative problem solving.
- Reaction, comment and feedback on proposed project.
- Identification of adverse impacts and documenting mitigation measures.

5.4 Primary and Secondary Stakeholders

Stakeholders are individuals, groups, or institutions that may be affected by and can significantly

influence the project activities, or are integral to the achievement of the objectives of a project. Stakeholders can be divided into 2 broad categories;

I. Primary stakeholders

II. Secondary Stakeholders

Primary stakeholders are those who have a direct interest in the project which includes residents, commercial entities and institutions falling in the project area. In this project main stake holders are the local residents who will be most affected by the project activities. Secondary stakeholders include the relevant government agencies and public interest groups which may indirectly influence or be influenced by the project. The concerns and input from both primary and secondary stakeholders are important to identify the issues arising from the construction and/or operation phase of the project and propose mitigation measures that minimize the negative project impacts and enhance the positive ones.

Table 5-1: **Primary Stakeholders**

S. No.	Stakeholder Groups	Stakeholders
1	*Settlements near the project area*	Residents of Mehmoodabad Region, Aurangi Town, Etihad Colony, Old Golimar North Karachi, Manzoor Colony, Defence view, Ali Muhammad Goth North Karachi.

Table 5-2: **Secondary Stakeholders**

S. No.	Stakeholder Groups	Stakeholders
1	*Government Departments*	Sindh Environmental Protection Agency (SEPA), FWO Officials (Frontier Works Organization) Sindh Forest & Wildlife Department, Health Department, Sindh Solid Waste Management Board, Karachi Metropolitan Corporation (KMC) Social Welfare Department, Govt. of Sindh Sindh Irrigation & Drainage Authority (SIDA)Culture, Office of Deputy Commissioner,

5.5 Consultation Approach

The main purpose of the consultation exercise was to disseminate project information to relevant stakeholders so that any feedback received could be used to address the issues at an early stage. Identification of stakeholders is one of the major steps for designing an effective consultation process. For this purpose a site visit was carried out by Pak Green Enviro-Engineering (Pvt.) Ltd team to identify the relevant stakeholders for consultation. At public level, local residents who are living on the surrounding areas of all three drains (MehmoodAbad, Gujjar, Aurangi) were selected for the consultation.

On organizational level following departments have been consulted.

- Sindh Environmental Protection Agency (SEPA)
- FWO Officials (Frontier Works Organization)
- Sindh Forest & Wildlife Department,
- Health Department,
- Sindh Solid Waste Management Board,
- Karachi Metropolitan Corporation (KMC)
- Social Welfare Department, Govt. of Sindh
- Sindh Irrigation & Drainage Authority (SIDA)Culture,
- Office of Deputy Commissioner

Organizational level meetings were conducted time to time at various levels. Secondary data related to these meetings and consultations (like minutes of meeting etc) has been incorporated in this report.

The stakeholders were briefed about background and scope of the project. Concerns and suggestions of the respondents were noted down by the team and pictures of the session were taken with the consent of stake holders. Picture log of consultation with Official stakeholders is attached as Annexure I. Letter regarding the Rehabilitation and Revamping of Nullahs with Govt Departments are attached as Annexure J.

Figure 5-1: stakeholder consultation on Organizational level

5.6 Methodology of consultation:

The EIA team carried out public consultations at various locations around the Project Site.

Figure 5-2 Stakeholder consultation on local level

Selection of the stakeholders for consultation, reconnaissance of the proposed project site and initial discussions with the neighboring community and workers, shopkeepers, drivers etc. Picture log of consultations with the locals is attached as **Annexure K**.

Environmental consultants and social specialists documented the opinions of the stakeholders expressed during the meetings etc.

5.7 Stakeholders' Feedback

Team Pak Green visited the project site, had discussions with stakeholders and consulted with the nearby local people to evaluate the socio-economic impacts of the project. People were provided with the massive information about the project. Positive remarks have been received by most of the stake holders regarding the project development.

5.8 Affected and wider Community.

Karachi is the most diverse city in terms of Ethnicity, Linguistic Identity and Religious affiliations. Most important factor of the project is a high number of local people are being affected by this project. As the project will serve and will affect the entire city. Detailed social assessment has been conducted keeping in view the marginalized community of the area especially waste pickers living on site.

They provided positive remarks regarding the subject project and in the favor of the subject activity. Stakeholders' participation Performa's and socioeconomic questionnaire were get filled by the inhabitants to evaluate the project socio-economic impacts. Socioeconomic surveys and filled questionnaires are attached with this report as Annexure- L.

5.9 Issues Discussed:

Following issues were discussed during the stakeholder consultation:

- Overall activities of the project;
- Possible impacts on natural vegetation, air, land and properties;
- Possible mitigation measures;
- Benefits of the project specifically for the local people.

5.10 Sample size

65 to 70 respondents were selected by the Team of consultants for conducting the socioeconomic survey. Only 1 to 5 percent of women were also consulted for the said survey; some of their names are mentioned in the above list of respondents while most of them were not willing to give personal information.

5.11 Findings of the Overall Discussion:

- It will enhance the socio-economic conditions/values of the area.
- It will increase the aesthetic value of the area.
- Sewerage system and drainage system will be improved.

5.12 Key Findings

Karachi is one of the biggest Metropolitan city of the world and like other big cities in the world city has been expanded a lot during last few decades. With the exponential increase in the population there is high need to provide the infrastructure and other facilities to the residents for better living standards.

This project can play a vital role in sealing the fate of Karachi and its residents towards development and well being in every aspect of life. .

Most of the residents had positive sentiments regarding this developmental project in the area because they are hopeful it will bring prosperity to their lives.

It will improve the Socio-economic status of the area. Only major concern they showed was they will lose their houses and some of them will lose their livelihoods as they are making money from the solid waste which is being thrown out into drains.

To address these issues compensation will be provided to the families who will be affected by anti-encroachment operation at project site. Other than that no adverse impacts regarding social, economical and physical environmental have been observed. In fact execution of the project will have significant positive impacts on the area.

5.13 Statistical Analysis

SPSS 19.0 has been used for the statistical analysis of the data collected during the visit of study site area through questionnaires.

Graphical representation of analysis is given below:

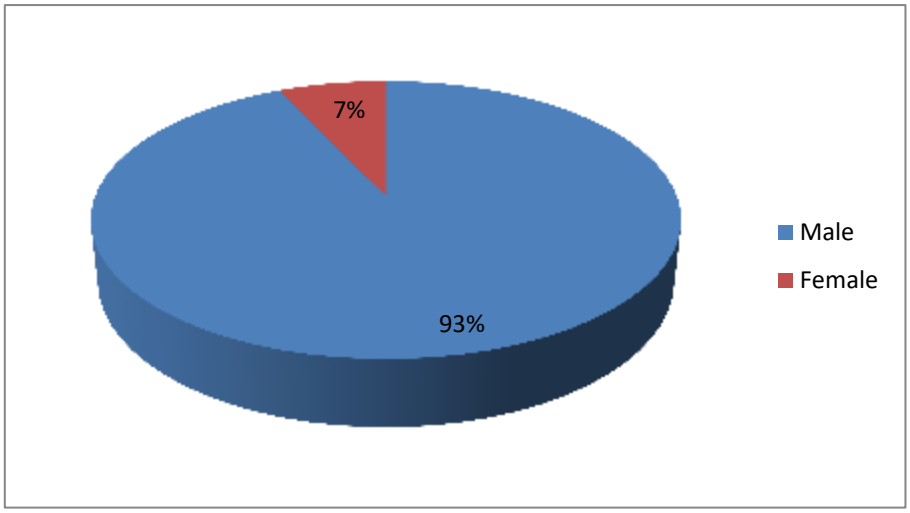


Figure 5-3: Gender

Discussion

In the sampled population, 93% respondents were males while 7% respondents were females. The number of female respondents is less as compared to male respondents because according to the social binding female hesitates to respond or communicate comfortably.

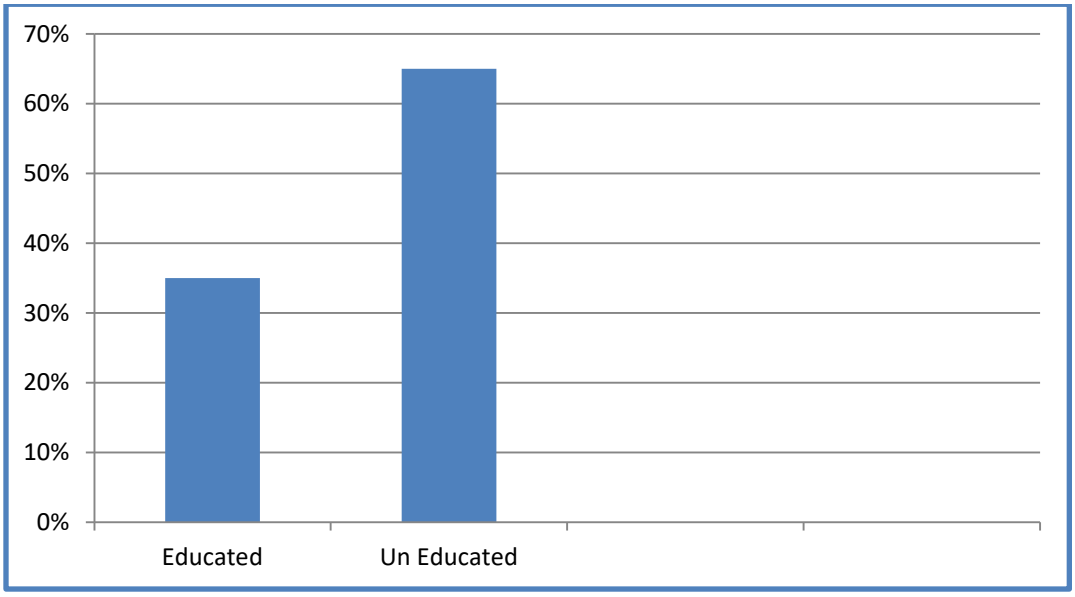


Figure 5-4: Education status

Discussion

In the sampled population, 35% respondents were educated while 65% were uneducated. Overall education status of the area is not satisfactory.

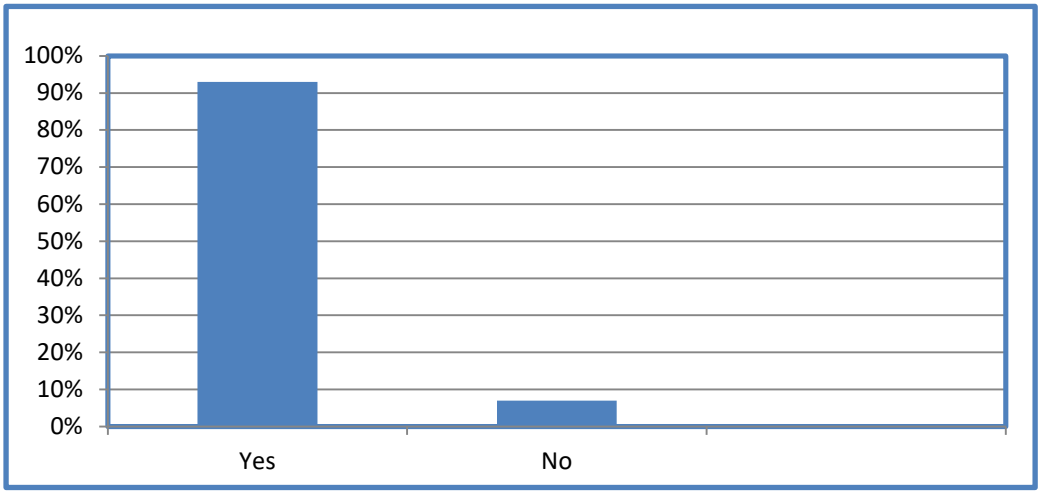


Figure 5-5: Remarks of Respondents about Project

Discussion

As per survey, around 89% of people favored the proposed project and they gave positive remarks regarding the subject project. While only 3% of respondents had no opinion regarding the project and 8% respondents were not satisfied with the proposed project. Only those people are not in favor of this project who are going to lose their houses as they have been living in adjacent to the project area from last few decades. Although they gave positive remarks about cleaning of the drains, they will get rid of solid waste related issues, construction of the roads will give them better surrounding to commute, urban flooding which has been a major disaster from last few years will be managed, But not at the cost of their houses.

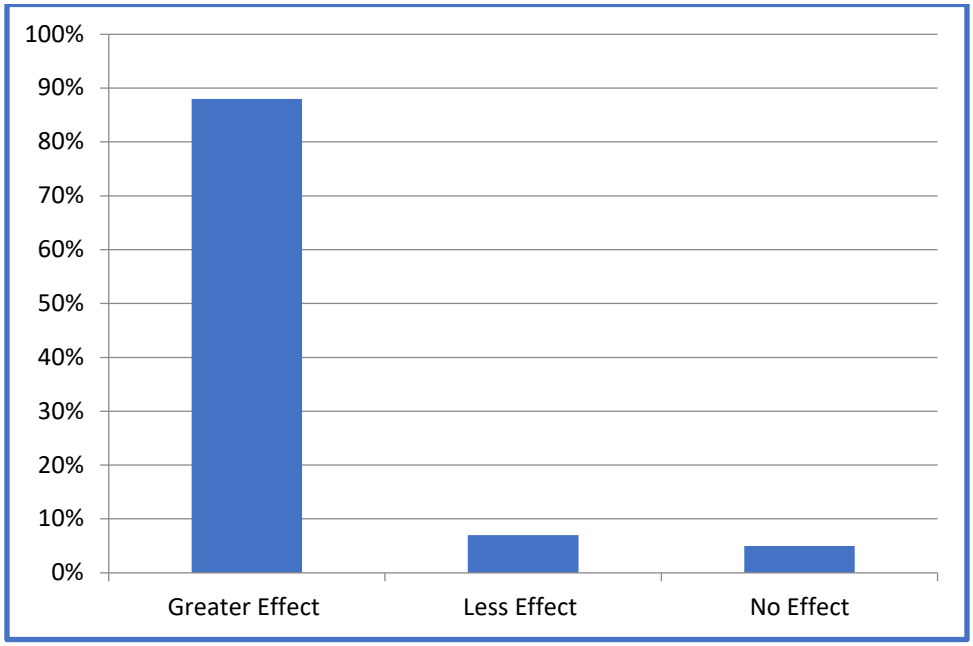


Figure 5-6: How Much Impact the said project will have on Environment?

Discussion

As per survey, 88% respondents said that subject project will have greater effect on the environment of the area, 7% people said that there will be less effect on the environment, 5% respondents said that the project will not affect the environment. Most of the population was not aware about the environmental importance; they were giving their remarks according to their own knowledge.

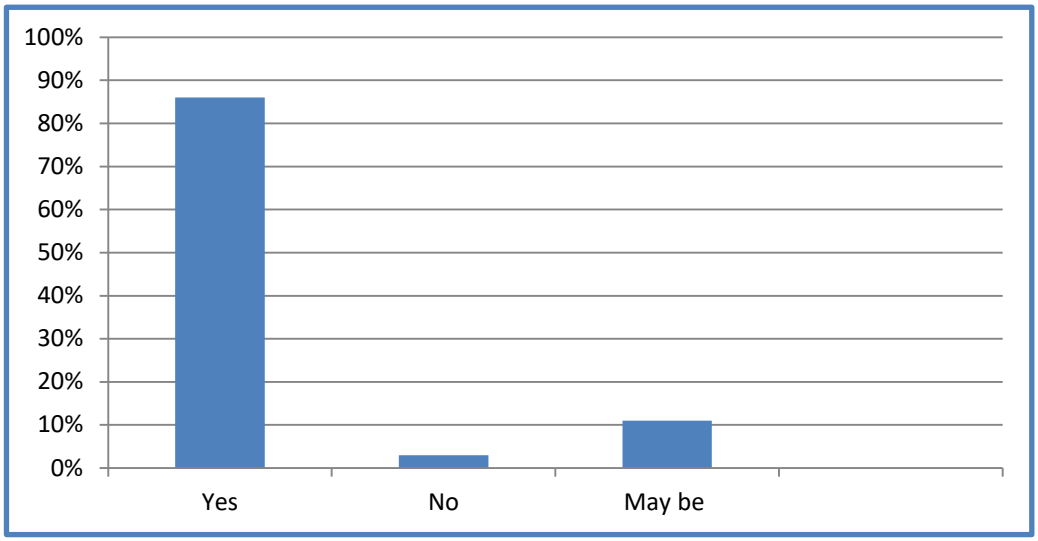


Figure 5-7: Will the Project Improve the Standards of the Area?

Discussion

As per survey, 86% people said that the project will improve the standard of the area, 3% said that it will have no impact on the area while 11 % respondents said may be it will improve the standard.

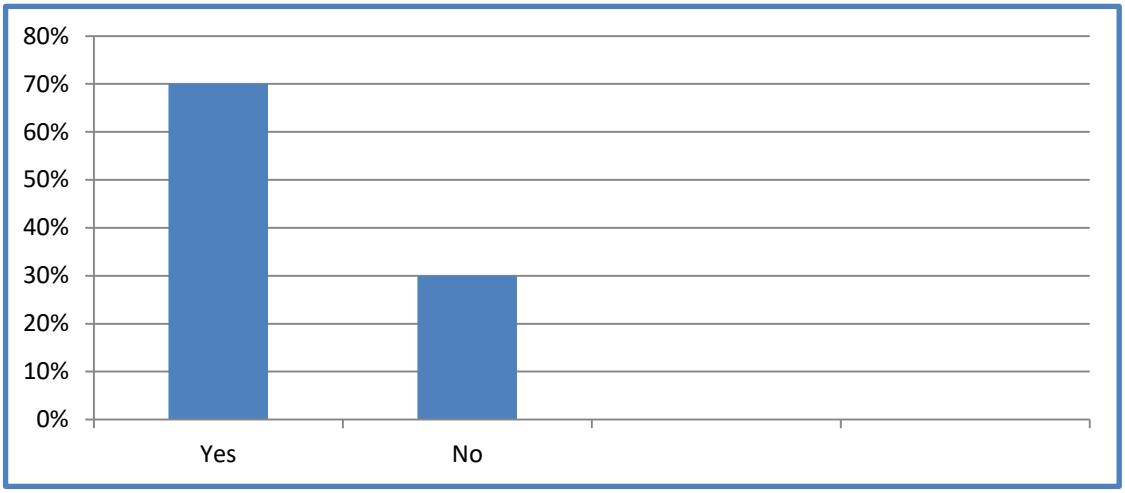


Figure 5-8: Are you satisfied with the current living conditions of the area?

Discussion

As per survey team analysis current living conditions of the area are not up to the mark due to current drainage and sewerage system as well as waste management practices , but still around 70% people said that they are satisfied with their living standards and only 30% people said that they are not satisfied.

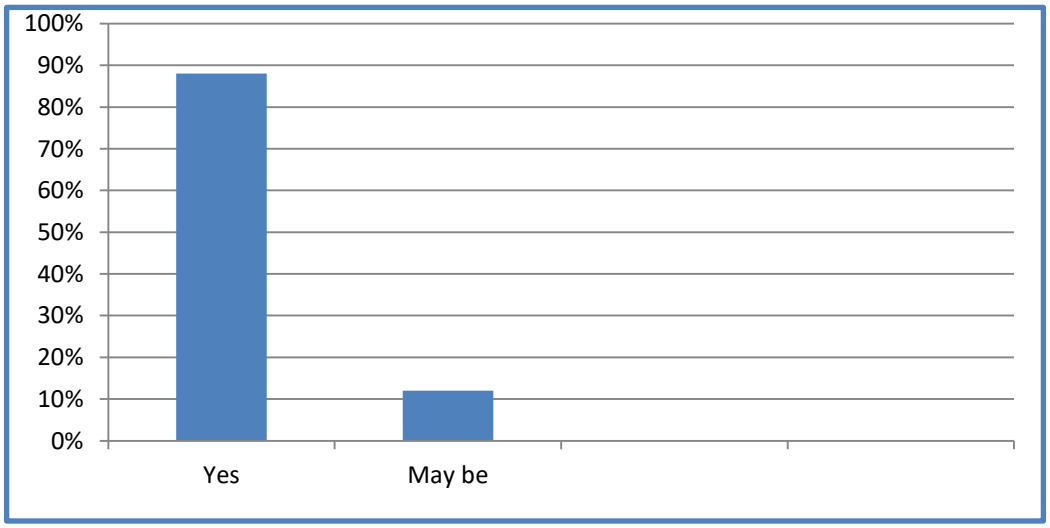


Figure 5-9: Do you think project will reduce the pollution and improve the environmental conditions?

Discussion

Around 88% people said that the said project will definitely reduce the pollution level and improve the environmental conditions of area. While only 12% people think that it may be helpful in reducing pollution and improve environmental conditions.

There are no significant additional load on the existing infrastructure i.e. utilities of water, telephone, electricity etc. due to the development of the proposed project.

Chapter 6: SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & THEIR MITIGATION MEASURES

The following chapter describes the overall possible impacts of project on the physical, biological and socioeconomic environment because of construction activities and mitigation measures to minimize the significance of the possible impacts up to an acceptable level. The anticipated impacts related to project have been assessed and mitigation measures are provided accordingly.

This section of the report screens the potential impacts imposed upon the physical, biological and socio- economic environment due to project activities. The screening process has, thorough review of literature, primary as well as secondary baseline data, and expert judgment, made assessment of the potential impacts of said activities on the physical, biological, and socioeconomic environment ofthe Project site.

Guidelines have been reviewed for classification of polluted and unpolluted sites with respect to their land use; sensitivity of ecosystem including flora, fauna, wildlife, historical and archeological sites and their values, and the sensitivity of the site.

The hazards encountered during the implementation of the proposed project will prove to be guideline for proposing appropriate mitigation measures. Mitigation measures have been proposed to reduce, minimize or compensate for theidentified potential adverse impacts, and their adoption has been recommended. Enforcement of the recommended mitigation measures would minimize and eradicate the negative impacts.

Impacts of the project can be of short or long-term, temporary or permanent, acute or chronic, positive or negative in nature.

6.1 Environmental Impacts due to Project Location

The said project is the "Restoration and revamping of existing storm water drains system of Karachi". The site does not fall in the category of sensitive area and no environmentally sensitive localities exist within radius of study area. The issues which can arise due to the location of the

subject project could be the issue of traffic congestion due to transportation of the construction material at the project site and an increase in the concentration of particulate matter in ambient air. But there will be no road blockade due to vehicles transporting construction material. If the project proponent maintains HSE conditions and complies with the SEQS limits than, there will not be any adverse significant impacts of the project on the environment.

If the mitigation measures are effectively implemented, the residual impact of the Subject project activities on the area's geophysical environment is expected to be insignificant.

Impact significance: Low or may be positive.

Nature of impact: Direct

Duration: Long-term

Reversibility: NA

Likelihood: Low (unlikely),

Consequences: Mild or may be positive

6.2 Impacts on the Physical Environment

6.2.1 Soil Erosion and Pollution

Due to soil erosion ability of the soil will be reduced to store water and nutrients.

Land will be exposed to subsoil, which often has poor physical and chemical properties.

There is a possibility of soil erosion and pollution to occur during construction phase of the project. There would not be any clearing of vegetation that leads to soil erosion. Removal of top soil after site clearance by agents such as wind, rain water, and surface run off is a likely action to occur.

Severity of impact is localized with low intensity due to the nature of project, which shall require minimum number of people during construction and shall not require heavy construction equipment. It is expected that the impacts will be low, local, and they will occur mostly during the construction stage (short term).

6.2.2 Land Degradation

Most of the building materials such as stones, aggregates, and sand required for construction of the proposed project will be obtained from the quarry sites. Since substantial quantities of these

materials will be required for construction of the development, the availability and sustainability of land resources at the extraction sites will be negatively affected as they are not renewable in the short term.

In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health and safety risks. Similarly, during construction of the proposed project a lot of Municipal waste will be generated. These will have an implication on dump environment.

Most of the construction waste will be used is land filling and pavement of road. The extent of this impact is localized with a low intensity. It is likely that the impact may occur. The impact can be highly improved/eliminated with mitigation. Therefore, the impact is negative and of low significance.

6.2.3 Air Pollution

Air pollution is quite likely to occur during construction phase. This is due to traffic and other equipment and heavy construction machinery using fossil fuels that release hydrocarbons and other gases including carbon dioxide, nitrous oxides, Sulphur oxides, and particulate matters which may pollute the air. Likewise, activities like land clearing, vehicle movement, excavations for building foundations, construction drive ways and landscaping may generate dust especially during the dry season.

The level of air pollution originating from the above-mentioned sources are expected to be low, localized and short term. No serious impacts are expected on people and the environment as whole.

6.2.4 Surface Water Pollution

Surface water quality will be compromised on low scale if there will be mixing of sewerage water with storm water at certain points. As these drains will be merge into Liyari and Malir rivers eventually, there is possibility of river water to get polluted. But impact will be low, significant and negative.

6.3 Impacts on Biological Environment

6.3.1 Impacts on Flora

There is no vegetation on the project site, there will be very less impact on flora. However, direct exposure to nitrous oxides (NOx) may cause growth inhibitions in plants to some extent. No special plant species of international conservation importance was recorded at proposed site. The impacts are therefore considered of very low significance.

6.3.2 Impacts on Fauna

The nature of the site has not attracted several organisms to find refuge in the area although some including different types of birds, reptiles, amphibians, and invertebrates are found. The clearance of vegetation and presence of noisy machinery, solid waste, trucks, and workforce will create unfavorable environment for most of these organisms while crawling organisms will eventually vanish following construction of paved surface.

However, the temporary nature of the construction activities will result in impacts of short-term duration and therefore the impact is considered of low significance.

6.4 Impacts on Socioeconomic Environment

6.4.1 Workers Accidents and Hazards during Construction

Construction workers are more prone to accidents resulting from construction activities. These accidents may have acute or chronic impacts depending on nature, severity and intensity. In this regard, construction and mobilization activities of the proposed unit could result into accidental injuries and hazards, etc. which could negatively impact the workforce.

Because of the intensive engineering and construction activities construction workers will be exposed to risks of accidents and injuries. At times, such injuries may be from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges among others.

6.4.2 Vibration and Noise

The level of noise and vibration are likely to increase during the construction phase. The noise will be mainly come from vehicles construction machinery and equipment operation during construction activities as well as people working on the project construction. This is a short-term impact and it will be felt mostly around construction sites and in its peripherals.

There will be no drilling activities or involvement of heavy or high noise machinery. it is predicted that the construction phase and operation of the proposed project will not pose any significant and the annoyance level is within the "no to little" impact category.

Considering technological advancement in construction industry, it is anticipated that machinery and equipment to be used during construction will be modern, versatile, and quieter than the old ones. It is also likely that they will require fewer numbers of operators reducing noise from workers. Therefore, the levels of noise and vibrations are anticipated to be within the tolerable limits, short term and localized. In view of the above and the fact that construction will concentrate on residential area, no significant impact is anticipated, and the impact can be highly mitigated.

6.5 Mitigation Measures

6.5.1 Protection of Flora

In order to protect plant species from potential negative impacts, the proponent shall ensure that:

- The contractor is responsible for informing all employees about the need to prevent any harmful effects on natural vegetation on or around the construction site as a result of their activities;
- Unnecessary removal, damage and disturbance of natural vegetation will be prohibited;
- Re-vegetation of the proposed project site will be undertaken;
- Indigenous trees should be planted around project area to enhance natural habitat.

6.5.2 Land Degradation and Soil Erosion Control

Potential negative impacts on land and soils shall be mitigated by ensuring that:

- The contractor implements erosion control measures as an on-going exercise;
- Any tunnels or erosion channels developed during the construction or maintenance period are backfilled and compacted and the areas restored to a proper condition;

- Areas where construction activities have been completed and where no further disturbance would take place are rehabilitated through re-vegetation;
- Prompt reclamation of exposed soil is done;
- Construction during long rains period should be done with caution to avoid soil from being washed away;

6.5.3 Soil and Water Pollution Measures

Measures to mitigate soil and water pollution impacts during construction phase shall ensure that:

- Concrete mixing directly on the ground is prohibited and only be undertaken on impermeable surfaces;
- Concrete batching activities are located in an area of low environmental sensitivity;
- Unused cement bags are stored out of the rain where runoff won't affect it;
- Used (empty) cement bags are; collected, stored in weatherproof containers to prevent windblown cement dust and water contamination, not to be used for any other purpose and shall be disposed of on a regular basis via the solid waste management system;
- All excess concrete is removed from site upon completion of concrete works and disposed of whilst preventing washing of the excess concrete into the ground;
- Awareness of employees and workers on protection of environment in their daily duties should be promoted; and
- All excess aggregate is removed from site and properly disposed of.

6.5.4 Waste Management

To ensure that solid waste is properly managed and potential negative impacts are mitigated, following mitigation measures should be taken.

- Solid waste is the biggest concern in this project. As all the drains are clogged due to solid waste. Waste should be managed and handled by concerned authorities on regular basis.
- It is highly recommended that proper waste management plan should be strictly followed.
- Waste storage containers on the construction site should be covered, tip-proof, weatherproof and scavenger proof.

- No burning, on-site burying or dumping of waste shall occur No local waste pickers and residents should be allowed to segregate the waste on individual level and it should be managed by concerned Government Authority and should be dumped in designated landfill site.

6.5.5 Air Quality Control

The construction contractor shall ensure the protection of air quality by undertaking the following measures at the construction site:

- Ensure that the generation of dust is minimized and implement a dust control programme to maintain a safe environment, minimize nuisance for surrounding residential areas/dwellings and protect damage to natural vegetation, etc.
- Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors.
- To minimize the pollution caused by dust generation during the construction stage, water should be sprinkled on the construction site and on drive ways as frequently as possible.
- To minimize exhaust fumes, machinery and equipment shall not be running when not in use while ensuring that they regularly serviced; and
- Construction vehicles and machinery shall be equipped with pollution-control devices to minimize emissions

6.5.6 Vibration and Noise Control

Vibration and noise produced by construction work will be managed as following:

- The contractor shall strive to keep noise generating activities to a minimum;
- The contractor shall restrict all operations that result in undue noise disturbance to local communities and/or dwellings (e.g., drilling etc.) to daylight hours on weekdays.
- The contractor shall inform in advance any local communities and/or residents that could be disturbed by noise generating activities such as drilling or compacting and shall try to keep such activities to a minimum.
- The contractor shall be responsible for compliance with the relevant legislation with respect to noise.

- Provision of earplugs and earmuffs to the workers working in high peak noises during the construction stage.
- Use of modern low noise machinery and vehicles is recommended.
- Activities that may involve noises and vibration should be withheld at night.

6.5.7 Landscape and Topography

As construction activities are very likely to lead to negative impact on landscape and topography at project site, such impacts will be brought to a minimum by executing the following measures:

- Planting of appropriate indigenous trees, grass cover and other vegetation types on project area should be encouraged so as to enhance scenic beauty of the area; and
- Removal and proper disposal of construction debris need to be implemented after completion of construction works and shall not be stockpiled or deposited.

6.5.8 Occupation Health and Safety Measures

Following safety measure should be observed during the construction stage of Hosiery unit-I:

- Instilling proper code of conduct and work ethics among construction workers and ensure that they are observed;
- Provision of Personal Protective Equipment (PPE) to all workers and enforce their use;
- Installing first aid kit and hire trained personnel to provide first aid;
- Reporting to OSHA within 24 hours of occurrence of any accident or near miss which can cause fatal or permanent disability; and
- Workers should be educated on their own safety and safety of others.

6.5.9 Potential Environmental Enhancement Measures

The proposed project will be installed with all precautionary measures to enhance and safe the environment. Following necessary measures will be adopted during construction and operation:

- Sprinkling of water will be done.
- PPEs will be provided during construction activity.

- Constructional waste and domestic solid waste will be disposed-off properly by concerned authority.
- Local people will be informed in advance when work is about to start in an area.
- Machinery will never be left unattended.
- Transporters engaged for the project would be forced to adhere to the load specifications of the access road. No overloading would be allowed in any case.
- Safety signs and boards will be placed during construction.
- Machinery will be kept maintained.
- Proper SOPs will be followed with proper schedule along with the HSE conditions.
- Project area will be restored with native plants. A proper tree plantation plan will be formulated to save the environment.
- Noise will be controlled by adopting proper measures.
- Safety signs will be placed at all locations where required.
- Hygienic conditions will be ensured and proper quality will be maintained by quality control testing.
- First aid facilities will be made available.

Table 6-1: Major Impacts and Mitigation Measures

Serial #	Environmental Issues/ Impacts	Mitigation Measures
1	Observance of administrative and legal formalities	It is recommended for obtaining of approval from other relevant departments.
3	Loss of environmentally sensitive areas	There is not any sensitive area near the project site
4	Changes in traffic pattern	Alternate route should be provided to the local people. Because due to project activities residents may face difficulty in commuting.

5	Potential conflicts with stakeholders	There is not any conflict at the current stage of the project. Neighboring communities were visited regarding their concerns. They have no objection regarding development of the subject project as per proposed design. It is recommended to Settle the issues through scoping and specific group discussions.
6	Resettlement issues	Resettlement should be provided to the local people who will be effected directly or indirectly with this project.
7	Erosion due to stripping and site clearance	Sprinkling of water on road sides or dusty tracks is recommended
8	Generation of dust	Careful loading and unloading of construction materials is recommended. Sprinkling of water on construction site and surrounding areas is recommended to avoid air pollution.
9	Generation of noise	Avoid suing forbidden horns at the site. Do not throw heavy equipment and construction materials in haphazard manner.
10	Local flooding/ponding	Immediate repair and maintenance of water supply pipelines and sewers in case of any defect should be undertaken.
11	Safety	Safety of the workers and others must be ensured. Safety jackets and protective equipment must be provided to the workers working on site.

		Privacy of the neighbors must not be disturbed.
12	Labor issues	Employ the local labor if possible Wages of the labor should be as per Government policy
13	Minor erosion of land	• Clearing of land should be step wise; vegetation should be removed only from the area where necessary. • Add more vegetation, restore the land by more plantation • Sprinkle water on dusty tracks is recommended
14	Contamination of land and water	Essential services like water supply, sewerage disposal and solid waste management must be in working condition.
15	Impacts of dust, noise and flue gases on neighbors	Sprinkling of water on dusty tracks is recommended. Avoid suing forbidden horns at the site. Do not throw heavy equipment and construction materials in haphazard manner. Proper tunings of vehicles and machinery must be ensured. Schedule of working hours should be implemented for minimum disturbance to neighbors. Continuous Environmental monitoring must be ensured as per proposed monitoring plan.

16	Safety/security concerns	Safety of the workers and others must be ensured. Privacy of the neighbors must not be disturbed.
17	Malfunction of utilities	It is recommended to appoint maintenance engineer and he should visit the site frequently to ensure maintenance and security.
18	Occupational Health, Safety and Environment	• EHS manager should be appointed to ensure safety procedures during project activities. • Proper working environment should be provided to the workers complying health and safety standards. • Safety of management, workers and visitors must be ensured. • Observance of operation and safety codes must be ensured.
19	Solid Waste Management	Solid waste should be managed properly by concerned authority on regular basis to maintain aesthetic value of the area and other related issues like spread of diseases and odor generation.

Table 6-2: Summary of Major Impacts & their Proposed Mitigation during Construction Phase

Potential Impact	Criteria for determining Significance	Key Mitigation Measures

Dust Emissions— Dust and PM may be generated during road construction and excavation activities. Gaseous emissions from site generators and transportation vehicles may affect ambient air quality in the vicinity of the project site. **Surface Excavation**— The excavation activities will impact the soil adversely. This will also lead to increase erosion and air pollution. But impact will be negligible.	An increase in visible dust beyond the boundaries of the construction site or Concentration of PM_{10} in excess of 150 $\mu g/m^3$ Ambient Air Monitoring at the project site.	• During excavation works drop heights will be minimized to control the fall of materials reducing dust escape; • Use of wind shield around stockpiles is recommended; • Vehicle speed restrictions should be applied in the project area; • Raw materials should be transported in covered trucks; • Sprinkling of water on tracts and surfaces is recommended to avoid dust emissions.
Solid waste Management— If solid waste will not be managed properly, it may cause negative impacts	Generation of excessive waste; throwing of waste in drains. Littering and Improper disposal of solid waste.	• Constructional waste should be utilized for road filling and maintenance purposes; • Domestic waste should be disposed off properly, managed by concerned authority • Proper solid waste management plan should be devised and implemented.
Noise- Noise may be generated during landscaping activities and from generators and transportation vehicles at the project site; which may be a nuisance for the workers.	OSHA standards	Activities generating high levels of noise should be minimized at the project site. If the noise level will exceed the permissible limits with reference to national and OSHA standards,

		following recommendations are suggested to take action against the high noise levels: • Proper tuning of construction machinery and vehicles is recommended. • Ear muffs and ear plugs are recommended in case of high noise levels for the workers. • Rubber wounds should be placed underneath the generator to avoid the vibration.
Vegetation Loss/ Soil erosion— There is no negative impact on vegetation and soil as no vegetation will be removed at the project site.	No removal of unnecessary or excessive removal of trees and shrubs.	• No tree cutting/ vegetation loss issue will be involved in the subject project as project site is free of any dense vegetation and trees. • Preparation of a Reinstatement Plan to restore the land after the constructional activities is recommended like construction of green belt is recommended on both sides of the road.
Socioeconomic Impacts— Inter-cultural differences between the project staff from other areas and the local community may arise due to the subject project. Positive socioeconomic impacts due to increased infrastructure, employment	No community complaints. Regarding this project except anti-encroachment operation and resettlement	• Avoidance of unnecessary interaction of local population with the non-local project staff. • Employment opportunities should be provided to the local people. • Compensation should be provided to the affected

opportunities and economic growth.		families for relocation.

Table 6-3: Summary of Major Impacts & their Proposed Mitigation during Operational **Phase**

Potential Impact	Criteria for determining Significance	Key Mitigation Measures
Gaseous Emissions- During the operational phase of the project, gaseous emissions from vehicles can affect the air quality of the area but impact will be negligible.	SEQS for Ambient Air	• Proper tuning of the vehicles should be done to avoid the excessive gaseous emissions. • Sprinkling should be done on the unpaved area to avoid dust pollution/ particulate matter.
Noise- Noise due to, construction machinery and generators can be a nuisance for the workers and local residents in the working area.	OSHA Standards	• Activities generating high levels of noise should be minimized at the project site. • Personal Protective Equipment PPEs including Ear muffs, Ear plugs, and other noise abating equipment will be provided to the workers on site. Generator should be covered with canopy. • Proper maintenance and tuning of the vehicles should be done.
Health & Safety Issues- different constructional and operational activities at the project site may cause health and safety issues for workers if	OSHA Standards	• Proper training of workers and staff should be conducted to avoid the accidents. • Use of PPEs should be

precautionary measures will not be adopted.		implemented at workplace. • First aid measures/medical facility should be provided at the project site.
Solid waste management- If solid waste will not be managed properly, it may cause negative impacts.	Exposure to solid waste. Generation of excessive waste Odor generation; Littering and Improper disposal.	• A solid waste management division should be formulated to deal with the proper disposal of solid waste, supervised by HSE Manager, SW Manager, and other related personnel. • All paper waste should be sent back to use in manufacturing of the paper again. • All types of solid waste left after reusing and recycling should be handed over to third party who will be dealing with proper and safe collection, handling and disposal of waste.

6.6 Methodologies for impact identification:

The methodology adopted for impact evaluation includes the Project Impact Evaluation Matrix.

6.6.1 Project Impact Evaluation Matrix

The impact Evaluation matrix was developed by placing project activities on x-axis and different environmental parameters likely to be affected by the proposed project actions grouped into categories i.e. Physical, Biological and Socio Economic Environment. For the impact assessment, project impact assessment matrix is used.

A project impact evaluation matrix is attached in next section of this chapter.

The evaluation of impacts has been carried out on the basis of developing matrix, in which impacts have been rated on the basis of their significance. For rating impacts significance following criterion has been developed.

NA – Not Available

O – Insignificant (No or minimal impact)

LA – Low Adverse (Short term, reversible or less damage to environment)

MA- Medium Adverse (Long term reversible damage to environment)

HA – High Adverse (severe irreversible adverse damage to the environment)

LB – Low Beneficial (Short term benefits or less beneficial to the environment)

MB – Medium Beneficial (Long term benefits to environment)

HB – High Beneficial (Continuous benefits to environment)

Environmental Component / Project Activities	Physical Environment							Biological Environment		Socio-Economic Environment							
	Topography & Drainage	Soil Quality	Landscape	Surface water quality	Ground water quality	Air quality	Noise	Flora	Fauna	Agricultural Land	Health & Safety	Disruption of Public Utilities	Employment	Population Disturbance	Social Disorder	Cultural Values	Traffic Management
Placement of construction machinery on site	LA	LA	LA	NA	O	O	O	LA	LA	O	LA	O	O	O	O	O	O
Parking of heavy vehicles	LA	O	O	NA	LA	O	O	LA	O	O	LA	O	O	LA	LA	LA	LA
Transportation of construction material	LA	MA	LA	NA	O	HA	HA	LA	MA	LA	HA	O	MB	MA	LA	LA	MA
Temporary storage of raw material	LA	LA	LA	NA	LA	HA	O	LA	LA	LA	LA	O	LB	LA	O	O	MA
Loading and unloading of raw material	LA	LA	MA	NA	O	HA	MA	LA	LA	LA	MA	LA	MB	HA	LA	O	MA
Labor camping on site	O	O	LA	NA	O	O	LA	O	O	LA	LA	MA	O	MA	MA	MA	O
Storage of oil and fuel	LA	MA	LA	NA	LA	O	O	LA	LA	LA	MA	O	LB	O	O	O	O
Extraction of ground water	O	O	O	NA	MA	O	O	MA	O	MA	LA	HA	O	O	LA	O	O
Construction material mixing/ preparation	LA	MA	LA	NA	LA	LA	HA	O	O	O	HA	LA	HB	MA	LA	LA	O
Welding/ cutting and steel fixing process	O	O	O	NA	O	MA	HA	O	LA	O	HA	O	HB	MA	LA	LA	O
Shuttering/ beams	O	O	O	NA	O	MA	HA	O	O	O	HA	LA	HB	MA	MA	MA	O

Building roofing	O	O	O	NA	LA	MA	MA	O	O	O	HA	LA	HB	MA	LA	LA	O
Excavation	HA	MA	MA	NA	LA	HA	HA	MA	LA	O	HA	O	HB	LA	O	O	O

Legend: O=Negligible/No impacts

B=Beneficial

LA=Low Adverse

MA=Medium Adverse

HA=High Adverse

Environmental Component / Project Activities	Physical Environment							Biological Environment		Socio-Economic Environment							
	Topography & Drainage	Soil Quality	Landscape	Surface water quality	Ground water quality	Air quality	Noise	Flora	Fauna	Agricultural Land	Health & Safety	Disruption of Public	Employment	Population Disturbance	Social Disorder	Cultural Values	Traffic Management
Water consumption	LA	O	LA	NA	HA	O	O	LA	LA	LA	LA	HA	B	LA	O	O	O
Social activities	O	O	LB	NA	B	B	B	B	B	HB	HB	B	HB	HB	HB	HB	O
Public welfare	O	O	B	NA	B	B	B	B	B	HB	HB	HB	HB	HB	HB	HB	LB
Economic activities	LB	O	B	NA	B	B	B	B	B	B	HB	B	B	B	B	B	LB
Employment	O	O	O	NA	O	O	O	O	O	O	B	B	HB	B	B	B	LB
Infrastructure improvement	LB	MB	HB	NA	B	B	B	HB	LB	HB	HB	B	HB	B	B	B	B

6.7 Decommissioning Activities

6.7.1 Potential Environmental and Social Risk

The decommissioning and closure phase of the project may include the following environmental and social risks:

- Physical environmental disturbance because of the removal of project infrastructure
- 7hhhh\Health and safety risks associated with demolition activities, remaining infrastructure, and /or poor rehabilitation.

In addition to that project infrastructure which may remain in situ (flow lines, waste disposal sites etc.),there is the potential ongoing risk of long-term liability and environmental risk.

6.7.2 Decommissioning Principles and Procedures

- Carefully consider long term social and environmental liability of all proposed development actions during the lifespan of the project and, where feasible, implement alternatives that minimize long term risks.
- Follow an incremental approach to decommissioning by minimizing the project footprint during the project lifespan and by closing and rehabilitating all areas which are no longer required for theproject at the time.
- Update the project Waste Management Plan to include all relevant aspects of waste management during decommissioning.

6.7.3 Re-contouring, Reinstatement and Rehabilitation

- Shape, level and compact the final landscape after removal of all project infrastructure.
- Shape all other channels and drains to smooth slopes and integrate into natural drainage pattern.
- Construct contour banks and energy dissipating structures as necessary to protect disturbed areas fromerosion prior to stabilization.
- Promote re-vegetation through the encouragement of the natural process of secondary succession.

Chapter 7: ENVIRONMENTAL MANAGEMENT & MONITORING PLAN

This Section of the EIA Study lays out the Environmental Management Plan (EMP) for the works concerning the Designing, Pre-Construction, Construction and Post-Construction including the Operational stages of the Revamping and Restoration of Storm Water Drains of Karachi Project of National Disaster Management Authority.

7.1 Need for EMP

The EMP is meant to provide an overall approach for managing and monitoring environment-related issues and to describe the institutional framework for implementing the EMP.

The previous sections identified the environmental impacts of different activities during the designing, pre-construction, construction and operation stages of Revamping and Restoration of Storm Water Drains Project and mitigation measures to reduce the severity of the impacts. For successful environmental practices, an essential requirement of the SEP Act 2014 is to develop an Environmental Management Plan (EMP) to guide through the procedures to the management and workers of the project for continual improvement.

- Outlining measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental impacts or reduce them to acceptable levels.
- The actions needed to implement these measures such as defining roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other stakeholders.
- Defining the requirements for communication, documentation, training & management, and implementation of the mitigation measures.
- Actions required assessing the effectiveness of the mitigation measures employed such as guide through the monitoring mechanism and identifying related parameters

that will be required for confirming the effective implementation of the mitigation measures.

7.2 EMP Process

The EMP comprises of the following areas & defining the methods and procedures of implementation.

- Organizational structure and roles and responsibilities of project personnel.
- Specific requirements for the implementation of the EMP.
- Mitigation or impact management matrix.
- Monitoring plan with the emphasis on specific parameters to monitor.
- The preparation of this plan has involved an extensive and detailed program of investigation to theprocesses involved and consultation with NDMA and the issues concerned. Therefore, this network will provide a structure to assist in the implementation of the management plan accordingly.
- The health, safety & environment (HSE) policy of FWO will be implemented by NDMA for environment and health and safety related concerns and issues. The site manager is the in charge will coordinate with the HSE department of FWO who are responsible for the construction works on the site. If the issue doesn't resolve at that stage, it will be reported to NDMA project manager for further proceedings.

7.3 Management Approach

Management will undertake overall responsibility for compliance with the EMP. It will ensure that all the activities that the management executes comply with positive environmental sensitivities as well asit will cooperate with the concerned regulatory agencies such as Sindh Environmental Protection Agency (SEPA). The dynamic approaches that are followed towards successful implementation of theenvironmental management plan are listed below:

- Compliance with the relevant legislative and regulatory requirements of the project.
- Developing appropriate monitoring indicators to assess the performance as well as

magnitude ofimpact on the environment.

- Regular review of the project activities and assessing their impacts on the environment.
- Setting project's key environmental concerns and addressing issues through public support,awareness and publicly reporting its progress.
- Communicating broadly with internal & external stakeholder on issue of environmental concerns.

7.4 Maintenance of the EMP

EMP needs to be revised on periodic basis to maintain up-to-date environmental management requirements with the changing physical and regulatory constraints. Therefore, outlining and defining the responsibilities of personnel and activities under the project's operation execution, implementation,mining, operation & monitoring and decommissioning phase are integral part of maintenance of the EMP. Dissemination of reviewed and revised EMP needs to be ensured to all stakeholders particularly, relevant government and municipal agencies so that their modified role is also redefined and re- established in the overall environmental management process.

7.5 Roles & Responsibilities

Environmental management should become an integral part of policy of the proposed project. Therefore, committing to reduce the environmental impacts will reflect the management approach and believe that good performance in this area is synonymous with running well-managed efficient proposedproject operations. A brief structure of role and responsibilities is given below:

7.5.1 Top Management of NDMA

Environmental management plan (EMP) will be regulated by the Top Management of NDMA; therefore,will play an important role. Some of the key role & responsibilities are given below:

- To cooperate and consult with relevant environmental agency in order to perform in better way.

- To evaluate the progress of development and implementation of this management plan.
- To approve any change in decision making with the consultation of respective managers, if appropriate.

7.5.2 Project Manager

The role of Project Manager is very important. The success of an EMP will mainly depend upon effective management of the EMP by Project Manager. Following is some of the roles & responsibilities given to the Project Manager:

- Ensure that the contractor is aware of all specifications, legal constraints, standards and procedurespertaining to the project specifically with regards to environment.
- Ensure that all stipulations within the EMP are communicated and adhered to by contractor(s).
- Monitor the implementation of the EMP throughout the project by means of site inspections andmeetings. This will be documented as part of the minutes of the site meeting documents.
- Be fully conversant with the Environmental Examination of the project, the conditions of theapproval of EIA and all relevant environmental legislations.

7.5.3 Site Manger

The role of site manager is very important. The success of an EMP will mainly depend upon effective management of the EMP by this person. Following are some of the roles and responsibilities given to the site manger

- To ensure that the points of views of staff are considered and placed in the EMP accordingly.
- To identify issues and where possible, propose solutions for inclusion in the management planreview process.
- To improve coordination and exchange of information between top management, employees,contractors, etc.
- To contribute towards the actions to deliver the management plan and

ensure its continueddevelopment.

- To monitor the progress of development and implementation of this management plan.
- Have overall responsibility for the implementation of EMP.
- Liaise with the Project Manager on his delegate, the HSE Officer and relevant discipline Engineerson matters concerning the environment.

7.5.4 Health, Safety & Environment (HSE) Officer

- Be fully conversant with the Environmental Examination and conditions of its approval.
- Be fully conversant with the Environmental Management Plan.
- Be fully conversant with all relevant environmental legislation, policies and procedures, and ensurecompliance with these.
- Convey the contents of this document to the contractor site staff and discuss the contents in detailwith the Project Manager and Contractor.
- Undertake regular and comprehensive inspection of the site and surrounding areas in order tomonitor compliance with the EMP.
- Take appropriate action if the specifications contained in the EMP are not followed.
- Monitor and verify that environmental impacts are kept to a minimum, as far as possible.
- Review and approve construction methods, with input from Site Manager, where necessary.
- Ensure that activities on site comply with all relevant environmental legislation.
- Order the removal of person(s) and/or equipment in contravention of the specifications of the EMP.
- Liaise with the Site Engineer regarding the monitoring of the site.
- Report any non-compliance or remedial measures that need to be applied.
- All environmental problems arising on the construction area will be reported to the Project Manager by the Site Manger. Reports on such problems will be

submitted to the Project Manager by the SiteManager.

- Prevent actions that will harm or may cause harm to the environment and take steps to prevent pollution on the site.

7.5.5 Contractor(s) for Construction and Operation

On behalf of contractor, the main responsibilities for all matters pertaining to environment will be that of the chief of the assigned contractor. The role and responsibilities of the contractor will consist of thefollowing basic points:

- To carry out construction/operation activities in environmentally sound manner.
- Shall propose measures to minimize environmental impacts during construction process and submit them to the Environmental Officer.
- In case of having impacts on the environment, the contractor will inform these to the HSE Officerin time to get instructions and then take next step.
- Comply with the environmental management specifications.
- Submitting and obligatory Method Statements for approval by the HSE Officer before any work isundertaken.
- Submitting a report at each site meeting which will document all incidents that have occurred duringthe period before the site meeting.
- Maintaining public complaints register.
- Arrange that all his employees and those of his subcontractors receive training before thecommencement of construction.

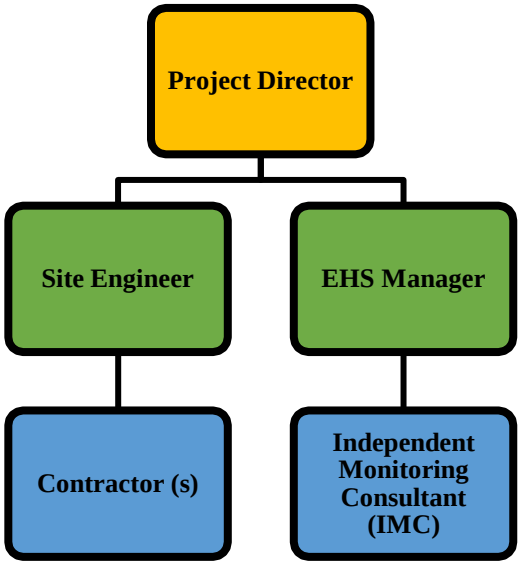


Figure 7-1 Suggested Organogram for Environmental Management

7.5.6 Independent Monitoring Consultants

The proponent shall appoint an Independent Monitoring Consultant (IMC) who will monitor to ensure that the construction is in accordance with the EIA approval conditions. The results of the periodic monitoring will be compiled in monitoring reports which will be submitted to the project management for review and necessary action. The consultant will maintain monitoring records and any deviations from or changes to the contract plans.

7.6 Environmental Management Program

Current plans for environmental management during development/design, construction, and operation phase of the project are mentioned in sections below.

7.6.1 Design of Project

It includes the location of proposed project site, extension area, facilities to be installed in given space of project area as well as machines and other related operations. If design parameters need to be change due to any reason after getting environmental approval, proponent will assess the environmental impacts that may arise from such changes. If the impacts are

found to be different and in excess of those mentioned in the report, mitigation measures must be developed to minimize these impacts with respectto the changes.

7.6.2 Approvals

Obtaining NOC from SEPA does not relieve the proponent for other obligations and hence NDMA and the contractor will obtain all relevant clearances and necessary approvals required by the Government of Sindh prior to initiate the proposed operations.

7.6.3 Environmental Trainings

Necessary training on environmental and other safety issues will be provided to the technical and supporting staff before start of activities to ensure that all the staff is well acquainted with the nature of job, inherent risks, hazards, requirements of job safety and EMP. The HSE Manager will determine thetraining requirements.

Records of all trainings should be maintained. It is recommended that in case of any undesirable eventor emergency situation, a follow-up session should be arranged to review the weaknesses ad gaps in theexisting system and possible reasons which caused the event. This would enable the management in keeping such events from recurring by placing additional and more efficient controls.

7.6.4 Water Sourcing

Measures will be implemented to maximize water recovery and reduce dependence on the use of freshwater for operations.

7.6.5 Construction works Management

All construction related work including campsite establishment, operation, and management of waste streams, equipment and material mobilization etc. shall be in compliance with the (1) agreed procedures(if) provided by the proponent to the contractor and (2) provisions of NOC. The contractors will abideby the relevant contractual provisions relating to the environment.

Performance of contractor and subcontractor will be monitored by IMC periodically and site supervisor constantly. All the construction crew particularly the technical staff will be

provided with necessary PPEs and other safety equipment as required by their job. Site supervisor and contractor will ensure thateach job is being performed in safe and sound manner and in accordance with the safe work procedures. Solid waste during construction will be removed on daily basis either through a local waste contractor or by the construction contractor himself who will engage some workers for removal of construction waste from site and disposal to a waste collection facility.

Proper drainage will be provided to construction camp and construction site, especially near excavations. The wastewater will be initially treated by sedimentation technique to remove suspended solids and reused if it meets the desired quality. If the effluent cannot be reused, it will be discharged to local sewers after ensuring that it does not contain any solid debris which can choke the sewer lines. Where possible, wastewater may be used for watering the vegetation nearby.

Type of construction material for the storage terminal shall meet the seismic design requirements for buildings located in seismic zone 2A. The design consultant also needs to consider other safety aspectsfor events like floods.

7.6.5.1 Site Restoration

The Site Supervisor will ensure that the restoration of the site after the end of construction activities iscarried out according to the requirements of the EIA and EMP.

7.6.5.2 Construction Monitoring

An Independent monitoring consultant will be hired to monitor the construction work and EMP compliance which would also include monitoring of waste management.

Table 7-1 Environmental Management Plan

Project	**Revamping and Restoration of Storm Water Drains of Karachi**

Proposed Project Activities	**Potential Impacts**	**Mitigation Measures**	**Implementing Agency**	**Monitoring Responsibility**
A. Design Phase				
Site Selection	• Occurrence of Accidents due to improper design • Locals can face Resettlement issues. • The Disturbance to properties/ businesses is possible.	• Project involves revamping and restoration of Storm Water drains within ROW. In case of loss to business/properties. Compensation should be paid to all concerned affected as per resettlement policy decided by Sindh Government, where Rs.15,000/per month will be given to each affectees with 30% damage to property, overall Rs. 3,60,000 rupees will be given to the affectees over the course of 2 years. • Project involves the revamping and restoration of Mahmoodabad, Gujjar and Orangi Nullah.	Contractor	Project manager

Public and Cultural Properties	Disturbance to locals visiting public properties i.e., mosque, schools, shrines, and graveyards etc.	• In case of unavoidable interference prior notification and consultation needs to be made to reach consensus on procedures and options or any other form of agreed compensation. • Provision of alternate route and prior notification regarding construction.	Contractor	Project manager
B. CONSTRUCTION PHASE				
Construction work and handling of waste	**a) Environmental Issues:** • Dust, Noise and vibration issues may generate during construction of project infrastructure posing minor health issues on labors and nearby community. • Scattered solid waste may affect visual and aesthetic environment and provide breeding place to mosquitoes.	• Waste will be properly disposed off. • Updated and tuned machinery will be used to control noise. • Water sprinkling will be carried out at consecutive intervals. • Dust masks and ear plugs should be provided to the laborers. • Bitumen waste should be stored in closed containers and placed in a fenced storage area with paved floor. Should be properly disposed of. Scattered solid waste should be properly managed in order to avoid contamination. • Availability of bins will be ensured for commonly generated solid waste.	Contractor	Site Manager

	b) Social Issues: Heaps of solid waste may cause disturbance in mobility.	• Timely management of solid waste will be ensured, and contractor would be asked to take services of TMA[2] for proper sanitation.		
Handling of construction material	**a) Environmental Issues:** • Construction material such as sand, bitumen may pose health risks. • Spray of bitumen may cause respiratory and visual impairment. • Emissions and runoff of cement-contaminated water from batching plant may pollute the nearby area.	• Material shall be appropriately covered to prevent dispersal of sand material. • Implement dust suppression measures for all stockpiles. • Protective health and safety measures should be adopted. • Concrete mixing on the ground shall not be allowed. • Emissions from batching plant should be properly controlled and runoff contaminated water should be collected, stored and disposed of at the	Contractor	Site manager

[2] Tehsil Municipal Authority

	b) Social Issues: Scattered construction material may obstruct mobility.	designated site. • Material should be kept aside in designated place without creating disturbance to public mobility.		
C. GENERAL ENVIRONMENTAL ISSUES				
Air Quality • **Dust Pollution** • **Dust plumes from construction Operation.**	• Dust emission may generate during construction activity. • Dust plumes from construction operations commonly, earthworks, haulage and dumping of soil have always generated excessive dust during in the city and suburbs and possibly lead to short term respiratory health effects (coughs). Due to heavy movement of vehicles, noise may generate. Air emissions may generate due to	Following of SEQS[3] as performance indicators. **(Copy attached as Annexure G).** • Access roads/street shall be sprinkled with water at least five times a day to suppress dust emissions. • Wet suppress or cover transported materials that may emit dust during transportation. • All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained to minimize exhaust emissions. • Open burning of solid waste by the Contractor should be strictly banned. • Asphalt, hot mix and batching plants should be	Contractor	Site Manager

[3] Sindh Environment Quality Standards

Emission from machinery/ equipment	fuel burning from machinery/equipment	equipped with dust control equipment such as fabric filters or wet scrubbers to reduce level of dust emissions. • Stockpiled materials will be covered to avoid dust/particulate emission. • Air quality analysis will be carried out before, during and after construction.		
Noise pollution	During construction, use of heavy machinery such as Excavators, Dumpers, FE loaders, bulldozers, stabilizers, concrete mixing plant, pneumatic drills, stone crushers asphalt plants etc. can result in noise pollution and vibrations, causing discomfort and health hazards to workers and surrounding communities, especially those using the religious and sacred sites.	• Utilize noise mitigation measures (including the construction of bunds, metal sheet walls) in order to limit noise levels at sensitive receptors. • Use of modern and well-maintained vehicles and machinery with reduced noise emission levels. • Confining excessively noisy work to normal working hours in the day. • Providing construction workers with suitable hearing protection such as earmuffs and training them in their use. • Heavy machinery like percussion hammers and pneumatic drills should be used at a minimum	Contractor	Site manager

		level and should not be used at all during the night. • Use of noise barriers in sensitive areas in the form of high boundary walls (concrete or wood), next to the religious and sacred sites. • Locating the rock crushing, concrete mixing, and materials shipment yards at least 500m from residential areas, and religious sites.		
Soil	Soil erosion may occur during the construction of facilities due to uncontrolled run-off from equipment washing yards, excavation of earth/cutting operations and clearing of vegetation.	• There is no vegetation present at the project sites therefore there no mitigation measures required here. • The exposed soil will be re-vegetated quickly and compensatory plantation will be followed, i.e., 10 trees to be planted for every tree cut. • Provide impervious platforms in maintenance yards and storage areas with oil and grease traps for collection of spillages during storage of liquid fuel and lubes, and equipment and vehicle maintenance. • Controlled disposal of oil, grease and chemicals, and restoration of site back to its original	Contractor	Site manager

		conditions before handing over. • Contractors to follow proper handling and disposal of construction waste and materials in designated site. • The contractor will ensure prevention of soil erosion and destabilization by applying batched excavation technique. • Productive land or land adjacent to agricultural/irrigated land may not be used for excavation.		
Vibration	• Shock waves can be produced due to heavy machinery working. • May create disturbance for nearby community	• Use of vibratory rollers should be prohibited.	Contractor	Site Manager
Surface and Groundwater	• Construction waste and oil spills, if left unattended will result in forming leachate that will percolate through the soil strata and may contaminate the	• Proper disposal of solid waste in designated site to sustain the water and land quality for domestic requirements. • Water required for construction should be obtained in a way so that water availability and supply to nearby communities remains	Contractor	Site Manager

	soil. • Wastewater from sanitation facilities of the Site workers may also result in contamination.	unaffected. • Contractor will conduct the mandatory water testing and obtain all necessary permits as per regulations from the Local Authority. • Contractor will ensure that construction debris is not unattended and causes contamination. • Construction work close to water bodies will be avoided, especially during monsoon period. • Latrines at worker's camps must be located at least 50 meters from any sources of groundwater such as hand pumps and wells.		
Water Requirements for Construction		• Contractor will obtain all necessary permits for water extraction/usage for the Local Authority	Contractor	Site Manager
Waste Disposal		• Prepare a detailed Solid Waste Management Plan for the construction site (including adequate placement of waste bins, requirements of sanitary staff, transportation of waste, and identification designated site for final disposal). • Plan for placement of waste collection containers throughout the project area.	Contractor	Site Manager

	Construction activities can result in the generation of wastewater, oil spillage from machinery and construction related solid waste.	• Disallow the burning of any of type of waste. • Prepare plans for the safe handling, storage and disposal of harmful materials. • Implement resource conservation and encourage staff (through training) to reduce waste, reuse waste and recycle waste wherever possible. • Collect all bio-degradable domestic waste and dispose of at the designated area as defined by TMA. • Do not burn materials which may lead to the release of toxic or hazardous substances (SEQS). • Sell recyclable waste to local vendors. • Collect non-biodegradable waste separately and dispose of at designated waste disposal area. • No fire is allowed in open. • Do not burn materials such as plastics and polyethylene which may lead to the release of toxic or hazardous substances. • Collected and disposed of the waste in municipal waste dumping points. • Reduce construction waste by reusing waste as a		

		fill material (prior to testing to confirm the suitability of material). • Collect construction waste separately to domestic waste. • Collect and remove all construction waste from the project area. • Reuse material as fill material or sell to local vendors· Sell or reuse gates removed from structures· • Treat construction wastes water and dispose of after treatment· • Do not burn materials which may lead to the release of toxic or hazardous substances. • Request suppliers to minimize packaging where practical. • Do not burn materials which may lead to the release of toxic or hazardous substances. • All the medical waste shall be disposed off in burial pits. • The burial site shall be identified away from community residents and project area. The burial		

		site shall be identified on the barren land with due coordination of TMA. • Handover to specialized and certified disposal contractor. • Effluent from contractor's workshop and equipment washing yards would be passed through gravel/sand beds to remove oil and grease contaminants before discharging it into nearby canal or agricultural land. • Training of workers will be carried out in the storage and handling of materials and chemicals that can potentially cause soil contamination. • Proper labelling of containers will be carried out, including the identification and quantity of the contents, hazard contact information etc. • Emergency Response Plan should be prepared to address the accidental spillage of fuels and hazardous goods at storage areas.		
Emergency Response Plan		• Measures for fire prevention and firefighting. • Indicators on site (for example, heavy rainfall) that will prompt the shutdown of specified areas of	Contractor	Site Manager

	Uncontrolled releases of hazardous materials may result from small cumulative events, or from more significant equipment failure associated with events such as manual or mechanical transfer between storage systems or process equipment.	work. • Procedure for shutdown of site, including transfer of plant, materials and personnel to safe areas (for example in the event of a flood). • Emergency evacuation procedure for staff and members of the public likely to be impacted by an emergency event on site (for example: fire or blast). • Where practicable, avoiding or minimizing the use of hazardous materials. Emergency lighting of adequate intensity should be installed and automatically activated upon. failure of the principal artificial light source to ensure safe shut-down, evacuation etc. • The contractor will prepare emergency shutdown procedures and evacuations to cover all staffs and affected members of the public in the event of any emergency incident (such as traffic accident and fire). The contractor will ensure emergency access routes are well known and have appropriate signage. • Identification of locations of hazardous materials		

		and associated activities on an emergency plan. • Training should incorporate information from Material Safety Data Sheets for hazardous materials being handled. MSDSs4 should be readily accessible to employees in their local language.		
Biodiversity (Fauna and Flora)	There project area is a habitat of some local animal species like cat, Dog, Mouse and donkey no critically endangered species present at sites. All of the three sites do not have any vegetation cover or plants.	• Planting of trees should be done at the project sites. • Do not introduce invasive or exotic species through plantation • The contractor's staff will be required to sign a code of conduct to function ethically. • Speed limit will be defined for minimal impacts on fauna.	Contractor	Site Manager
Health and Safety Measures	• Health problems or immediate risk may emerge at dismantling and construction phase e.g. at	• Providing basic medical service and supplies to workers on-site (First Aid Boxes). • Setting and enforcement of speed limits. • Do not allow workers with inadequate training to	Contractor	

4 Material Safety Data Sheet

	time of bitumen plant/asphalt handling • Accidentals risks • Dust particles • Air and Noise pollution • Un-awareness regarding usage of PPEs may have serious outcomes	operate heavy machinery • Provision of appropriate and high quality [5]PPEs to workers such as gloves, vests, hard-hats, masks etc. • Protection devices (earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines. • Provision of protective clothing for laborers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc. • Provision of proper safety signage at sensitive/accident-prone spots. • Consecutive sessions would be organized to create awareness among labors. • Arrange awareness sessions on public safety for visitors during special festivals.		Site Manager/HSE Officer
D. GENERAL SOCIAL ISSUES				
Project will have positive outcomes for the local communities by rehabilitation of the Project.				

5 Personal Protective Equipment

Job opportunities	It will lead to temporary increase in local employment and economic activity.	Priority will be given to local area inhabitants for skilled and unskilled labour jobs. Majority of labour need will be met from the project areas. The project will also require skilled workers and these may be available from the community. It is anticipated that approximately 75% of the workforce will be from the project area while some 25% of labour (skilled) would be hired from outside the project area. This labour influx may have a positive impact on economy of the area.	Contractor	Contractor
Labor Management	• The significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities can occur. • There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. • Child labour and school drop	• Provide adequate health care facilities within construction sites. • Standard Operating Procedures (SOPs) should be developed and implemented to ensure that all safety measures are in place with provision of adequate facilities as drinking water, first aid box and proper sanitation. • Provide first aid facility round the clock. • Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Ensuring that children and minors are not	Contractor	Contractor

	out Health Safety attributes	employed directly or indirectly on the project. • 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). • Communication on hiring criteria, minimum age, and applicable laws. • 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.		
However, following issue might be generated:				
Gender issue	• Project activities may cause hindrance to normal passage especially for women • Privacy of the community may	• Workers would be trained to address privacy issues and be ethically behaved. • Labours would be instructed to respect privacy of local population, especially women and children	Contractor	Site Manager

	be disturbed	• Staff capacity-building		
Land acquisition for the temporary storage of materials and machinery.	• Material storage may restrict public movement	As per Govt. rate, landowner will be paid for temporary storage of material. Normally, 50,000/- is annually paid to the owner of the land to whom land is rented out as per defined local government rates.	Contractor	Site Manager
Traffic Management	• Blocking of road may hamper public mobility due to increase in number of vehicles Road Safety	• Provision of alternative routes • Ensuring that the construction is done in sections so, it doesn't overwhelm the system and routine movement continues to avoid any inconveniences. • Water sprinkling at project site at consecutive intervals • Indicators/signboards regarding alternate routes should be provided at proper distance to avoid accidents. • Inform and coordinate the local residents regarding construction time schedule and also to display the details at project site for their convenience (Public consultation has been carried out. **Performa is attached as Annexure L).**	Contractor	Site Manager

		• Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents; \ • In case of any complaint, focal person of NDMA may contact (details will be highlighted at project site). • **Traffic Management Plan is attached at Annexure- M).**		
Economic Issues	Economic issues may arise due to; • loss of land, • structures/assets • productive plants • livelihood • shopkeepers • vendors (Mobile/permanent)	• Land acquisition is involved, any resettlement issue will be addressed according to Land Acquisition Act 1894. • Public structures are found to be affected in the project area because they are fallings in ROW • Livelihood will be affected by project activity • No shops were found to be affected as located out of ROW. • No permanent vendors were observed during social and environmental assessment survey • In case of any complaint, focal person of NDMA may contact and his contact details will be	Contractor	Site Manager

		provided at project site.		

Table 7-2: Environmental Monitoring Plan

Environmental monitoring will be carried out to ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented.

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Monitoring	**Supervision**
Surface water quality	Malir and Lyari rivers	Sampling and analysis of river water quality according to NEQS	Biannually	Contractor	NDMA
			Annually	External Monitor (Through EPA Certified laboratory)	
	Malir and Lyari rivers	Spot Measurements of pH, conductivity, turbidity; visual inspection of presence of petroleum products	Monthly	Contractor	NDMA
Air Quality (dust, smoke)	Along the access and haul road	Visual inspection to ensure good standard equipment is in use and dust suppression measures(sprinkling) are in place	Daily	Contractor	NDMA
	Along the access and haul road	Visual inspection to ensure good standard equipment is in use and dust suppression measures (sprinkling) are in place	Daily	Contractor	NDMA
Air Quality (PM10, NO2,	At all project sites	Air quality monitoring for 24hoursforthe Parameters	Annually	Contractor	NDMA

SO2, CO2, CO)		specified in NEQS	Annually	External Monitor (through EPA certified laboratory)	
Emissions from equipment	Close to construction Area	Visual inspection	Monthly	Contractor	NDMA
Noise and vibration	Close to noise Generating equipment and road	Spot measurements	Monthly	Contractor	NDMA
		24 hours noise Monitoring through and EPA certified laboratory	Annually	External Monitor (through EPA certified laboratory)	NDMA
Waste Management	Storage and	Visual inspection that solid waste is disposed of at designated sites	Monthly	Contractor	NDMA
Spills from Hazardous liquid storage	Storage area	Visual inspection for leaks and spills	Monthly	Contractor	NDMA
Road Traffic safety	Along the road	Visual inspection to ensure Traffic Management Implemented at project site	Monthly	Contractor	NDMA
Local roads/adjacent roads		Visual inspection to ensure local roads are not damaged	Monthly	Contractor	NDMA
Drinking water and Sanitation	At construction Camps	Visual inspection	Weekly	Contractor	NDMA
Safety of workers	At active construction sites	Visual inspection in all areas, where run off leaves bare and at important drainage features (ditches,	Monthly	Contractor	NDMA

		gullies etc.) after major rainfall events			
Erosion		Visual inspection to ensure local roads are not damaged	Weekly	Contractor	NDMA
Reinstatement of work sites		Visual inspection	After completion of all works	Contractor	NDMA
Wildlife Safety Plan	Project area	Visual inspection, verify proposed physical structures for Wildlife safety, verifying design documents, verifying the budget in the overall costing of the road construction.	Monthly	Project manager, Contractor	NDMA
Tree plantation plan	Project area	Visual verifying with documents, number of trees planted, sample of mortality and survival	Monthly	, Contractor	NDMA

Chapter 8: CONCLUSION & RECOMMENDATIONS

Based on the study conducted for Environmental Impact Assessment (EIA) for the subject project, the following conclusions are made:

8.1 Conclusion

The EIA study reveals that the project is economically viable and socially acceptable and the proponent will implement the project in the environment friendly manner. He will adopt all the necessary measures to control any impact if resulting from the project. He will provide the safe drinking water, safe working environment, proper training and first aid facility to all workers and staff. The project will generate additional jobs during construction and operation phases.

8.2 Recommendations

- In view of the comprehensive screening process and findings of the present study there is no need of conducting further investigations.
- Tree plantation along the project area is recommended.
- Any seepage and leakage will be controlled through proper mitigation measures.
- Sound proof room should be constructed for generator to control its sound.
- Use of narcotics and smoking must be prohibited during working, filling or handling of fuel.
- PPEs must be provided to workers such as gloves, masks, etc.
- Proper solid waste management system must be adopted.
- Safety signs, safety board's etc. must be placed on site during various developmental stages.
- Machinery will never be left in running condition.
- First Aid measures, health & safety Equipment (PPEs) will be provided to workers.
- Jobs and employment will be provided to the local area.

The present EIA report is enough to meet the administrative and legal framework. After the complete study of the project, it is concluded that project will not have significant adverse impacts on the nearby community and on environment. Overall, the project will have positive impacts on the local population and country as a whole. Therefore, it is requested for the environmental approval for the subject project.