

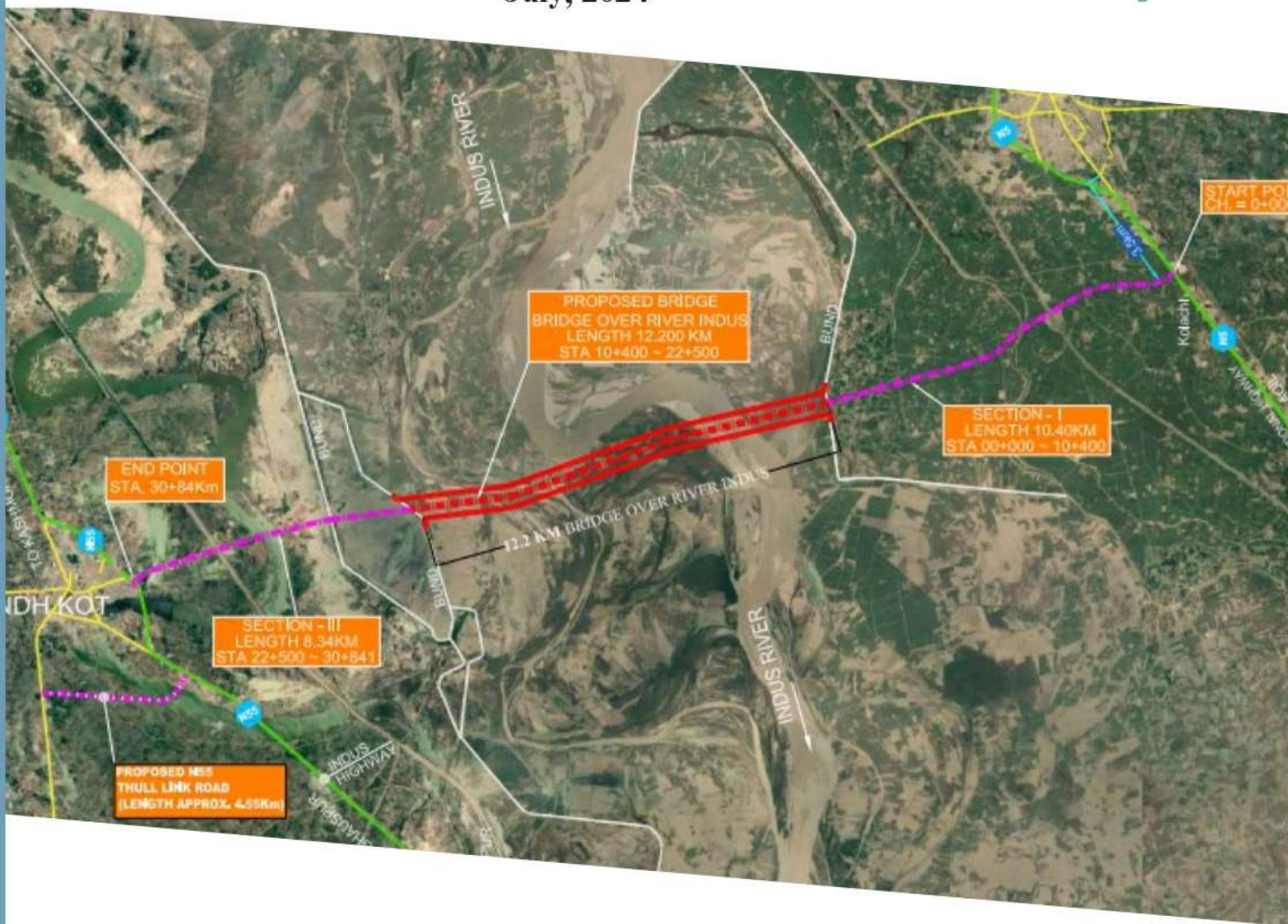


SACHAL



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI-KANDHKOT BRIDGE PROJECT

Final Report
July, 2024



Submitted To:
Sindh Environmental Protection Agency
Government of Sindh

**ENVIRONMENTAL IMPACT ASSESSMENT
FOR
ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT**

**Final Report
July 2024**



SACHAL

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**ENVIRONMENTAL IMPACT ASSESSMENT
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BRIDGE PROJECT**



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Executive Summary

This report documents the findings and results of the Environmental Impact Assessment (EIA) for the proposed Enhancement of Length of Bridge over Indus River under the Ghotki & Kandhkot Road & Bridge Project.

The Works and Services Department, Government of Sindh (GoS) in association with the Public Private Partnership Unit in the Finance Department is in under execution of design, construct and develop a Ghotki-Kandhkot Road & Bridge Project through Public Private Partnership on a Design, Build, Finance, Operate and Transfer (DBFOT) basis wherein the Sachal Engineering Works (Pvt.) Ltd. has been working as EPC Contractor.

The enhancement of bridge is proposed for 12.2 km from Bank-to-Bank in compliance of decisions of 38th PPP Board meeting dated: 26 October 2022 and Technical Sub-Committee meeting dated: 16 December 2022 to ensure compliance of Resolution No. Resolution: F-2(i)/2022 (November) and Specifically F-3/2022 (November) of 187th Indus River Commission (IRC) meeting held on 03 Nov 2022.

The right of way (RoW) would be same as already mentioned in the EIA report approved by SEPA. The only change would be in the length of the bridge's start and end piers/point along the same right of way (RoW) as per the change in the main bridge's length. The layout plan of the project showing the proposed bridge plan is given below.



While in the planning stage, in compliance with promulgated environmental legislation at provincial and national level, in the province, the proponent has prepared an Environmental Impact Assessment (EIA) for the Ghotki -Kandhkot Road & Bridge Project and submitted to Sindh Environmental Protection Agency (SEPA). After going through the review process including arrangement of a public hearing and meeting of an expert committee, Sindh Environmental Protection Agency (SEPA) issued an NOC or approval to proceed with the construction of the project vide letter # SEPA/2020/5/11/EIA/194/389/20 dated 16/09/2020 which requires a separate approval under Condition of EIA approval for any further construction/enhancement and in compliance of Section-17 of Sindh Environmental Protection Act-2014 and rules and regulations made thereunder.

During the floods of 2022, it was observed that those bridges which were constructed bank to bank length like Jhurrek-Mullakatiyar road bridge, Sukkur bypass road bridge, Hyderabad bypass bridge over River Indus passed the high flow of water smoothly without any afflux but the bridge like Qazi Ahmad-Amri, Dadu-Moro road and other bridges caused pressure on the flood protective embankments along upstream of the bridges and the lag time increased.

The project will ensure safety of flood protection infrastructure and help to save all surrounding areas including minor and major installations in the best interest of Country.

A detailed Environmental Management and Monitoring Plan (EMMP) is prepared for the proposed enhancement of length of bridge for construction and operations to mitigate the impacts identified during this EIA study.

Under this EIA study following aspects have been covered:

- Review of relevant legislative requirements applicable on the proposed project.
- Review, documentation and analysis of the existing baseline conditions in project surrounding areas.
- Identification, documentation and analysis of environmental impacts associated with the proposed construction and operation.
- Identification and documentation of mitigation safeguards to minimize the adverse environmental impacts of proposed construction and operation.

Therefore, this EIA study concludes the following:

The proposed project will not have any long term significant and adverse environmental impacts as the bridge is proposed from bank to bank which will have positive impact



and will ensure smooth flow during high flood season and maintaining the ecological balance of the aquatic ecosystem.

Additionally, a detailed EMMP identifies all the possible impacts associated with construction and operation phase of the proposed enhancement of length of river bridge and mitigation safeguards are integral part of plan to minimize adverse impacts associated with the project. Based on the points discussed above, it is concluded that the revised bridge design will not have any significant long term adverse impacts onto the existing environment, if strict implementation of the Environmental Management and Monitoring (EMMP) during the phase of project construction and operations is ensured.

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Acronyms

EA	Environmental Assessment
ECS	Environmental Consultancy & Services
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GKRBP	Ghotki Kandhkot Road & Bridge Project
GOS	Government of Sindh
IEE	Initial Environmental Examination
IMC	Independent Monitoring Consultant
IRC	Indus River Commission
KM/H	Kilometer Per Hour
NCS	National Conservation Strategy
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
O&M	Operation & Maintenance
OHS	Occupational Health and Safety
PEPA	Pakistan Environmental Protection Agency
PIU	Project Implementation Unit
PPP	Public Private Partnership, GoS
PSDP	Public Sector Development Program
PSC	Project Supervision Consultant
SEPA	Sindh Environmental Protection Agency
SEQS	Sindh Environmental Quality Standards
SEWPL	Sachal Engineering Works Private Limited
SFD	Sindh Forest Department
SWD	Sindh Wildlife Department
SW&SD	Sindh Works & Services Department

CHAPTER 1: INTRODUCTION

1.1 Prelude

This Environmental Impact Assessment (EIA) report has been prepared for the proposed Enhancement of Length of Bridge over Indus River under the Ghotki-Kandhkot Road & Bridge Project to comply with the legislative requirement.

The proponent has already obtained the NOC from Sindh Environment Protection Agency for entire project vide reference no. SEPA/2020/5/11/ EIA/194/389/20 dated: 16/09/2020 which requires a separate approval under the Condition of EIA approval for any further construction/enhancement and in compliance of Section-17 of Sindh Environmental Protection Act-2014 and rules and regulations made thereunder.

The initial planned 2.15 km span of the bridge has been proposed to extend up to 12.2 km Bank-to-Bank in compliance of decisions of 38th PPP Board meeting dated: 26 October 2022 and Technical Sub-Committee meeting dated: 16 December 2022 to ensure compliance of Resolution No. Resolution: F-2(i)/2022 (November) and Specifically F-3/2022 (November) of 187th Indus River Commission (IRC) meeting held on 03 Nov 2022. However, the right of way (RoW) would be same as already mentioned in the EIA report approved by SEPA. The only change proposed would be in the length of the bridge's start and end point along the same right of way (RoW) as per the change in the main bridge's length.

The proposed enhancement of the length of Bridge over Indus River will ensure smooth flow during high flow season and maintaining the ecological balance of the aquatic ecosystem. The project will also ensure safety of flood protection infrastructure and help to save all surrounding areas including minor and major installations in the best interest of Country.

1.2 Project Background

The Works and Services Department, Government of Sindh (GoS) in association with the Public Private Partnership Unit in the Finance Department is in under execution of design, construct and develop a Ghotki-Kandhkot Road & Bridge Project through Public Private Partnership on a Design, Build, Finance, Operate and Transfer (DBFOT) basis wherein the Sachal Engineering Works (Pvt.) Ltd. has been working as EPC Contractor.

The project will connect the National Highway (N-5 at Ghotki) to Indus Highway (N-55 at Kandhkot) along with the project facilities. Both Ghotki and Kandhkot together host the largest oil and gas fields, power projects, crop market, especially rice and fertilizer plants in the country. The location of the project is also shown in Figure-1.

The Ghotki-Kandhkot Road & Bridge Project (GKRB Project), already under construction is a very important infrastructure project that is being constructed over river Indus. Implementation of the project will significantly benefit various sectors of the economy of Pakistan. There have been substantial improvements and development in the road network of the southeast zone of Pakistan, yet this zone remains beyond the advantages of integrated road network due to the lack of a bridge over the Indus River and its tributaries that lie between Ghotki and Kandhkot. Currently, the link between Ghotki and Kandhkot is only through N5 from Ghotki via Sukkur to Shikarpur (N65) and Shikarpur to Kandhkot (N55).

The road distance between Ghotki and Kandhkot via Guddu Barrage is 151 km and with the construction of this project, the distance will be reduced to 42 km from 151 km thus saving 109 km and approximately 2 hours of travel time. The traffic from Punjab to Balochistan using route N-5 has to traverse through Sukkur downstream then move to N65 reach Jacobabad for onward journey to Balochistan province and vice versa. Similarly, traffic from Punjab and KPK moving towards lower country utilizing route N55, also has to cross Shikarpur at N65 and then Sukkur to reach N-5 for further onward journey and vice versa. The people of Ghotki, Ubaru, Pano Akil, Kandhkot, Ghouspur, Mirpur Mathelo and several other adjoining areas have to travel long distances of about 150 km to reach either side of the river Indus. The project will also help in betterment of environment by saving fuel consumption and subsequently reduction in carbon emissions.

In the original project, the bridge component was only 2.15 km, revised to 03 km with extensive river training works. However, later keeping in view the extreme flood events due to the climate change and removal of hindrance for Indus dolphin (an endangered species) movement across the river, it is decided that there will a Bank-to-Bank bridge (12.2km).



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1.3 Brief Description of Project

The overall original proposed works comprised of.

- Highway Alignment (30.2 km)
 - Earthworks
 - Subbase and Base Courses
 - Surface Courses and Pavement
 - Road Protection Works
 - Drainage and Erosion Work
 - Construction of Toll Plaza Including Control Building
 - Construction of Connecting Point on N-5
 - Construction of Flyover Connecting Point of N-55
- Thull Link Road Work (4.5 km)
 - Construction of Thull Road
 - Other Structures
 - 2-Lane Beghari Canal Bridge
 - 2-Lane Ghota Feeder Canal Bridge
 - 2-Lane Bridge oJari Wah
 - 2-Lane Nala Bridge
 - 2-Lane Tibi Minor Bridge
 - Culverts
- Main Bridge Over River Indus (2.15 km). This is now proposed to **12.2 km** bank to bank of river.
 - 4-Lane Bridge Over River Indus

Although part of the total project, the present report mainly focuses on the proposed enhancement of the length of the bridge over Indus River. However, being a part of overall project many impacts still may be overlapping.

1.3.1 Purpose of the GKRB

The main purpose of this project is to facilitate mobility of both people and goods between Ghotki and Kandhkot cities and provide a shortest link between N5 and N55 by constructing the bridge over Indus River.

1.3.1.1 Economic development through better communication

The provision of this link will make a great contribution to the development of Sindh province in general and this area in particular. It will facilitate faster transportation of goods, equipment etc. from various agricultural production areas located in the region including the Sugar mills, cotton ginning mills, sunflower cultivations, and other agricultural farms would also be benefitted through this Bridge and Road link.

1.3.1.2 Improvement in Social Life of the Sindh Province

Sindh Province especially rural areas have suffered from certain adverse factors with respect to aspect of social life because of less economic development, lower income, and higher poverty. Besides the above factors, the lack of a good road network and longer travelling is also one of the reasons for the unstable social life in Sindh. Therefore, the construction of this link will contribute towards improvement of social life of Sindh. Through better mobility and improved access to employment opportunities, education, health care, business, and commercial activities in an extended area much beyond the limits of their small villages, the quality of life of the people will get improved and they would be able to reap the benefits of economic progress and development.

1.4 Location of the Project

The overall project starts on National Highway (N5) approximately 5.28 km Southwest of Ghotki. The project ends at Indus Highway (N55) in the area of Kandhkot. The location map of the project and proposed bridge is presented in Figure 1.



Figure 1: Location Map of the Project & Proposed Bridge Enhancement

1.5 Permissions

The project has obtained the following permissions/consents from Authorities.

1.5.1 Sindh Environmental Protection Agency

The project has obtained a letter from Sindh EPA for the project vide reference SEPA/2020/5/11/ EIA/194/389/20 dated 16/09/2020.

1.5.2 Sindh Wildlife Department

The project has obtained letter from Sindh Wildlife Department for project vide no. SO-IV(FT&WL)/2-46/2022 dated: 02-06-2022.

1.5.3 Sindh Forest Department

The project has obtained a letter from Sindh Forest Department for project as per initial approved plan vide no. A-1 of 2021-21 dated: 02-06-2021.

1.5.4 Public Private Partnership Board

The project has obtained decision from bridge for Bank-to-Bank in compliance of decisions of 38th PPP Board meeting dated: 26 October 2022 and Technical Sub-Committee meeting dated: 16 December 2022.

1.5.5 Indus River Commission

The project has obtained Resolution from IRC for Length of Bridge from Bank to Bank vide No. Resolution: F-2(i)/2022 (November) and Specifically F-3/2022 (November) of 187th Indus River Commission (IRC) meeting held on 03 Nov 2022.

1.6 Project Proponents

1.6.1 Works & Services Department, Government of Sindh

Government of Sindh through its Works & Services Department (SW&SD) is the owner and client of GKRB Project. SW&SD is responsible for providing services in the form of road network and building facilities for various departments in Sindh province. Its main function is planning, designing, construction and maintenance of Roads/Highways and Buildings of the Province.

1.6.2 Sachal Engineering Works (Pvt.) Ltd.

Sachal Engineering Works (Pvt.) Ltd. (SEWPL) having vast experience in construction of bridges, roads and buildings, river training and protection works has been assigned to execute the work as an EPC Contractor with the assistance of expert designing and planning engineers. It has the resources and capabilities to plan, design, construct and manage a range of civil, mechanical and electrical engineering projects and their supporting infrastructures. The company, namely Ghotki-Kandhkot Road & Bridge Company has been established to execute the project, termed as Concessionaire.

Core values of the company are:

- Innovation in concepts, services, products and delivery system to provide the clients with viable solutions.
- Responsible conduct towards customers, employees, the community and environment in which they operate.
- Constant improvement –to meet the ever-changing needs of the customers.
- Taking the long view in the businesses and actions to ensure that the company has a Sustainable future.

The company strives for excellence in everything from delivering ground-breaking world-class projects through its core business of engineering & construction. The firm believes in superior quality, outstanding values and consistent operational excellence coupled with differentiation and value creation to meet the client needs. While delivering the highest quality in development, the firm believes in working in harmony

with nature to provide a better environment, an environment that adds value to life and enriches the experience of living.

The Concessionaire, as envisaged in the contract agreement, undertook the EIA through Consulting Firm to meet the applicable rules and regulations and submit the report for the approval by the concerned authorities. However, changes occurred in the scope of work in the shape of length of the bridge where the in original project the bridge component was only 2.15 km, revised to Bank-to-Bank bridge (12.2km). Due to such major changes in the scope of work, the regulatory authority (Sindh Environmental Protection Agency) suggested conducting a fresh EIA by incorporating the impacts of changes in the scope of work.

1.7 Need of the Project

Currently, the distance between Ghotki and Kandhkot via Guddu Barrage is 151 km. With the construction of this project, the distance from Ghotki to Kandhkot will be reduced to 42 km from 151 km thus saving of 109 km would have time saving of around 2 hr. The construction of the bridge over the Indus River is a top priority development agenda for the Government of Sindh (GoS) that will not only benefit the upper region of Sindh but the province as a whole.

The Ghotki and Kandhkot Bridge across the Indus River will certainly strengthen links and contribute substantially to the development of the southeast zone as well as to the national and regional economic growth. By constructing the bridge, economic development of both Ghotki and Kashmore districts will promote industrial and commercial activity as well as improve economic and employment opportunities for the local people. Easier communication will help expand education and training facilities, and the resulting skills development will ensure the availability of highly skilled workers.

Situational Analysis

Ghotki District is an agro-based rural district where the majority of the population reside in the rural areas; the sources of livelihood are less diversified for its population. While agriculture is the main source of employment for the rural population, in the urban areas of the district people are engaged in various other economic activities like trade, services, industry, personal business, and government and private jobs. Daharki, Ghotki and Mirpur Mathelo are the main trading centers of this district. Taluka Khangarh and Ubauro are more dependent on agricultural as compared to taluka Ghotki, Mirpur Mathelo and Daharki. Though Ghotki, Mirpur Mathelo and Daharki are also agro-based, here mega industries also provide livelihood earning opportunities to the resident population.

Kashmore is also an agro-based district with the majority of the people earning their livelihood through farming while the second largest group works as casual labor in agricultural fields.

The traders from Ghotki district, if want to sell their goods to Kandhkot, Gauspur, Kashmore, Thull or Jacobabad markets, they usually have to travel a long way either via Guddu Barrage or via Sukkur Barrage to reach destinations. The situation is same for right bank cities and markets to reach left bank markets. This project will provide linkage to markets on both sides of the River Indus.

1.8 Socio-Economic Benefits of Project

As perceived by the Locals, following are the positive socio-economic benefits of the proposed project.

- Employment opportunities for locals will increase during the operation phase. Business in the project areas will increase since locals will be able to open small shops on both sides of the road, as a result transportation will increase, and more goods and services will be available to the villages. Farmers will be able to directly sell sugarcane to sugar mills in Ghotki.
- Mobility within the neighborhood will be improved. The people will be able to easily travel to urban areas. It would be easier to travel to their neighborhood if it is in Kandhkot and they work in Ghotki or vice versa. This bridge will connect people from both districts since most people cross the Indus River frequently for livelihood and sometimes for medicines or on special occasions like wedding ceremonies, funerals and visiting friends and family.

1.9 Purpose of Environmental Impact Assessment (EIA)

This Environmental Impact Assessment (EIA) Report has been prepared in compliance with the Sindh Environmental Protection Act (SEPA), 2014 and Sindh EPA (Environmental Assessment) Regulations, 2021 for decision on environmental approval of the revised bridge design. As per Sindh EPA (Environmental Assessment) Regulations, 2021 the proposed project falls in the Category E (6) and J of Schedule-III which means the proposed project requires full-fledged EIA to be conducted for complying with SEPA Act, 2014.

1.10 Specific Objectives of EIA

The specific objectives of this EIA are to:



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- Assess the existing environmental and socio-economic conditions at and around the project site, particularly identify any environmental and social sensitivity areas.
- Identify the likely impacts of the proposed project on the natural and socio-economic environment, predict and evaluate these quantitatively wherever possible and determine their significance in the light of technical and regulatory concerns, and as well as those related to public perceptions.
- Propose appropriate mitigation and monitoring measures that can be incorporated into the design of the proposed bridge design activities to minimize any damaging effects or lasting negative consequences identified by the assessment.
- Prepare an EIA report for submission to the Sindh Environmental Protection Agency (SEPA).

1.11 EIA Methodology

The environmental assessment has been conducted with the following basic targets:

- Identification of the regulatory requirements that apply to the project activities at the site, in the context of environmental protection, health and safety.
- Assessment of the project activities in terms of their likely impacts on the environment during the construction and operation phases of the project in order to identify issues of environmental concerns.
- Recommendation of appropriate mitigation measures that can be incorporated into the design of the project to minimize the environmental impacts of those identified.

For achieving these targets amicably, the proponent commissioned the services of environmental consultant namely, Environmental Consultancy & Services (ECS) for conducting this EIA study for the Proposed Enhancement of Length of Bridge over Indus River under Ghotki-Kandhkot Road & Bridge Project. ECS engaged following experts for completion of this EIA assignment as shown below in Table 1.

Table 1: Detail of EIA Team

S.No	Name of Expert	Position Assigned in EIA study.
1.	Engr. Shahid Ali Lutfi	Team Leader / Sr. Environment Engineer
2.	Dr. Bashir Ahmed	Sr. Advisor / Ecologist
3.	Mr. Mian Rashid Mahboob	Sr. E&S Expert
4.	Engr. Nouman Sheikh	Sr. Environmental Engineer
5.	Engr. M. Saeed Akhtar	Sr. Environmental Engineer
6.	Mr. Mohsin Mushtaq	Sr. Social Expert
7.	Mr. Adnan Ali	Field Coordinator
8.	Mr. M. Ghufraan	Sr. Environmentalist
9.	Mr. M. Omar	Sr. Environmentalist

EIA study was conducted in the following stages.

Stage-I Project Data Acquisition	- Initial meeting between environmental consultant and project team for basic project data acquisition.
Stage-II Desk Study/Literature Review	- Review of regulatory requirements based on preliminary assessment of project activities and the project bridge length enhancement. - Review of primary available data of project and secondary literature review to collect environmental data about the project area.
Stage-III Scoping and Stakeholder Consultation Meetings	- Disclose basic non-technical summary of the proposed length enhancement to the stakeholder through formal and informal discussions during meetings to identify environmental and social parameters those are likely to undergo significant change due to the proposed changes and document suggestions, concerns and recommendations of stakeholders consulted.
Stage-IV Baseline Investigations and Surveys	- Site visits for the baseline investigations including physical, ecological and social environmental conditions of the project area.
Stage-V Environmental and Social Impact Analysis and Mitigation	- Evaluation of the environmental parameters those are likely to undergo

	significant change due to the proposed enhancement. - Development of environmental management and monitoring plan to mitigate the adverse impacts of the proposed project.
Stage-VII Documentation of EIA report	- Documentation and submission of EIA report to SEPA.

1.12 EIA Report Structure

This EIA report has been organized in the following chapters.

Chapter 1: Introduction

Highlights project prelude, background information, basic overview of the proposed project, need and significance of the proposed project, report structure and purpose of EIA study.

Chapter 2: Legislative and Policy Framework

Gives an overview of policies, legislation and guidelines relevant to the project.

Chapter 3: Project Description

Highlights detailed description of the project such as design, components, comparative analysis, construction, operations and methodology.

Chapter 4: Environmental and Social Baseline

Describes the existing environment in the project area. It carries details of the area's infrastructures, physical, ecological and socio-economic conditions of the area.

Chapter 5: Stakeholder Consultations

Describes the details about all stakeholders, the overall consultation process and their concerns and recommendations about the project.

Chapter 6: Analysis of Alternatives

This section of the EIA document presents an outline for project alternatives to select the best option.

Chapter 7: Environmental Impacts Analysis and Mitigations.



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Describes the anticipated environmental and social impacts of the project and their consequent screening in accordance with the general guidelines. The screening further identifies the residual impacts resulting as a consequence of the adoption of mitigation measures.

Chapter 8: Environmental Management and Monitoring Plan

Describes the environmental management and monitoring plan to be implemented by the proponent for effective mitigation of adverse impacts and improved environmental performance.

Conclusion: Summarizes the report and presents conclusion.

CHAPTER 2: **LEGISLATIVE AND POLICY FRAMEWORK**

2.1 Background Information

The first cover to the environmental safeguards within the country was under the Pakistan Environmental Protection Ordinance (EPO), 1983. It was the first commitment at the state level to ensure environmental conservation and safeguards in developmental pursuits. EPO focused primarily on industrial operations and unspecified other environmental aspects. The perceived technical lacunas were resolved when Pakistan Environmental Protection Act (PEPA), 1997 was enacted which was ambitious to incorporate preventive and curative measure for the promotion of sustainable development in the country.

Environmental Protection Act empowered Pakistan Environmental Protection Agency to implement all the relevant environmental legislation across all the provinces of Pakistan. However, after the 18th amendment the environmental portfolio devolved to provincial governments. Consequently, the Sindh Environmental Protection Agency was empowered to formulate environmental legislation, rules, regulations and standards and their enforcement/implement in the whole Sindh province as a formulating, regulatory and monitoring agency. It is important to note that, the enactment of comprehensive legislation on the environment, covering multiple areas of concern, is a relatively an ongoing and continuous phenomenon in a developing country like Pakistan.

2.2 Environmental Legislation Framework

2.2.1 Pakistan Environmental Protection Ordinance, 1983 (PEPO, 83)

Pakistan Environmental Protection Ordinance, 1983 (PEPO), 83 was the first specialized environment law promulgated through an ordinance. Under section 8 of the PEPO, 83 it was required to get environmental approval. However, practically this law was never implemented due to lacunas in it. Environmental Protection Agencies were not established at that time and there was no judicial mechanism for implementation and execution of this law. No rules were framed and thus for practical purposes this law never got implemented. However, with this introductory law Environment Protection Agencies were established in late 80s of last century and later on in 1994 National Environmental Quality Standards (NEQS) were notified.

2.2.2 Pakistan Environmental Protection Act, 1997 (PEPA, 97)

Pakistan Environmental Protection Act, 1997 (PEPA), received the assent of the Acting President on the 3rd of December 1997. The law provides for the protection, conservation, rehabilitation and improvement of the environment, prevention and

control of pollution, promotion of sustainable development, and for matters connected therewith and incidental thereto.

Requirement of Section 12 of PEPA, 1997 is reproduced below.

“12. Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA). (1) No person of a project shall commence construction or operation unless he has filed with the federal Agency an Initial environmental examination or, where the project is likely to cause an adverse environmental effect an environmental impact assessment and has obtained from the Federal Agency approval in respect thereof.”

2.2.3 Sindh Environmental Protection Act, 2014

After the 18th amendment all provinces adapted or enacted their own Environmental Protection Laws in the relevant province. The Sindh Environmental Protection Act was notified by the Provincial Assembly of Sindh via notification #PAS/Legis-B-06/2014 dated March 20, 2014. The Act extends to whole of the province of Sindh. The Sindh Environmental Protection Act, 2014) like PEPA, 1997 provides for the protection, conservation, rehabilitation and improvement of the environment. This Act, consisting of 37 sections divided into eleven Parts, establishes composition, duties and responsibilities of the Sindh Environmental Protection Council, entitled to: co-ordinate and supervise the enforcement of all the provisions relating to the environment in the Province; approve comprehensive provincial environmental and sustainable development policies and ensure their implementation within the framework of a conservation strategy and sustainable development plan; approve the Sindh Environmental Quality Standards; provide guidelines for the protection and conservation of species, habitats, and biodiversity and for the conservation of renewable and non-renewable resources; integrate principles and concerns of sustainable development into socio-economic and development policies, plans and programmes at the provincial, district and local levels; deal with inter-provincial and federal-provincial issues; provide guidelines for biosafety and for the use of genetically modified organisms; etc.

Sindh Environmental Protection Act 2014 specifies that no person shall discharge waste, pollutant, emit noise or any other matter that may cause or likely to cause pollution or adverse environmental effects (as defined in section 2) in levels higher than specified in Sindh Environmental Quality Standards. No person shall import hazardous waste into Sindh province or its coastal, internal, territorial or historical waters, except prior approval of the Agency. Part VI deals with Environmental Examinations and Assessments and specifies that all provincial authorities, local councils and local authorities responsible for formulating policies, legislation, plans and programs to be implemented in Sindh province which may cause any environmental impact in the

jurisdiction of the province shall forward to the Sindh Environmental Protection Agency a strategic environment assessment. Copy of Act is attached as Annexure-1.

2.2.4 Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021

Under these regulations the projects are categorized requiring EC or IEE or EIA at the planning stage to be approved by Sindh Environment Protection Agency (SEPA). The categories are defined in the Sindh Environmental Protection Agency (SEPA). According to the Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021 the proposed project falls under Schedule III E (6) and (J). Copy of SEPA Environmental Assessment Regulations is attached as Annexure-2.

2.2.5 Sindh Environmental Quality Standards (SEQS)

Environmental quality standards play a crucial role in regulating industrial activities, waste disposal, and other human interventions that may impact the environment. Compliance with these standards is essential to prevent and mitigate adverse environmental effects, ensuring sustainable development and the well-being of the population.

In exercise of the powers conferred by section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of the Government, have notified Sindh Environmental Quality Standard, 2016 which specifies standards for industrial and municipal effluents, gaseous emissions, vehicular emissions, and noise levels. These standards would be applicable to the project. Sindh Environmental Protection Agency, with the approval of the Sindh Environmental Protection Council, has established following standards. Copy of SEQS is attached as Annexure-3.

- SEQS for Municipal and Industrial effluent
- SEQS for Industrial Gaseous Emissions and Motor Vehicle Exhaust
- SEQS for Ambient Air Quality and Ambient Noise

2.2.6 The Sindh Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules, 2014

These rules are called the Sindh Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules, 2014. Priority parameters are parameters of Sindh environmental quality standards which are selected for the purpose of submission of Environmental Monitoring Reports to the Agency by an industrial unit. On the basis of the pollution level, these rules classify the unit into category “A”, “B” or “C” for liquid effluents, and category “A” or “B” for gaseous emissions.



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2.2.7 Sindh Hazardous Substance Rules, 2014

The Sindh Hazardous Substances Rules, 2014 are a set of rules derived from the Sindh Environmental Act, 2014 and are first of the very specific hazardous substances regulations brought into force in 2014 after the initial draft set of rules devised in 2003. They represent specific regulations with the aspect of handling, storage and disposal of hazardous substances and issuing an approving license to the user or facility. Schedule-I of the Rules enlists the hazardous substances that are under the scrutiny of the Sindh-EPA.

Under its licensing terms, the Rules highlight components as follows:

- Employment of Qualified technical personnel
- Packing and labeling
- Conditions of Premises
- Safety precautions
- Trainings
- A comprehensive safety plan
- Waste management Plan and
- Transporting of hazardous substances

2.2.8 Sindh Hospital Waste Management Rules, 2014

Sindh Hospital Waste Management Rules, 2014 promulgated under SEPA 2014 were enforced on December 2014. Under these Rules, every hospital owner, occupier, operator shall be responsible for the management of the hospital waste generated by it till its final disposal in accordance with the provision of the Act and these rules.

The section 2 of Sindh Hospital Waste Management Rules, 2014 states that a “Hospital Waste Management Plan shall be based on internationally or nationally recognized environmental management practices, standards, which shall efficiently and effectively address the hospital waste”.

According to Section 8, “on recognition of the type and nature of the waste material and the organisms in the waste, risk waste shall be inactivated or rendered safe before final disposal by a suitable thermal, chemical, irradiation incineration, filtration or other treatment method”.

The Hospital Waste Management Plan shall include:

- Waste management points for every ward and department, indicating each point, location on the basis of risk assessment.
- The categories of waste being generated in accordance with Schedule-I
- Quantity of each waste category.



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- Details of the types, numbers of containers, waste bags and trolley required annually.
- Schedule and frequency of waste collection from each ward and department.
- Effective arrangements for onsite and off-site transportation of waste as provided in Schedule-I and II.
- Contingency plans for storage or disposal of risk waste in the event of breakdowns of hospital waste facility, or of maintenance or collection arrangements.
- Training courses and programs on waste management.

The Waste Management Plan shall be regularly monitored, reviewed, revised and updated and submitted to the Agency on annual basis.

2.3 National and Provincial Environmental Policies and Guidelines

Environmental Policies and Guidelines relevant to the proposed project were also reviewed for this EIA study brief history of the national policies and guidelines is given below.

2.3.1 National Conservation Strategy (NCS)

The National Conservation Strategy (NCS) is the primary and earliest Policy document of the Government of Pakistan on national environmental issues. The Policy was approved by the Federal Cabinet in March 1992. The Strategy also attained recognition by international donor agencies, principally the World Bank. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas in order to preserve the country's environment. A midterm review of the achievements of the NCS in 2000 concluded that achievements under the NCS have been primarily awareness raising and institutional building rather than actual improvement to environment and natural resources and that the NCS was not designed and is not adequately focused as a national sustainable development strategy¹. The need therefore arose for a more focused National Environmental Action Plan (NEAP) required to bring about actual improvements in the state of the national environment with greater emphasis on poverty reduction and economic development in addition to environmental sustainability.

¹Arthur J. Hanson et al, *Pakistan's National Conservation Strategy Renewing Commitment to Action, Report of the Mid-Term Review, 2000*



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The NEAP was approved by the Pakistan Environmental Protection Council under the chairmanship of the President/Chief Executive of Pakistan in February 2001. NEAP now constitutes the national environmental agenda, and its core objective is to initiate actions that safeguard public health, promote sustainable livelihoods, and enhance the quality of life of the people of Pakistan. A National Environmental Policy has been approved by the Federal Cabinet in its meeting held during June 2005. This policy has already been endorsed by the Pakistan Environmental Protection Council during 2004. The new policy has a total of 171 guidelines on sectoral and cross-sectoral issues. The objectives of the new policy include assurance of sustainable development and safeguard of the natural wealth of the country. The following are the approved Sectoral Guidelines:

- Water Supply and Management.
- Air Quality and Noise.
- Waste Management.
- Forestry.
- Biodiversity and Protected Areas.
- Climate Change and Ozone Depletion.
- Energy Efficiency and Renewable.
- Agriculture and Livestock.
- Multilateral Environmental Agreements.

2.3.2 National Environmental Policy, 2005

National Environmental Policy aims to protect, conserve and restore Pakistan's environment to improve the quality of life of the citizens through sustainable development. The objectives of the policy are:

- Conservation, restoration and efficient management of environmental resources.
- Integration of environmental considerations in policy making and planning process.
- Capacity building of government agencies and other stockholders at all level for better environmental management.
- Meeting international obligations effectively in line with the national aspirations.



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- Creation of a demand for environment through mass awareness and community mobilization².

2.3.3 National Climate Change Policy, 2011

To ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate resilient development. The main objectives of Pakistan's Climate Change Policy include:

- To pursue sustained economic growth by appropriately addressing the challenges of climate change.
- To integrate climate change policy with other inter-related national policies.
- To focus on pro-poor gender sensitive adaptation while also promoting mitigation to the extent possible in a cost-effective manner.
- To ensure water security, food security and energy security of the country in the face of the challenges posed by climate change.
- To minimize the risks arising from the expected increase in frequency and intensity of extreme weather events such as floods, droughts and tropical storms.
- To strengthen inter-ministerial decision making and coordination mechanisms on climate change.
- To facilitate effective use of the opportunities, particularly financial, available both nationally and internationally.
- To foster the development of appropriate economic incentives to encourage public and private sector investment in adaptation measures.
- To enhance the awareness, skill and institutional capacity of relevant stakeholders.
- To promote conservation of natural resources and long term sustainability.

2.3.4 Sindh Drinking Water Policy, 2017

The Public Health Engineer and Rural Health Development Department, Government of Sindh with the approval of Chief Minister Sindh issued Drinking Water Policy in 2017. The main principles of Sindh Drinking Water Policy have been adopted from National Water Policy, 2009. The goal of Sindh Drinking Water Policy, 2017 is to improve the quality of life of people of Sindh by reducing morbidity and mortality caused by water borne diseases through provision of safely managed and potable

²National Environmental Policy, 2005.

drinking water to the entire population that is located in premises available when needed and free from contamination, affordable and sufficient quantity and in a way that is equitable and sustainable.

2.4 Other Applicable Cross-sectoral Laws in Sindh

The term "environment" encompasses both the physical and biological factors and includes the air, water, soil, climate, flora, fauna, and various other elements that collectively create the ecological system in a specific area. The environment also encompasses the interactions and relationships between living organisms and their surroundings. The concept of the environment extends beyond immediate physical space and incorporates the complex web of interconnected ecosystems and habitats on a global scale.

Understanding and protecting the environment are crucial for promoting sustainable development and ensuring the well-being of all living organisms. As such, apart from Sindh Environment Protection Act in general other special laws related to forests, water resources, wildlife, land, agriculture, health and planning are also applicable while preparing the EIA report of a development project. The following laws are relevant to this project and are discussed briefly in the following paras.

- i. **Land Acquisition Act 1894:** Land Acquisition Act, 1894, empowers the government to acquire private land for a project of national importance and lays down the acquisition procedure. A compensation is paid to the owners as per principals laid down in the law.
- ii. **The Sindh Forest (Amendment) Act, 2012:** Regulates Forest resources in the province. Categorize the forest area such as reserve, guzara and protected forests. It empowers the government to declare any forest area reserved or protected and implement the relevant rules and regulation in such forests. As reported in SFD letter, the project is not reserved forest.
- iii. **The Sindh Wildlife Protection Ordinance 1972 (Amendment 2001, 2010) Act, 2007, 2020:** The law empowers the provincial wildlife department to establish game reserves, parks, and wildlife sanctuaries. It regulates the hunting and disturbance of wildlife. It provides for the preservation, protection, and conservation of wildlife by the formation and management of protected areas and the prohibition of hunting of wildlife species declared protected under the ordinance. The ordinance also specifies three broad classifications of the protected areas which are National Parks, Wildlife Sanctuaries and Game Reserves.



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- iv. **The Sindh Occupational Safety and Health Act, 2017:** While environmental laws and standards mainly focus on the impacts of the project on the surrounding environment (air, water, soil, socioeconomics), the health and safety laws primarily focus on the inside environment of the project to be suitable and safe for the staff and workers. The Sindh Occupational Safety and Health Act, 2017 provides for the health, safety and welfare of workers, disposal of solid wastes and effluents, and damage to private and public property, compulsory vaccination, inoculation, and Precautions against contagious or infectious diseases at workplaces. The project management will chalk out a standard health and safety policy and shall implement the same in accordance with the provision of law.
- v. **Sindh Cultural Heritage (Preservation) Act – 1994:** Preservation of culture heritage is an important role in the development of society and understanding of the past culture of the civilizations. Sindh Cultural Heritage (Preservation) Act – 1994 provides rules and regulations to preserve and protect ancient places and objects of agricultural, historical, ethnological, archaeological, artistic, and national interest in the province of Sindh. Nothing is expected to be damaged of culture and heritage importance due to execution of the project.
- vi. **The Antiquities Act 1975:** Preservation and protection of antiquities (any object more than 75 years old) is mandatory under the Antiquities Act, 1975. The law also empowers the government to declare any antiquity as protected. There is hardly any chance for finding such material in the proposed project area, however, if during digging for the infrastructures any such material was found the same shall be brought in the notice of relevant department of the Government for further action.
- vii. **Sindh Solid Waste Management Board Act, 2014.** Solid waste from the project is mainly comprised of construction waste and municipal waste. Both types of waste shall be disposed as per provision of relevant laws and applicable good practices. Sindh Solid Waste Management Board (SSWMB) was formed under the SSWM Act of 2014. The SSWMB is responsible for the collection and disposal of solid waste. All these regulations will apply to the project construction & operations waste disposal.
- viii. **Sindh Canal and Drainage Act, 2016:** Discharge of effluents from the project camps would be disposed after proper treatment through septic tank system. The Canal and Drainage Act amended 2016, prohibits fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of the drainage.



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- ix. **Employment of Child Act, 1991:** Child labor is prohibited through the world and likewise it is in Pakistan. In Pakistan, the Employment of Child Act (ECA) 1991 disallows child labor in the country. It states that no child shall be employed or permitted to work. The contractor will be bound by this Act to disallow any child labor at the project sites. All these regulations will apply to the project's construction & operation phases.
- x. **Sindh Labour Laws:** Following the 18th constitutional amendment of 2010, the subject of labor has been devolved to the provinces prompting Departments of Labour to embark on the development of labor legislation at provincial level. The Province of Sindh has developed 14 new labour laws through its tripartite consultative process. Some of the relevant laws applicable with this project are The Sindh Minimum Wages Act 2015, Sindh Payment Wages Act 2015, Sindh Workers' Welfare Management Act 2015, Sindh Companies Profit (Workers' Participation) Act 2015, Sindh Shops and Commercial Establishment Act 2015 and Sindh Factories Act 2015. The proponent is committed to implementing the relevant provision of these laws in the project.
- xi. **Sindh Local Government Ordinance:** Under clause (h) of sub section 54 of chapter V, the law endorses the management, operation, maintenance and improvement of the sanitation disposal and solid waste collection.

2.5 National Environmental Guidelines

2.5.1 Pakistan Environmental Assessment Procedures

The Federal EPA has prepared a set of guidelines for conducting environmental and social assessments. The guidelines derive from much of the existing work done by international donor agencies and NGOs. The package of regulations, of which the environmental and social guidelines form a part, includes the PEPA 1997 and the NEQS. These guidelines are listed below followed by comments on their relevance to the proposed project.

Policy and Procedures for Filing, Review & Approval of Environmental Assessments, Pakistan Environmental Protection Agency, September 1997: These guidelines define the policy context and the administrative procedures that govern the environmental assessment process from the project pre-feasibility stage to the approval of the environmental report. The section on administrative procedures has been superseded by the Sindh Environmental Assessment Regulations 2021. The package of regulations prepared by PEPA with relevance to this EIA includes:



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- Policy and Procedures for Filing, Review and Approval of Environmental Assessments.
- Guidelines for the Preparation and Review of Environmental Reports.
- Guidelines for Public Consultation.

2.6 International Environmental Treaties

Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. The country is thus obliged to adhere to the commitments specified in these treaties.

2.6.1 Biodiversity & the Protection of Plants and Animals

- Ramsar Convention, 1971 for the Conservation and wise use of natural resources and includes all aspects of wetland conservation
- Convention on the Biological Diversity, 1992
- Cartagena Protocol on Bio safety to the Convention on Biological Diversity, 2000
- Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES), 1973
- International Plant Protection Convention, 1997

2.6.2 ILO Conventions

Pakistan has been a member of the ILO since 1947 and has thus far ratified 36 conventions. Of these, 33 are in force, whereas 3 have been denounced. The fundamental conventions which are being implemented across Pakistan through applicable labor laws include:

- C029 - Forced Labor Convention, 1930 (No. 29).
- C100 - Equal Remuneration Convention, 1951 (No. 100).
- C105 - Abolition of Forced Labor Convention, 1957 (No. 105).
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111).
- C138 - Minimum Age Convention, 1973 (No. 138) Minimum age specified: 14 years.
- C182 - Worst Forms of Child Labor Convention, 1999 (No. 182).

2.6.3 Climate Change & the Ozone Layer

- United Nations Framework Convention on Climate Change, 1992
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997
- Vienna Convention for the Protection of the Ozone Layer, 1985



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- The Montreal Protocol on Substances that Deplete Ozone Layer and associated amendments, 1987.



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CHAPTER 3: PROJECT DESCRIPTION

3.1 Background

The history of road transport in modern-day Pakistan dates back to the Indus Valley civilization. The Grand Trunk Road was a major road commissioned by Sher Shah Suri in the 16th century and used during the Suri and Mughal periods. Caravanserais were built for travelers to spend the night. During the 1990s, Pakistan began an ongoing project to rebuild all national highways throughout the country specifically to important financial, cargo and textile centers. The National Highway Authority or NHA is responsible for the maintenance of all national highways in Pakistan. The construction of motorways began in the early 1990s, with the idea of building a world-class road network and reducing the load on the heavily used national highways throughout the country.

National Highway Authority (NHA) is custodian of various national highways/ motorways/ expressway/ strategic routes having approximate length of 12,131 kms. It is 4.6% of total national roads network i.e. 263,775 kms, however, it carries 80% of commercial traffic and N-5 which is bloodline of Pakistan, carries 65% of this load in the country. N5 and N55 are the national highways traversing the cities of Sukkur and Shikarpur respectively. The N5 highway after crossing through Sukkur also traverses the small cities of Ghotki and Pannu Akil. Similarly, the N55 highway after traversing the city of Shikarpur crosses through Kandhkot. These highways relate to each other via Sukkur bypass and Guddu bypass.

Ghotki to Kandhkot (and vice versa), lie on the opposite banks of River Indus and currently the people have two options which take them approximately four hours to negotiate this small distance across the river. First option is to travel through Sukkur bypass and the second option is through Guddu barrage. This amount of effort and time can be economized if there is a direct route connection between the two cities. Furthermore, the traffic heading towards Peshawar, Lahore, Jacobabad, Dadu and Karachi does not have considerable number of options to travel between N5 and N55 highways and such proposed facility can be fruitful to cater for this traffic. Another worth mentioning perspective will be the freight logistics with in Pakistan that utilizes the road infrastructure more than any other transport modes. This utilization of road infrastructure is intensifying with the passage of time and hence the need of expanding infrastructure is more than ever.



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3.2 Project Components

Government of Sindh through its Works & Services Department (SW&SD) is the owner and client of GKRB Project. SW&SD has planned & executed project to construct 31 km connection between N-5 to N55 in shape of road and bridge at the point of Ghotki on one side and Kandhkot on the other side, the access road from Kandhkot side would have link with Jacobabad-Kandhkot Road to divert the Balochistan bound traffic towards the shorter route of Jacobabad instead of moving via Shikarpur.

The original proposed Works comprised of.

- Highway Alignment (30.2 km)
 - Earthworks
 - Subbase and Base Courses
 - Surface Courses and Pavement
 - Road Protection Works
 - Drainage and Erosion Work
 - Construction of Toll Plaza Including Control Building
 - Construction of Connecting Point On N-5
 - Construction of Flyover Connecting Point of N-55
- Thull Link Road Work (approx. 4.547 km)
 - Construction of Thull Road
- Other Structures
 - 2-Lane Beghari Canal Bridge
 - 2-Lane Ghota Feeder Canal Bridge
 - 2-Lane Bridge Over Jari Wah
 - 2-Lane Nala Bridge
 - 2-Lane Tibi Minor Bridge
 - Culverts
- Main Bridge Over River Indus (2.15 km). This is now proposed to **12.2 km** bank to bank of river.
 - 4-Lane Bridge Over River Indus

The bridge length is now planned to increase to 12.2 km to cover the entire width of the river (bank to bank) and the river training work component is reduced. The remaining component of the project are almost same as originally proposed. This report mainly focuses on the extended bridge component of the overall project.

3.3 Project Bridge Comparative Analysis Amendment

The details of bridge comparative analysis of initial and proposed plan are given below in Table-2.

Table 2: Brief Comparison of Changes in Design

Bridge Components	Initial Approved	Revised Approved	Units
Length of the Bridge between the abutments	2,150.0	12,200.0	meters
Guide Banks Geometry			
Straight upstream near abutment (Right Guide Bank) / FP Bund	175.0	1282.7	meters
Downstream straight length (Right Guide Bank) / FP Bund	280.0	754.0	meters
Straight upstream near abutment (Left Guide Bank) / FP Bund	230.0	446.8	meters
Downstream straight length (Left Guide Bank) / FP Bund	280.0	2123.4	meters

3.4 Layout of Revised Bridge Design

The layout plans of the revised design are shown in Figure 2-4, and the same in detailed are attached as Annexure-5.



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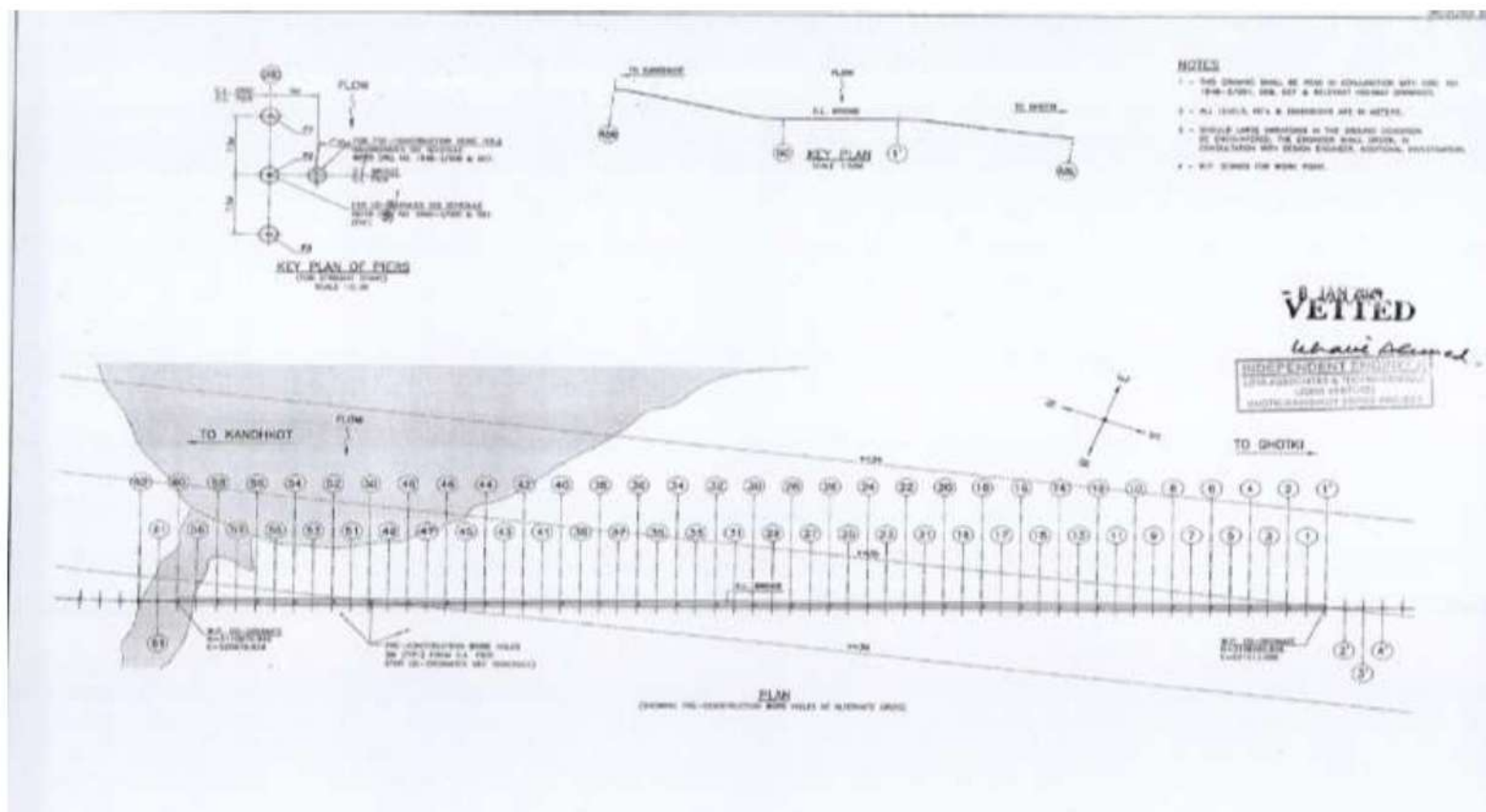


Figure 3: Layout Plan of the Revised Design (2 of 3)



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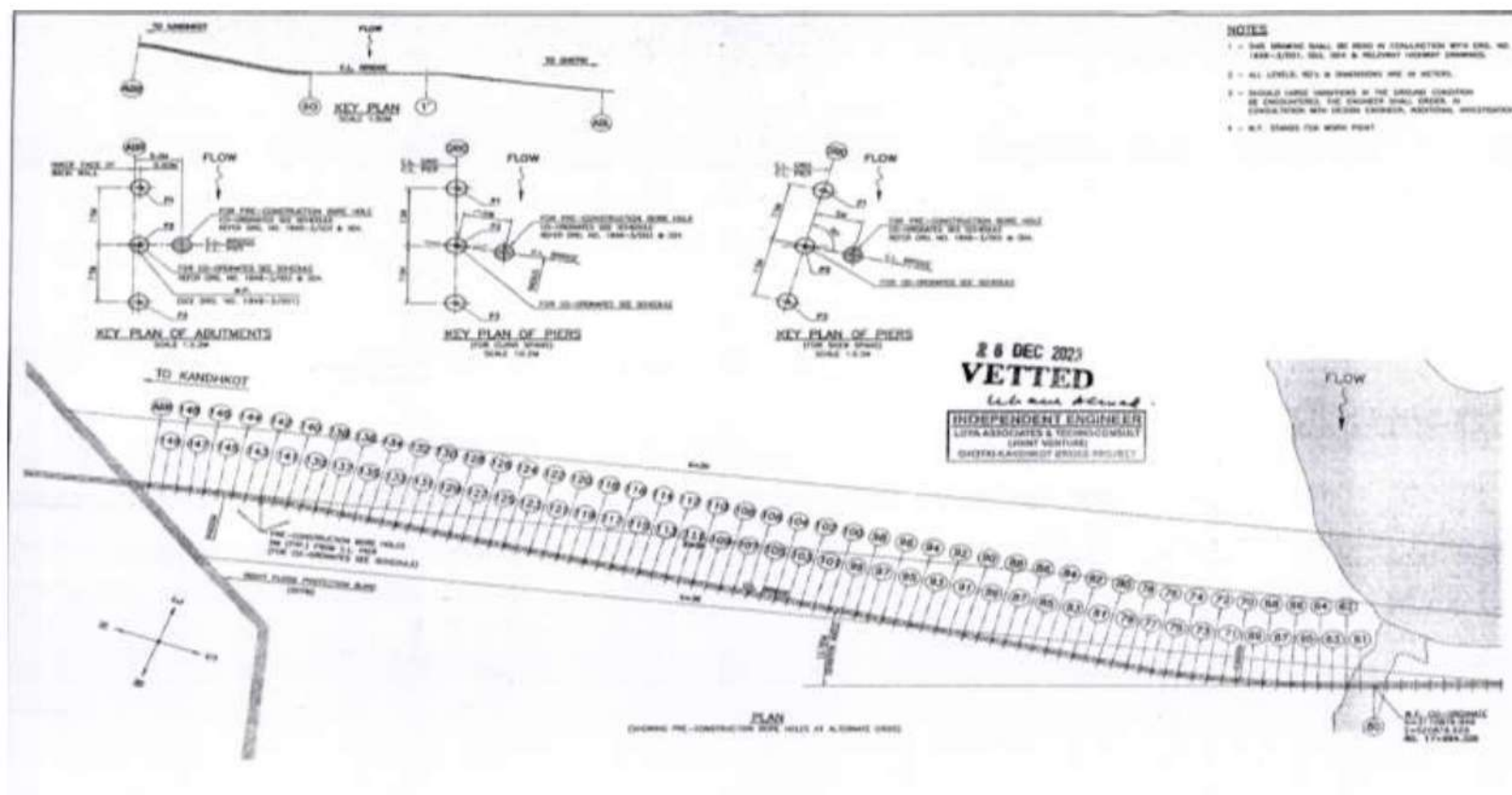


Figure 4: Layout Plan of the Revised Design (3 of 3)



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3.5 Layout of the Project

The overall project starts on National Highway (N5) approximately 5.28 km Southwest of Ghotki and ends at Indus Highway (N55) in the area of Kandhkot. The layout plan of the overall project is shown in Figure-5, and the same in detailed is attached as Annexure-6.

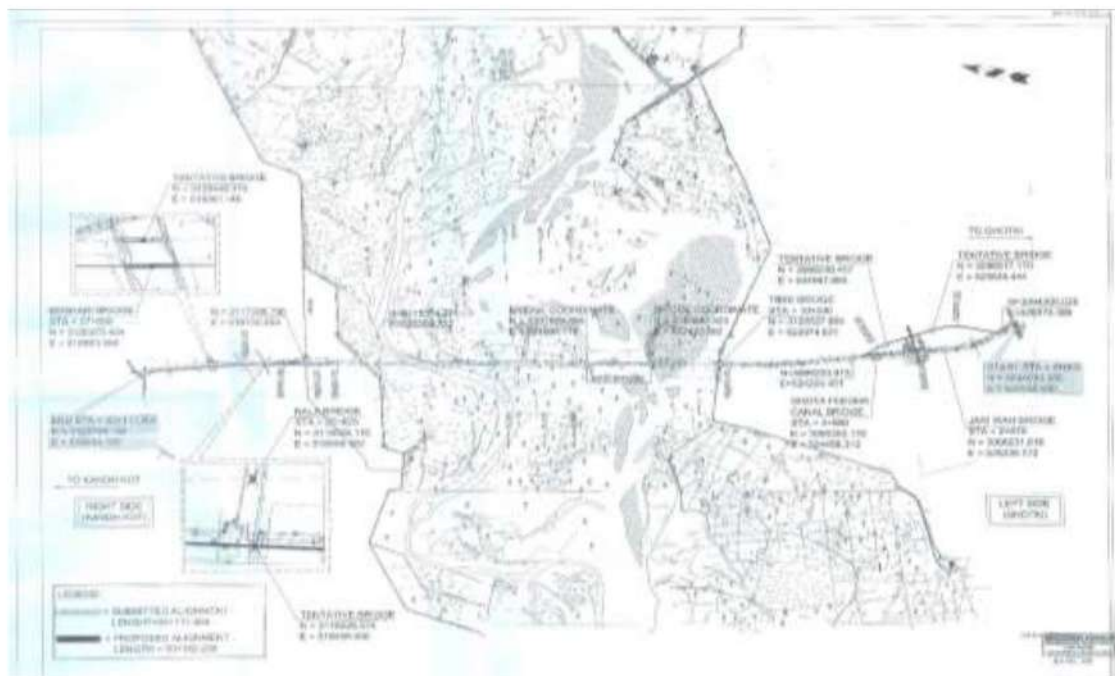


Figure 5: Overall Project Layout Plan

3.6 Construction Methodology

The construction methodology of the bridge enhancement project would be similar as earlier approved in EIA of entire project. The details of bridge works are also given below.

A. Rebar Cages

- Prepare working platform for handling rebars.
- Cut specified rebars of designated diameter to the desired length as shown on the drawings.
- Bend stiffeners to circular shape as scheduled.
- Precisely measure the rings and weld the ends.
- Continue fabricating stiffeners as required.
- Place longitudinal bars in required quantity on work bench.



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- Mark the positions of stiffeners to be welded as shown on the bar bending schedule.
- Bind the rings with the longitudinal bars.
- Precisely check the measurements and adjust if required.
- Weld the rings with the longitudinal bars.
- Prepare helical rings of specified rebars to run around longitudinal bars as shown in the bar bending schedule.
- Mark the positions of helix to weld to the longitudinal bars.
- Hold the concrete spacers in the desired positions, so that concrete cover could be provided to all the rebars, while cage being lowered in the bore.
- Prepare such cages as shown in the bar bending schedule to be lowered in positions with minimum loss of time.

B. Materials

- Stockpile adequate quantity of specified approved materials including Cement, Coarse & Fine aggregates, admixtures, bentonite, mixing water etc.

C. Access to Site

- Plan access to avoid risk of obstructing the river flow, while taking care of seasonal changes in the river discharge.

D. Bentonite Tanks

- Select convenient points for construction of bentonite tanks of adequate capacity, while taking care of water level in the tank with reference to mud level in the pile bore.
- Arrange sufficient quantity of bentonite to meet the site requirement.
- Conduct pH Value and Specific Gravity tests on bentonite slurry to meet the site requirement.
- Arrangement for de-sanding may be made during circulation of bentonite slurry while bore is advancing.

E. Equipment

- Pile boring rotary machine with necessary tools like augers, buckets and pumps to meet the site requirement.
- Crane, welding units, concrete batching plant, transit mixers, lighting towers etc.
- Tremie with sufficient pipe lengths, temporary and permanent liners.



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F. Manpower

- Deploy qualified and experienced workforce for the pile construction. Also arrange experienced skilled personnel well versed with their job.
- Explain in detail every subgroup to execute their work well streamlined in a professional way.

G. Boring

- Mark the location of pile foundation on the ground.
- Drive the conductor pipe and permanent liner. (if required)
- Start boring by taking care of position and alignment of bore and stability of the equipment with the cutting tool suggested by the subsoil investigation.
- Circulate bentonite slurry to manage with the stability of bore.
- Collect soil samples and record the elevation to prepare a complete bore log.
- Check the tip of the bore, when it reaches the design elevation. Clean and ream the bore.

H. Cage Lowering

- As soon as the bore is ready, bring the lowest cage section there and up lift vertically above and allow it to lower down until the spliced part remains above the ground.
- Hold the cage in position by providing support.
- Bring the next part of cage as shown in the plan. Hold it above the first part.
- Precisely coincide the bars of both cages and weld as shown in the plan.
- Release the supports and lower down the cages till the next spliced part remains above the ground.
- Repeat this exercise and extend the length of the cage as shown in plan.
- Complete the placing of rebar cages to the design.

I. Concreting

- Lower down the specified pipes for sonic tests up to the bottom of the bore as shown in plan and hold them in position.
- Next lower down the tremie pipe up to little above the bottom of the bore.
- Fix the funnel shaped tremie at the top of the pipe.
- Bring in approved fresh concrete mix in the transit mixers.
- Without wasting time start pouring concrete through the chute into the tremie to fall into the bore.
- Continue pouring concrete while eyeing on quantity of concrete being filled in the bore.



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- When the height of concrete reaches certain elevation, the tremie may be removed and the section of pipe can be disassembled, just taking care of the tip of tremie pipe remains submerged in the fresh concrete.
- Keep pouring the concrete and gradually lift the tremie while its end remains in fresh concrete.
- Calculate quantity of concrete.
- Collect concrete samples to conduct specified tests.
- Pour concrete well above the ground level to ensure all residual muck has been pushed up.
- Clean rebars and extend the rebars to continue construction of shaft.
- Complete specified quality tests on concrete samples and sonic tests as envisaged.
- Repeat this exercise and proceed for other pile foundation.



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CHAPTER 4: ENVIRONMENTAL & SOCIAL BASELINE

4.1 Introduction

The first step in environmental study is to recognize the existing condition of environmental resources, then identify the potential and residual impacts (both positive & negative) and after on, to recommend the detailed mitigation measures for negative impacts and enhancement measures for positive impacts.

Taking into consideration the off-site as well as on-site impacts of the project enables to draw a clear and systematic picture of the present environmental conditions and possible changes in future. Such a picture provides information about potential or actual environmental changes in the different parts of the area and establishes the environmental trend of the study area. Thus, in any environmental study the first task is to establish the Baseline environmental conditions.

Keeping in view of the above purpose, the current chapter describes the baseline conditions of the project area and surroundings. It comprises the present condition of the various components of environment (Physical, ecological and socio-economic) of the Project Area along with the whole Study Area. Both secondary data (from desk study) and primary data (on ground monitoring of air, noise and water quality) have been used for establishing the baseline conditions. Local knowledge has also been used through consultation with the government stakeholders. Information on these aspects has been derived from the desk study of available data, and field visits to the Project Study Area.

To develop a comprehensive environmental and social baseline of the project area comprehensive review of literature was done by team of experts. Furthermore, the literature reviewed for developing a comprehensive environmental and social baseline was validated by frequent site visits and field investigations for ground trothing to describes the existing environmental settings in the study area and is based upon the secondary information collected from the published sources, reconnaissance survey, primary socio-economic survey and environmental monitoring of air and noise, in the study area. The major purpose of describing the environmental settings of the study area is:

- To establish a benchmark regarding the existing environmental quality
- To identify various environmental components prone to be affected by proposed project.

The following dedicated activities were performed at the project site for baseline development.



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- Visual observations by experts were carried out in the project area.
- Air, noise and water quality monitoring was carried out through Sindh EPA approved laboratory at the project site.
- Review of earlier working and observations by experts were carried out to validate the ecological conditions of the project area.

4.2 Methodology of Baseline Study

Baselines study is generally divided into two components. Secondary data collection which is the data available regarding the site like review of studies conducted in the past and by various government publications. geotechnical data, meteorological, socio-economic indicator of the area where the site is located. Primary data which is the firsthand data by collecting samples of air, water and noise etc. and analyze the samples in the SEPA certified laboratory. Primary data is already collected in initial approved by project team regarding traffic, flora and fauna and socio-economic aspects by conducting field studies.

The baseline studies were carried out with survey and site visits in the study area for collection of the primary data. Various Government and Semi-Government departments were approached for getting information for secondary data generation.

The various parameters surveyed and studied for the baseline study are discussed in the following sections components:

- Physical Environment
- Ecological Environment
- Socio-Economic Environment

4.3 Physical Environment

The physical environment of the Project has been described here in terms of Climate, geology, ecology, soil characteristics and seismicity, the air shed, watershed i.e. hydrology and protected areas. The GKRB Project is in two districts of Sindh Province i.e. Ghotki and Kashmore.

4.3.1 Topography

Ghotki district is divided into three clear physical parts.

- i. Desert area
- ii. Cultivable area and
- iii. Flooded area (katcha).



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The cultivable area is located between desert and flooding areas in the center of district. It is declared fertile land of Sindh and irrigated through Ghotki Feeder of Guddu barrage irrigation system. The river Indus flows adjacent to the district in the north and its direction flows from Northeast to Southwest. The length of riverine tract is 87 KMs. The Flooding plain is called Katcha, bounded by safety bunds and river forests abound in the area. The total area of district under forest and katcha is 402,578 acres, which is total area's 25.88% percent.

River Indus flows through Kashmore and Kandhkot and there exists a network of feeder canals which irrigate the lands. The majority of people of this District lead a pastoral life and are engaged in the agricultural sector. In the katcha areas forests occur which provide timber and fuel wood.

4.3.2 Geography

4.3.2.1 Ghotki

Ghotki District lies in 69°10'12" to 70° 11'20" east longitudes and 27°19'35" to 28°19'35" north latitudes and borders district Rahim Yar Khan in northeast, India in east, District Sukkur in south and southwest and District Kashmor in west. Ghotki city is the Head Quarter of Ghotki District. District Ghotki is spread over an area of about 6,506 sq.km in which desert constitutes 25,000 acres of land. The desert area, which consists of hills of wind-blown sand, and is known as Achhro Thar (White Desert), stretches from Sanghar district to Cholistan desert of Punjab along with the border of the Indian state of Rajasthan. This desert is situated along the southern belt of district Ghotki.

River Indus flows from north-east to south- west of the district. The length of riverine tract is 87km. The flood plain is called Katcha and is bounded by safety bunds. Forests abound in the area. The total area of the district under forest and katcha is 402,578 acres, which is 25.88% percent of the total area of the district. The cultivable area is located between the desert and the flood areas and lies in the center of the district. It is fertile land and is irrigated through Ghotki Feeder canal of Guddu barrage irrigation system.

4.3.2.2 Kashmore

Kashmore is situated in upper Sindh bordering Punjab and Balochistan provinces. Kashmore district borders districts Jaffarabad and Dera Bugti in north, Rajanpur district in northeast, Rahim Yar Khan District in east, District Ghotki and Sukkur in south, district Shikarpur southwest and district Jacobabad in west. It is a very fertile District with Rice and wheat being major crops which are exported almost every Province of Pakistan.



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Due to its distinguished geographical location and crossroad connecting borders with three provinces, Kashmore has a unique identity. The Indus River runs through the Eastern side of Kashmore district. The southeastern side of Kashmore district has the forest of Katcha that supports wild animals. The Thar Desert is on the Eastern side of the district and is home to wild desert animals.

4.3.3 Climatic Conditions

Ghotki and Kandhkot are located in the Sindh province. They experience (semi-arid) conditions due to geographical proximity. Their climate is characterized by extremely hot summer temperatures often exceeding 40°C and can occasionally rise above 45°C, heatwaves are common during this period. However, winter is experienced mild and short, temperature ranging between 10°C to 20°C Frost is rare. The average annual rainfall is 100 mm to 150 mm, which mainly occurs during the monsoon season from July to September. Mostly low humidity is experienced except during the monsoon season.

A. Temperature

The hot season lasts for 3.0 months in Ghotki from April 21 to July 21 as well as 3.0 months in Kandhkot from April 22 to July 20, with average daily high temperatures above 103°F. June is the hottest month, featuring average highs of 109°F and lows of 85°F. Similarly, the cool season spans 2.7 months from December 1 to February 22, with average daily high temperatures below 79°F. January is the coldest month, with average lows of 47°F and highs of 72°F. The temperature charts for both are shown in Figure-6.³

³ <https://weatherspark.com/y/106767/Average-Weather-in-Ghotki-Pakistan-Year-Round>



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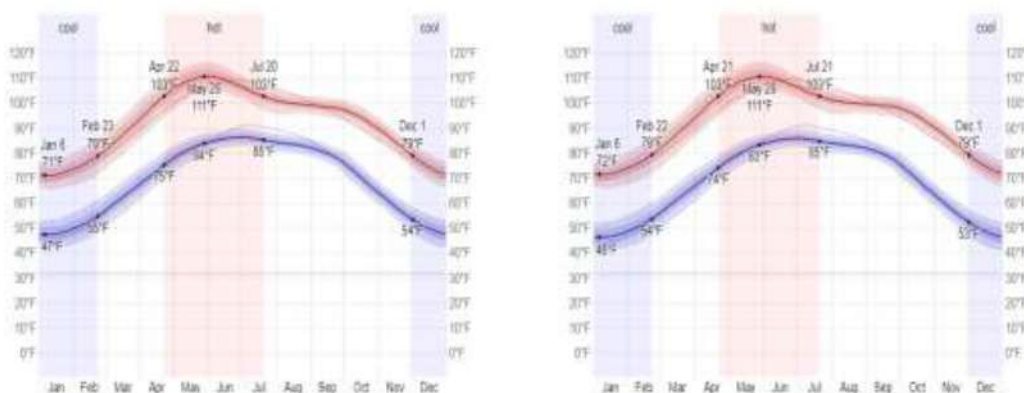


Figure 6: Temperature Trend of Ghotki & Kandhkot

B. Precipitation

Ghotki and Kandhkot have low annual rainfall, typically ranging from 100 to 150 millimeters. The majority of precipitation occurs during the monsoon season, which is relatively short and lasts from July to September. However, the cities are on the western edge of the monsoon zone, so rainfall can vary greatly from year to year. The rainy period of the year lasts 1.8 months in Ghotki from July 7 to September 1 and 2.0 months in Kandhkot from July 5 to September 5, with a sliding 31-day rainfall of at least 12.7 millimeters. The month with the most rain is July, with an average rainfall of 17.78 millimeters. The rainless period of the year lasts 10 months in Ghotki from September 1 to July 7 as well as 10 months in Kandhkot from July 5 to September 5. The month with the least rain is October, with an average rainfall of 0 millimeter. The mean monthly precipitation records for Ghotki and Kandhkot can be seen in Figure-7.⁴

⁴ <https://weatherspark.com/y/106766/Average-Weather-in-Kandhkot-Pakistan-Year-Round>



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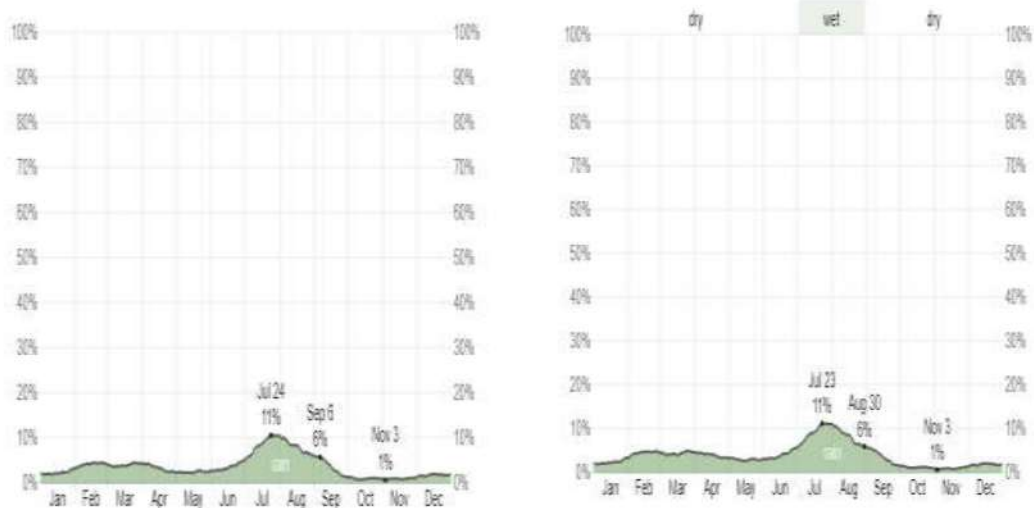


Figure 7: Precipitation Trend of Ghotki and Kandhkot

C. Relative Humidity

Ghotki and Kandhkot experience extreme seasonal variation in the perceived humidity. The muggier period of the year lasts 3.6 months in Ghotki from May 31 to September 19 and 3.4 months in Kandhkot, from June 5 to September 17. During these periods the comfort level is described muggy, oppressive, or miserable at least 19% of the time in Ghotki and 20% of the time in Kandhkot. The muggiest month of the year for both is July. The least muggy day of the year is February 6. The mean monthly humidity is shown graphically in Figure-8.

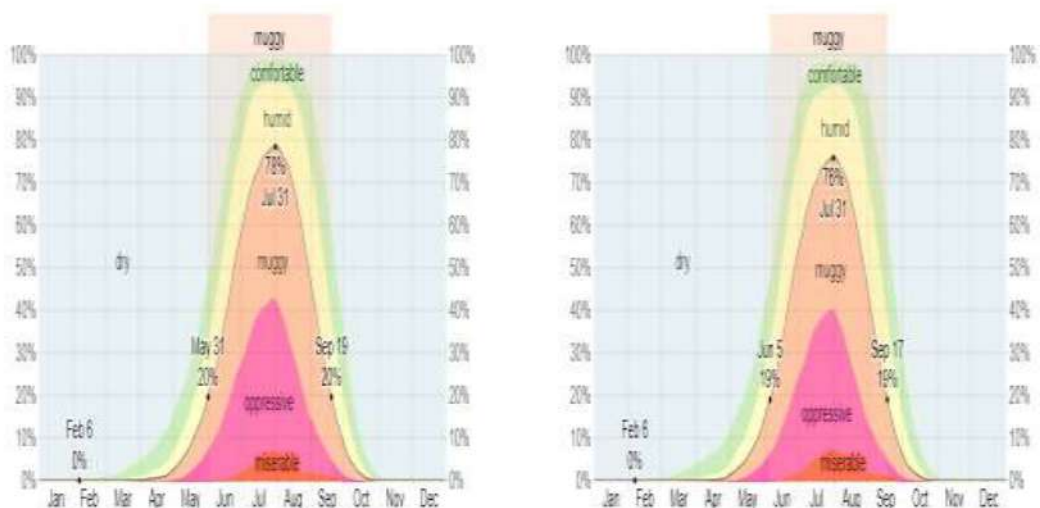


Figure 8: Mean Monthly Relative Humidity

4.3.4 Wind Speed and Direction



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This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages. The average hourly wind speed in experience significant seasonal variation over the course of the year. The windier part of the year lasts for 3.9 months from May 11 to September 7 with average wind speed of more than 13.03 km per hour in Ghotki and 3.7 months from May 8 to August 11 with average wind speed of more than 11.90 km per hour in Kandhkot. The windiest month of the year is June with an average hourly wind speed of 16.89 km per hour in Ghotki and July with an average hourly wind speed of 14.96 km per hour in Kandhkot.

The calmer time of year lasts 8.1 months from September 7 to May 11 in Ghotki and 8.3 months from August 31 to May 8 in Kandhkot. The calmest month of the year in is November, with an average hourly wind speed of 8.2 km per hour.

The project area lies in a region where wind blows throughout the year with highest velocities during the summer months the direction of the wind is from the south and during winter season the wind blows from the east. The wind direction and speed in between the two monsoon seasons, summer and winter are rather unsettled and large variations are noted in terms of speed and direction. Figure-9 & Figure-10 shows the wind speed and direction of the project area respectively.

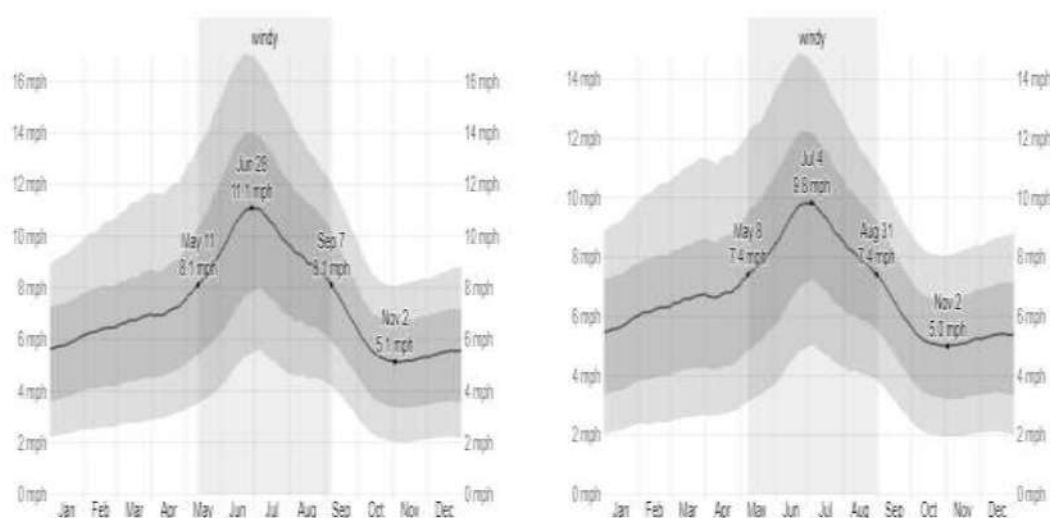


Figure 9: Wind Speed of the Project Area



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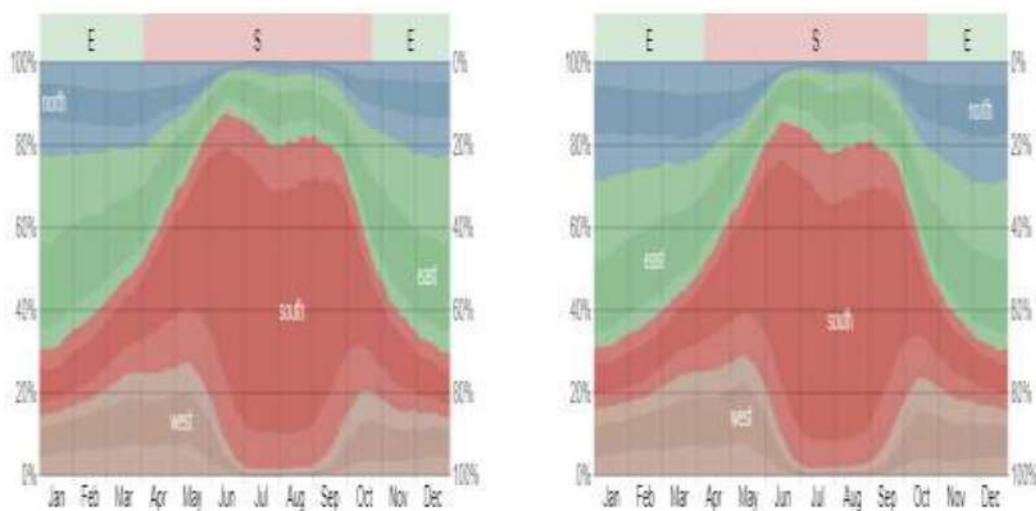


Figure 10: Wind Direction of the Project Area

4.3.5 Ambient Air and Noise

To assess the ambient air and noise in the project area's surroundings, air quality and noise level monitoring were conducted through third-party SEPA-approved laboratory. Monitoring results for ambient air & noise are within the SEQs limits and are presented as Ghotki site and Kandhkot site in Table-3 & Table-4 respectively. Copies of laboratory reports are attached as Annexure-4.

Table 3: Ambient Air and Noise Monitoring Results (Ghotki)

Sr. #	Location	Parameters	SEQS Limit	Unit	Results
1.	Near Bridge Start Point Ghotki Site	CO	10	mg/m3	2.1
2.		NO ₂	80	µg/m3	58.9
3.		NO	40	µg/m3	10.4
4.		O ₃	130	µg/m3	45.6
5.		PM ₁₀	150	µg/m3	139.7
6.		PM _{2.5}	75	µg/m3	39.4
7.		SPM	500	µg/m3	412.3
8.		Lead	1.5	µg/m3	ND
9.		SO ₂	120	µg/m3	60.2
10.		Ambient Noise	75	dB	62.4



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Table 4: Ambient Air and Noise Monitoring Results (Kandhkot)

Sr. #	Location	Parameters	SEQS Limit	Unit	Results
1.	Near Bridge End Point Kandhkot Site	CO	10	mg/m ³	2.2
2.		NO ₂	80	µg/m ³	53.1
3.		NO	40	µg/m ³	10.6
4.		O ₃	130	µg/m ³	49.7
5.		PM ₁₀	150	µg/m ³	143.6
6.		PM _{2.5}	75	µg/m ³	42.1
7.		SPM	500	µg/m ³	428.6
8.		Lead	1.5	µg/m ³	ND
9.		SO ₂	120	µg/m ³	55.9
10.		Ambient Noise	75	dB	63.3

4.3.6 Irrigation Network

Ghotki district is irrigated by the Guddu Barrage irrigation system. The Ghotki Feeder is the main canal irrigating the district.⁵ On the other hand, Kashmore-Kandhkot are also irrigated by the Guddu Barrage irrigation system. The main canals irrigating the Kashmore-Kandhkot are Begari, Unar, and Desert Pat Feeder Canals. In all, there are approximately 2,259 water courses.

4.3.7 Disaster Risks

Pakistan straddles the boundaries between the Indo-Pakistan, Arabian and Eurasian plates, and its structure is predominantly affected by their past and present interrelationships. Two composite plates, comprising both continental and oceanic crust (Indo-Pakistan & Arabia) are separated by an intra-oceanic transform boundary, which within the Pakistan offshore area is expressed as the Murray Ridge. The Eurasian Plate is a collage of three microplates which amalgamated in Iran-Afghanistan and western Pakistan area during Cretaceous to Paleogene times (Quad Report, 1994). The most easterly of these microplates, the Afghan Block, forms a considerable part of Pakistan's northwestern edge, and is bounded by the two major transform fault systems of Herat

⁵ <https://pakistanalmanac.com/sindh-ghotki>



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and Chamman. The boundaries between microplates can be traced by belts of ophiolite assemblages. The Indo-Australian plate upon which Pakistan, India and Nepal lie, is continuously moving northward, colliding with and sub-ducting under the Eurasian plate, thus forming the Himalayan mountains, and triggering earthquakes in the process. Figure-11 shows Tectonic plates configuration.

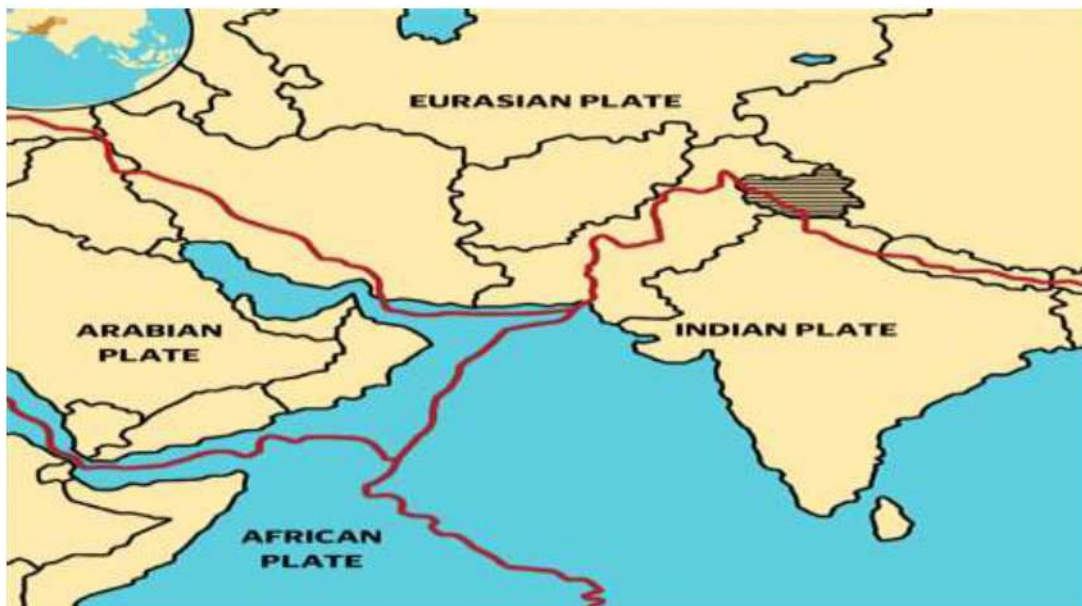


Figure 11: Tectonics Plate Configuration

Ghotki and Kandhkot are situated in a seismically low to moderate region, but their vulnerability to seismic events stems from their proximity to the tectonic boundary between the Indian and Eurasian plates. The Indian plate's collision with the Eurasian plate creates significant stress and strain in the Earth's crust, contributing to the potential for earthquakes. In this region, several active faults contribute to its seismicity. One of the major fault systems is the Indian Shield's boundary fault, which extends through Sindh province. The presence of active faults near Ghotki and Kandhkot further elevates the risk of seismic events, which, despite being in a low to moderate seismic zone, can still pose significant risks to infrastructure and communities. The historical record indicates that the region is susceptible to seismic activity, and periodic monitoring is essential.

The Arabian Sea plate is sub ducting beneath the Eurasian plate, this tectonic setting can lead to seismic activity and the potential for earthquakes. The seismic activity in Sindh is monitored by institutions such as the Pakistan Meteorological Department (PMD) and the National Center for Seismology (NCS). These organizations use seismometers to detect and measure ground motion. Table-5 indicates that the project area is falling in Zone 2A, varying from 0.08 to 0.16.



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Table 5: Details of Boundaries of Seismic Zone

Seismic Zone	Peak Horizontal Ground Acceleration
Zone 1	0.05 to 0.08g
Zone 2A	0.08 to 0.16g
Zone 2B	0.16 to 0.24g
Zone 3	0.24 to 0.32g
Zone 4	> 0.32g

Note: Where “g” is the acceleration due to gravity

4.4 Ecological Environment

The baseline of ecological environment is divided into three sub-sections whose details are given below.

4.4.1 Flora

4.4.1.1 Natural Vegetation Between Guddu and Sukkur Barrages

The project represents a habitat commonly recognized as a riverine, it has been frequently fed by river water, coupled with rich soil of alluvial origin. The area specifically comes under the command of Guddu barrage represents 8 grass species with *Acacia nilotica* dominating the top strata. The floristic composition between sukkur and Guddu barrage comprises 105 species, 81 genera and 36 families. The details of floristic of these species are given below in Table-6.

Table 6: Details of Floristic Species

S#	Family	Plant Species	Life Form	Habit
1	Acanthaceae	Blepharis indica	Therophyte	Herb
2	Aizoaceae	Trianthema portulacastrum	Therophyte	Herb
3	Aizoaceae	Zaleya pentandra	Chamaephyte	Herb
4	Amaranthaceae	Amaranthus graecizans	Therophyte	Herb
5	Amaranthaceae	Amaranthus viridis	Therophyte	Herb
6	Asteraceae	Echinops echinatus	Therophyte	Tall Herb



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7	Asteraceae	Eclipta prostrata	Chamaephyte	Herb
8	Asteraceae	Grangea maderaspatana	Therophyte	Herb
9	Asteraceae	Launaea procumbens	Chamaephyte	Herb
10	Asteraceae	Launaea resedifolia	Therophyte	Herb
11	Boraginaceae	Coldenia procumbens	Chamaephyte	Herb
12	Capparidaceae	Cleome brachycarpa	Chamaephyte	Herb
13	Convolvulaceae	Convolvulus prostratus	Chamaephyte	Herb
14	Convolvulaceae	Cressa cretica	Therophyte	Herb
15	Cucurbitaceae	Citrullus colocynthis	Chamaephyte	Herb
16	Euphorbiaceae	Euphorbia hirta	Therophyte	Herb
17	Fabaceae	Melilotus alba	Chamaephyte	Herb
18	Fabaceae	Melilotus indica	Chamaephyte	Herb
19	Gentianaceae	Enicostemma hyssopifolium	Hemi-cryptophyte	Herb
20	Nyctaginaceae	Boerhavia diffusa	Chamaephyte	Herb
21	Nyctaginaceae	Boerhavia procumbens	Cryptophyte	Herb
22	Nyctaginaceae	Commicarpus boissieri	Phanerophyte	Herb
23	Polygalaceae	Polygala erioptera	Chamaephyte	Herb
24	Polygalaceae	Polygala irregularis	Chamaephyte	Herb
25	Polygonaceae	Persicaria glabra	Chamaephyte	Herb
26	Polygonaceae	Polygonum effusum	Chamaephyte	Herb
27	Portulacaceae	Portulaca oleracea	Therophyte	Herb
28	Primulaceae	Anagallis arvensis	Therophyte	Herb
29	Scrophulariaceae	Bacopa monnieri	Chamaephyte	Herb
30	Scrophulariaceae	Schweinfurthia papilionacea	Chamaephyte	Herb
31	Solanaceae	Solanum albicaule	Chamaephyte	Herb
32	Solanaceae	Solanum nigrum	Therophyte	Herb
33	Solanaceae	Solanum surattense	Chamaephyte	Herb
34	Tiliaceae	Corchorus depressus	Chamaephyte	Herb
35	Verbenaceae	Phyla nodiflora	Chamaephyte	Herb
36	Zygophyllaceae	Tribulus terrestris	Therophyte	Herb



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37	Zygophyllaceae	Zygophyllum simplex	Therophyte	Herb
38	Amaranthaceae	Aerva javanica	Phanerophyte	Shrub
39	Asclepiadaceae	Calotropis procera	Phanerophyte	Shrub
40	Asclepiadaceae	Leptadenia pyrotechnica	Phanerophyte	Shrub
41	Asteraceae	Iphionia grantioides	Chamaephyte	Subshrub
42	Asteraceae	Pluchea lanceolata	Phanerophyte	Shrub
43	Asteraceae	Vernonia cinerascens	Phanerophyte	Shrub
44	Boraginaceae	Heliotropium curassavicum	Chamaephyte	Subshrub
45	Boraginaceae	Heliotropium ophioglossum	Chamaephyte	Subshrub
46	Boraginaceae	Trichodesma indicum	Chamaephyte	Subshrub
47	Burseraceae	Commiphora stocksiana	Phanerophyte	Shrub
48	Burseraceae	Commiphora wightii	Phanerophyte	Shrub
49	Caesalpinaceae	Senna holosericea	Chamaephyte	Subshrub
50	Capparidaceae	Cadaba fruticosa	Phanerophyte	Shrub
51	Capparidaceae	Capparis decidua	Phanerophyte	Large Shrub
52	Chenopodiaceae	Atriplex stocksii	Chamaephyte	Subshrub
53	Chenopodiaceae	Haloxylon stocksii	Phanerophyte	Shrub
54	Chenopodiaceae	Salsola imbricata	Phanerophyte	Shrub
55	Chenopodiaceae	Suaeda fruticosa	Phanerophyte	Shrub
56	Euphorbiaceae	Euphorbia caducifolia	Phanerophyte	Large Shrub
57	Fabaceae	Alhagi maurorum	Phanerophyte	Subshrub
58	Fabaceae	Crotalaria burhia	Phanerophyte	Shrub
59	Fabaceae	Indigofera oblongifolia	Phanerophyte	Shrub
60	Fabaceae	Tephrosia purpurea	Chamaephyte	Subshrub
61	Malvaceae	Abutilon fruticosum	Phanerophyte	Subshrub
62	Malvaceae	Abutilon indicum	Phanerophyte	Subshrub
63	Malvaceae	Sida ovata	Phanerophyte	Subshrub
64	Mimosaceae	Acacia jacquemontii	Phanerophyte	Shrub
65	Mimosaceae	Prosopis glandulosa	Phanerophyte	Large Shrub



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66	Mimosaceae	Prosopis juliflora	Phanerophyte	Large Shrub
67	Resedaceae	Ochradenus baccatus	Phanerophyte	Shrub
68	Rhamnaceae	Ziziphus nummularia	Phanerophyte	Shrub
69	Rubiaceae	Kohautia retrorsa	Phanerophyte	Subshrub
70	Solanaceae	Datura fastuosa	Phanerophyte	Shrub
71	Solanaceae	Lycium edgeworthii	Phanerophyte	Shrub
72	Solanaceae	Solanum cordatum	Chamaephyte	Subshrub
73	Solanaceae	Withania somnifera	Phanerophyte	Shrub
74	Tamaricaceae	Tamarix indica	Phanerophyte	Shrub
75	Tiliaceae	Grewia tenax	Phanerophyte	Shrub
76	Zygophyllaceae	Fagonia indica	Chamaephyte	Subshrub
77	Mimosaceae	Acacia nilotica	Phanerophyte	Tree
78	Mimosaceae	Acacia senegal	Phanerophyte	Tree
79	Mimosaceae	Prosopis cineraria	Phanerophyte	Tree
80	Salicaceae	Populus euphratica	Phanerophyte	Tree
81	Salvadoraceae	Salvadora oleoides	Phanerophyte	Tree
82	Salvadoraceae	Salvadora persica	Phanerophyte	Tree
83	Tamaricaceae	Tamarix aphylla	Phanerophyte	Tree
84	Tamaricaceae	Tamarix dioica	Phanerophyte	Tree
85	Poaceae	Aeluropus lagopoides	Cryptophyte	Grass
86	Poaceae	Cenchrus ciliaris	Hemi-cryptophyte	Grass
87	Poaceae	Cenchrus pennisetiformis	Hemi-cryptophyte	Grass
89	Poaceae	Chloris barbata	Hemi-cryptophyte	Grass
90	Poaceae	Chrysopogon aucheri	Hemi-cryptophyte	Grass
91	Poaceae	Cynodon dactylon	Hemi-cryptophyte	Grass
92	Poaceae	Dactyloctenium aegyptium	Therophyte	Grass
93	Poaceae	Dactyloctenium aristatum	Therophyte	Grass
94	Poaceae	Desmostachya bipinnata	Cryptophyte	Grass
95	Poaceae	Dichanthium annulatum	Hemi-cryptophyte	Grass
96	Poaceae	Panicum antidotale	Hemi-cryptophyte	Grass
97	Poaceae	Phragmites karka	Cryptophyte	Tall Grass



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98	Poaceae	Saccharum benghalense	Hemi-cryptophyte	Tall Grass
99	Poaceae	Saccharum spontaneum	Hemi-cryptophyte	Tall Grass
100	Poaceae	Sporobolus nervosus	Hemi-cryptophyte	Grass
101	Convolvulaceae	Convolvulus glomeratus	Chamaephyte	Climber
102	Fabaceae	Rhyncosia minima	Chamaephyte	Climber
103	Cyperaceae	Cyperus bulbosus	Cryptophyte	Sedge
104	Cyperaceae	Cyperus pygmaeus	Hemi-cryptophyte	Sedge
105	Typhaceae	Typha angustata	Cryptophyte	Reed

4.4.1.2 Conservation Status of Forest Between Guddu and Sukkur Barrages

The forest growing along the river depending upon annual inundation waters received at time of flooding are called riverine forests. Riverine forests in the province of Sindh owe their existence to the River Indus. The predominant species of riverine forests in Sindh are *Acacia nilotica* (Babul), *Prosopis cineraria* (Kandi), *Tamarix aphylla* (Lawa), *Tamarix dioca* (Lai) and *Populus euphratica* (Bahan). Riverine forests and irrigated plantations constitute the most productive forests of the province as they provide commercial timber and firewood. These riverine forests are not ordinary wasteland jungles; they are unique ecosystem; providing habitat to a variety of vertebrate and invertebrate fauna and flora.

According to the Sindh Forest Department's estimates riverine forests are spread over 0.241 million hectares which make 1.7% of the total land area of the province. Riverine forests in the four districts upstream Sukkur (Ghotki, Sukkur, Kashmore and Shikarpur) are spread over an area of 48,470 hectares while downstream Kotri these forests occupy an area of about 56,010 hectares in Thatta, Hyderabad and Jamshoro.' With the construction of barrages on river, the Kacho (land in between protected embankments) is divided in the following three zones:

- Area between Guddu and Sukkur barrages
- Area between Sukkur and Kotri barrages
- Area between Kotri barrage to mouth of the Indus River

The ecological features, biodiversity and socio-economic conditions of the above areas are dependent on water regime and as a matter of fact they are three different sub-ecosystems with varying characteristics and distinct environments.

The 170 km river stretch between Guddu and Sukkur barrages (the dolphin game reserve) contains some riverine forests. These forests along river Indus get annual



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inundation during monsoon. The vegetation in riverine forests is much influenced by the frequent change in erosion and deposition due to changing course of the river Indus. The Riverine Forests have canopy of *Populus euphratica* (Bahan), *Prosopis cineraria* (Kandi), *Acacia nilotica* (Babul), *Tamarix dioica*, *Tamarix indica* (Lai), *Salvadora persica* (Pilu), *Salvadora oleoides* (Khabbar) etc. Bahan *Populus euphratica* is one of the pioneer indigenous tree species of Pakistan but over the past few years this tree species showed great decline. Shah Belo is the place where Bahan *Populus euphratica* was found dominant. Its wood is used for fuel in Sindh. Kandi *Prosopis cineraria* is a versatile species, providing fodder, fuel, food, timber, and shade, as well as enhancing the fertility of the soil and sand dune stabilization.

4.4.1.3 Ethnobotany of Riverine Forests

The forests between Guddu and Sukkur contain some important medicinal plants, which are of high commercial value. These are: (i) *Cordia gharaf*, (ii) *Calotropis procera*, (iii) *Citrullus colocynthis*, (iv) *Datura fistuosa*, (v) *Solanum albicaule*, (vi) *Polygonum effusum*, (vii) *Withania somnifera*, (viii) *Tribulus terrestris* and (ix) *Zygophyllum simplex*.

In addition to these multi-purpose trees, many other worthwhile small trees / large shrubs are also recorded which include *Acacia jacquemontii*, *Acacia senegal*, *Calotropis procera*, *Capparis decidua*, *Commiphora stocksiana*, *Commiphora wightii*, *Cadaba fruticosa*, *Cordia gharaf*, *Euphorbia caducifolia* etc. The growth of riverine forests also depends on the flood conditions of the river. The riverine forests in Sindh are under threat from human disturbances due to their conversion into agricultural and residential lands.

4.4.2 Fauna

The Indus River and its riparian forests have a unique freshwater ecosystem that supports both terrestrial and aquatic biodiversity. In Sindh, 16 species of mammals, 15 species of reptiles, 4 species of amphibians, 150 species of avifauna, and 67 species of fish are reported. Among the animal species only Indus River Dolphin (*Platanista gangetica minor*) is the endangered species located close to the barrage area. Hilsa (*Tenualosa ilisha*) and Barramundi (*Lates calcarifer*) are the two migratory fish species and commercially very important fish species in Indus. Hilsa (locally known as palla) is an anadromous fish that lives in sea and migrate to Indus reportedly as far as up to Multan (located about 300 km upstream of Guddu) for breeding before construction of barrages. Construction of barrages has restricted the migration of Hilsa up to only Kotri barrage. Barramundi is a catadromous fish that lives in Indus (close to the coast) and migrates in to the sea for breeding.



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4.4.2.1 Mammals

The riverine forest of Indus has highly valuable wildlife habitats for mammals. Indus river dolphin is the most significant species and found in huge numbers in Sindh. The riparian forests between Guddu and Sukkur along Indus are once reported to provide a habitat for fishing cat and hog deer (IUCN endangered) and smooth coated otter (IUCN vulnerable), but none of these species are now reported to be present in these areas due to conversion of these forests in to agricultural lands and plantation areas, and poaching. Otter population is reportedly declined by pesticide laden return flows from agricultural fields and development of fish farms along the Indus. Mammals of Indus dolphin game reserve are shown in Table-7.

Table 7: Mammals of Indus Dolphin Game Reserve

Common Name	Scientific Name	IUCN Red list
Indus Dolphin	Platanista gangetica minor	Endangered
Smooth-coated Otter	Lutrogale perspicillata	Vulnerable
Hog Deer	Axis porcinus	Endangered
Golden Jackal	Canis aureus	Least Concern
Jungle Cat	Felis chaus	Least Concern
Wild Boar	Suss crofa cristatus	
Indian Hare	Lepus nigricollis	Least Concern
Fishing Cat	Felis viverrina	Endangered
Small Indian mongoose	Herpestes Javanicu	
Indian Porcupine	Hystrix indica	
Hedgehog	Hemiechinus spp	
Fox	Vulpes bengalensis	
Asiatic Jackal	Canis aureus	
Desert Cat	Felis silverstris	
Five stripped palm squirrel	Funambulus	
Indian grey mangose	Herpestes edvar	

4.4.2.2 Indus River Dolphin

The Indus Dolphin (*Platanista gangetica minor*) or Bulhan, as it is locally known is an endangered river cetacean that occurs in Pakistan. The Indus River dolphin is thought to have its origin in the ancient Tethys Sea, which dried up around fifty million years ago forcing the dolphin to adapt to its only remaining habitat - the rivers. Living in the turbid waters of the Indus for millions of years has meant that its sight has been replaced by a sophisticated sonar system known as echolocation, which it uses to steer and hunt underwater. This species represents a unique genome, an irreplaceable part of the biodiversity of life on earth.



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Dolphins are abundant in the long stretches of deep water in association with shallow water meanderings, confluences and mid channel sand bars. The primary habitats preferred by the Indus River dolphins are characterized by an eddy-counter current system in the main river flow caused by a point bar formed from sediments and deposits, a convergent stream branch, or by an upstream meander. They are also found below sand bars and bridges where eddies are formed. Being a mammal, the dolphin can survive a wide range of temperature fluctuations. It can tolerate temperatures as low as 5 °C in the upper reaches of Indus in winter, and as high as 35°C in the summer in the plains of Sindh. They have also been found in highly turbid water in monsoon and it is thus assumed that the water temperature and turbidity are not significant factors in determining the distribution of this species. Dolphins feed mostly on fish (particularly on Wallago attu, singari Macrones aor and marakho Catlabuchanani) and invertebrates. It does much of its feeding at or near the bottom, using echolocation, swimming on one side, and probing the river bottom with its snout and its flipper.

According to a survey conducted by the Sindh Wildlife Department in 2011, from Guddu to Sukkur Barrage total 918 Dolphins were seen in which 804 were mature 47 were the young and 67 were baby. There are more than 18 major schools of dolphins at different locations between Guddu barrage to Sukkur barrage.

Births of dolphins may take place throughout the year but appear to peak in July to August. The gestation period for the dolphins is approximately 10 months and a single calf is born every two years. Juveniles are weaned at around one year of age, but do not reach sexual maturity until around 10 years of age. This species is thought to live at least 28-30 years in the wild.

Dolphin population in Indus is currently under threat of habitat fragmentation by the barrages, trapping in irrigation channels of Sukkur, reduced flows in the river in winter, sedimentation of the riverbeds, depletion of prey base, pollution from the agricultural return flows and municipal wastes, entanglement in fishing gears and poaching for its oil.

4.4.2.3 Reptiles and Amphibians

Reptiles and amphibians commonly found in and around Indus between Guddu and Sukkur barrages include four species of amphibians, three species of freshwater turtle, one species of agama (Lizard), one species of monitor lizard and ten species of snakes. None of these species are listed in the IUCN red list. Reptiles and amphibians are given in Table-8.

Table 8: Reptiles and Amphibians in and around Indus between Sukkur and Guddu Barrages

Common Name	Scientific Name	Status
Skittering frog	Rana cyanophlyetic	Common



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Tiger frog	<i>Rana tigrina</i>	Less Common
Indus toad	<i>Bufo andersoni</i>	Common
Green toad	<i>Bufo viridis</i>	Less common
Checkered keelback	<i>Xenochrophis piscator</i>	Less common
Marsh snake	<i>X. cerasogaster</i>	Less common
Cat snake	<i>Boiga trigonata</i>	Less common
Dhaman	<i>Ptyas mucosus</i>	Less common
Royal snake	<i>Sphalerosophis atriceps</i>	Less common
Sand snake	<i>Psammophis condanarus</i>	Less common
Indian krait	<i>Bungarus caeruleus</i>	Less common
Cobra	<i>Naja naja</i>	Less common
Russell.s viper	<i>Viper russelii</i>	Rare
Saw-scaled viper	<i>Echis carinatus</i>	Common
Monitor lizard	<i>Varanus bengalensis</i>	Less common
Spinytailed lizard	<i>Uromastic hardwicki</i>	Common
Indian softshell turtle	<i>Trionyx gangeticus</i>	Less common
Indian flapshell turtle	<i>Lissemys punetata</i>	Common
Brown river turtle	<i>Kachuga amithi</i>	Common

4.4.2.4 Avifauna

River Indus and its associated tributaries provide habitats for both resident and migratory birds. Vegetation on both sides of the river provides ample habitat to forest birds and associated agriculture areas are the source of food for many species.

The migration of water birds occurs in a north-south direction and vice versa. The birds breeding in central Asia migrate to various destinations in Pakistan, following the Indus valley and plains down to the Indus delta. This flyway of migratory birds is a corridor of international importance, the so-called “Central Asian – South Asian Flyway.” Large numbers of water birds and other birds like teal, pintail, mallard, gadwall, white-headed duck, and houbara bustard follow the Indus on their way towards the wetlands of southern Sindh, which are the most important major wintering grounds of migratory water birds in the region. Approximately ten wetlands of Sindh have been designated as Ramsar Sites to provide safe refuge for these birds. Upstream and downstream of Guddu Barrage and its pond areas also provide an ample opportunity for migratory birds to roost and use as staging ground in winter. The shallow ponds are the attraction for ducks and waders while deep water areas provide food for fish eating birds. A total of 41 migratory bird species are reported in the project area. Details of few avifauna of Indus dolphin game reserve are given in Table-9.

Table 9: Avifauna of Indus Dolphin Game Reserve

Common Name	Scientific Name	Status	IUCN Red List
Avocet	<i>Recurvirostra avosetta</i>	Less Common	Least Concern
Bank myna	<i>Acridotheres ginginianus</i>	Less Common	Least Concern



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Bay backed shrike	Lanius vittatus	Less Common	Least Concern
Black bellied tern	Sterna acuticauda	Less Common	Endangered
Black partridge	Melanoperdix niger	Rare	Vulnerable
Black shouldered kite	Elanus caeruleus	Less Common	Least Concern
Black winged stilt	Himantopus himantopus	Common	Least Concern
Black-headed gull	Chroicocephalus ridibundus	Common	
Blue rock pigeon	Columba livia	Common	Least Concern
Bonellis eagle	Aquila fasciata	Rare	Least Concern
Brahminy kite	Haliastur indus	Common	Least Concern
Collard dove	Streptopelia decaocto	Common	Least Concern
Common babbler	Turdoides caudata	Common	Least Concern
Common buzzard	Buteo buteo	Less Common	Least Concern
Common Indian myna	Acridotheres tristis	Common	Least Concern
Common sandpiper	Actitis hypoleucos	Common	Least Concern
Common wood shrike	Tephrodornis pondicerianus	Rare	Least Concern
Coot	Fulica atra	Common	Least Concern
Crested lark	Galedrida cristata	Common	Least Concern
Great horned owl	Bubo virginianus	Less Common	Least Concern
Greater spotted eagle	Aquila clanga	Less Common	Vulnerable

4.4.2.5 Ichthyofauna

The Indus is home to a number of endemic fishes and about 127 species of fresh water fish found in the lower Indus Basin including those inhabiting the estuary of the Indus Delta. Twenty-two species of indigenous fish are reported from the barrage site. Carps, catfishes and snakeheads are the dominant fish species and represent most of the fish catch. Exotic species reported are three species of tilapia and two species of Chinese carps. Submerged shoals and areas between guide bunds and spurs, where water velocities are low are found to be suitable habitat for the fish for breeding.

The Guddu barrage has no organized fisheries in the barrage pond area due to security concerns. Fishing in the downstream of the barrage is also found to be limited. Generally fishing is permitted under the government issued licenses. In 2011-2012, about 450 boat licenses were issued in Kashmore district. Legally fishing is not allowed in the months of June and July as this is the prime breeding season for carp fishes, but cat fishes are allowed to be fished during this season. Details of few common fish species of Indus dolphin game reserve are provided in Table-10.

Table 10: Common Fish Species of Indus Dolphin Game Reserve



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Common Name	Species	Family	IUCN Red List
Singhari	Aortichthys aor	Bagridae	Least Concern
Ray Finned	Aspidoparia morar	Cyprinidae (carp)	Least Concern
Fauji-Khaga	Bagarius bagarius	Sisoridae (catfish)	Near Threatened
Theli	Catla catla	Cyprinidae (carp)	Least Concern
Soll	Channa marulias	Channidae	Least Concern
Chela	Chela cachius	Cyprinidae (carp)	Least Concern
Suhni	Cirrhinus reba	Cyprinidae (carp)	Least Concern
Morakha/Morie	Cirrhinus mirgala	Cyprinidae (carp)	Least Concern
Pali	Gudusia	Clupeidae	Least Concern
Kalbans	L. calbasu	Cyprinidae (carp)	Least Concern
Seereha	L. gonius	Cyprinidae (carp)	Least Concern
Rahu	Labeo rohita	Cyprinidae (carp)	Least Concern
Baam	Mastacembelus armatus	Mastacembelidae	Least Concern
Tengara	Mystus cavasius	Bagridae (catfish)	Least Concern
Cheetal	N. chitala	Notopteridae	Least Concern

4.4.2.6 Invertebrates

Animal species are far more diverse and numerous in inland waters than plants. Apart from fishes, invertebrates form an important group. The important groups include sponges, flatworms, mollusks, polychaete worms, oligochaete worms, crustaceans, insects and numerous parasitic species in various groups. As on land, insects are the most diverse group of organisms in inland waters. Unlike terrestrial fauna, where beetles (Order Coleoptera) are the most diverse, flies (Order Diptera) appear to be by far, the most abundant group in inland waters. Invertebrate diversity of freshwater ecosystems of Pakistan is not properly documented. It is estimated that about five thousand species may exist in inland waters of Pakistan. Two species of freshwater prawns and two species of insects are reported between Guddu and Sukkur barrages. Details of few crustaceans and water insects of Indus dolphin game reserve are provided in Table-11.

Table 11: Crustaceans and Water Insects of Indus Dolphin Game Reserve

Common name	Scientific name	Status
Large jhenga	<i>Palaemon carcinus</i>	Less Common
Small jhenga	<i>Macrobrachium malcomsoni</i>	Less Common
Water bug	<i>Coraixa promontoria</i>	Common
Water bug	<i>C. substriata</i>	Common
Water-scorpion	<i>Laecotrephes rubri</i>	Less Common

4.4.3 Protected Areas

4.4.3.1 Indus Dolphin Game Reserve

Indus Dolphin Game Reserve stretches between Guddu and Sukkur Barrage. There are two main barrages in the stretch, starting from Guddu Barrage and ending at Sukkur Barrage. Guddu Barrage controls the flow of water for irrigation and flooding. This barrage has 68 bays and it feeds Ghotki feeder, Begari feeder and Pat and Desert canals. Sukkur Barrage was built by British and has 66 spans with heavy gates feeding the largest irrigation system of the world with more than 5 million acres.

This wetland is important due to the presence of a large variety of fish, reptiles, birds and mammals and especially due to the presence of wetland threatened species the Hog Deer (*Axis porcinus*), Indus Dolphin (*Platanista minor*), Smooth-coated Indian Otter (*Lutrogale perspicillata*), Marbled Teal (*Marmaronetta angustirostris*) and Pond Spotted Turtle (*Geoclemys hamiltonii*).

The Barrages in the Reserve are government owned property while the surrounding areas are partially private, owned by the local communities. This long stretch is maintained as an Indus Dolphin Game Reserve by the Sindh Wildlife Department. The boundaries of Indus dolphin Game Reserve are shown in Figure-12.

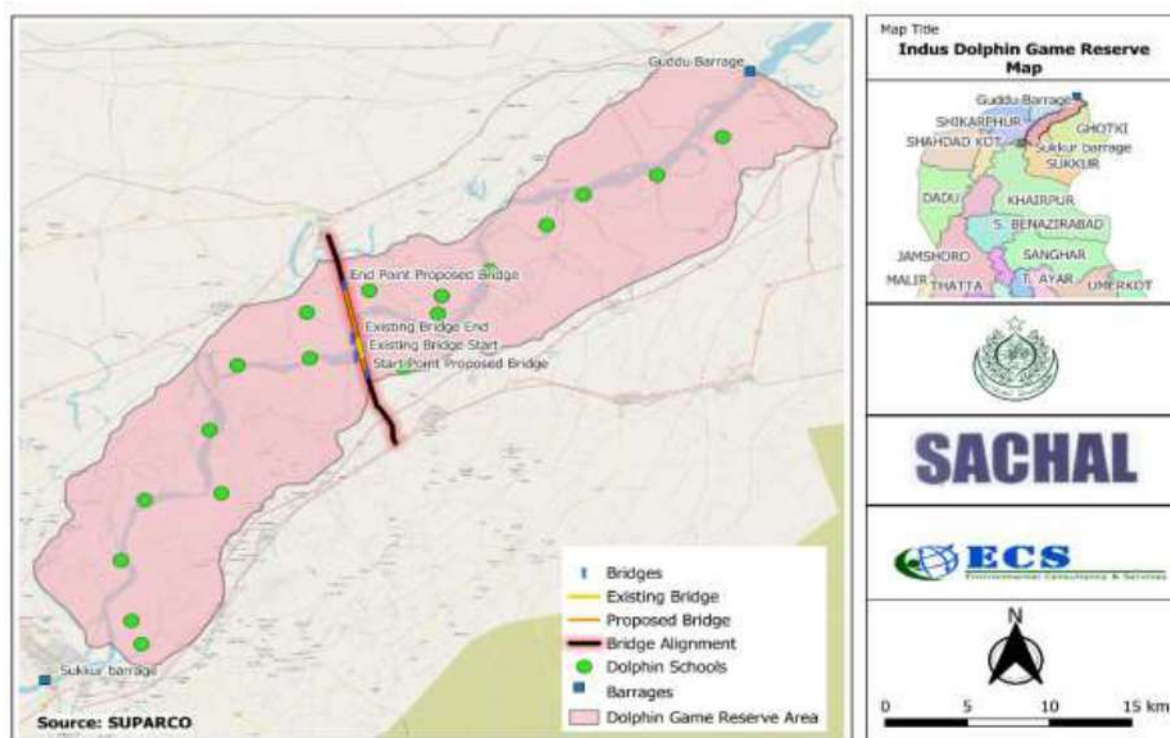


Figure 12: Indus Dolphin Game Reserve

Indus river dolphins are believed to have originated in the ancient Tethys Sea. When the sea dried up approximately 50 million years ago, the dolphins were forced to adapt to its only remaining habitat— rivers. Today, they can only be found in the lower parts of the Indus River in Pakistan and in River Beas, a tributary of the Indus River in Punjab, India. In Pakistan, their numbers declined dramatically after the construction of an irrigation system, and most dolphins are confined to a 1207 km stretch of the river and divided into isolated populations by six barrages. They have adapted to life in the muddy river and are functionally blind. They rely on echolocation to navigate, communicate and hunt prey including prawns, catfish, and carp.

The Indus dolphin is a blind cetacean endemic to the Indus River and found in greatest numbers between Guddu and Sukkur barrages. Other aquatic vertebrates include six species of freshwater turtles. Historically, Gharial *Gavialis gangeticus* used to occur in this region, which locally is almost extinct.

4.4.3.2 Ramsar Site

The Indus Dolphin Reserve was also declared as Ramsar wetland of International Importance in year 2001. It describes the Indus Dolphin Reserve as spanning over an area of 125,000 ha, is 170 km stretch of the River Indus between the Sukkur and Guddu barrages, providing a home for the remaining individuals of the formerly common Indus dolphin *Platanista minor* (or *P. indi*), a blind cetacean endemic to this river. Originally sea creatures, the Indus dolphins adapted to river life as the Indian subcontinent rose.

Pakistan gets a large number of guest birds from Europe, Central Asian States and India every year. These birds that originally reside in the northern states spend winters in various wetlands and deserts of Pakistan from the high Himalayas to coastal mangroves and mud flats in the Indus delta. After the winter season, they go back to their native habitats.

The bird migratory route from Siberia to various destinations in Pakistan over Karakorum, Hindu Kush, and Suleiman Ranges along Indus River down to the delta is known as International Migratory Bird Route. The birds start on this route in November. February is the peak time and by March they start flying back home to their nesting and breeding areas.

4.5 Social-Economic Environment

The socio-Economic baseline provides an overview of the social and economic conditions of the project area based on primary and secondary data sources. This overview helps in understanding the socioeconomic importance of the project area and contributes towards identification of any social risk that the project proponents must be aware of during the project design phase. The baseline data presented here also provides a basis for monitoring project activities during the project construction and operation phases.

The major economic sectors of Ghotki and Kashmore-Kandhkot are given below as A and B respectively⁶.

A.

- Agriculture, Forestry, Fishing and Hunting (59%)
- Construction (19.7%)
- Community, Social & Personal Services (8.3%)
- Others (13%)

B.

- Agriculture, Livestock breeding, Fishing & Hunting (54%)
- Elementary occupation (32%)
- Service workers, Shop and Market sales workers (6%)
- Others (8%)

Administratively, Ghotki is divided into 5 talukas, while Kashmore is divided into 3 talukas. Details of the talukas are provided below as C and D, respectively.

⁶ <https://pakistanalmanac.com/sindh-ghotki>

C.

- Ghotki
- Mirpur Mathelo
- Ubaro
- Daharki
- Khangarh

D.

- Kashmore
- Kandhkot
- Tangwani

4.5.1 Demography and Religious Affiliations

According to the 2017 census, Ghotki has a population of 1.648 million people, while Kandhkot has a population of 366,111. In Ghotki the male population is 850,272 and the female population is 798,271, whereas in Kandhkot, the male population is 190,070 and the female population is 175,998. The populations of Ghotki and Kandhkot are increasing annually by an average of 2.83% and 2.53%, respectively.

In Ghotki, 93.1% population follows Islam, 6.2% practice Hinduism, 0.1% are Christian, 0.5% are from scheduled castes, 0.08% are Ahmadis, and 0.04% belong to other religions. On the other hand, In Kashmore 95.9% are Muslims, 3.8% are Hindus, 0.2% are from scheduled castes, 0.1% are Christian, 0.1% are Ahmadis, 0.02% belong to other religions.

CHAPTER 5: **STAKEHOLDER CONSULTATION**

5.1 Overview

The main objective of consultation is to disseminate information about the project and its anticipated impacts with the stakeholders. Stakeholder consultation is a mean of involving stakeholders in the Project's decision-making process in order to address their concerns, improve project plan. Stakeholder consultation, if conducted in a participatory and objective manner, is a means of project sustainability.

The consultation and participation serve, as an effective tool for social interaction. This tool helps to develop significant confidence between the stakeholders and the proponent of the project to minimize the anticipated environmental and social impacts of the project.

The most important objective of these consultations is to determine the extent of the impact of project activities and suggest appropriate mitigation measures accordingly. This section of EIA clearly describes the issues raised by the stakeholders during different consultation meetings conducted specifically for this assignment, discussion with stakeholders are carried out which was primarily focused on determining the perceptions of the following stakeholders.

- Sindh Wildlife Department
- Sindh Forest Department
- World Wide Fund
- Sindh Environmental Protection Agency

The overall objectives of the process are identified as follows:

- To inform and acquire feedback from stakeholders on revised bridge design.
- To identify potential issues and mitigation measures.
- To incorporate stakeholders concerns in the project documents.
- To identify the negative impacts due to the project execution

This section has been prepared based on consultations carried out by the consultant during the preparation of EIA and same are used in the EIA. Further, the proponent is also in coordination with Sindh Forest Department and Sindh Wildlife Department to ensure continual improvement for ecology protection and management during the project development.

The bridge is in a protected area as Sindh Environmental Protection Agency, Sindh Wildlife Department, Sindh Forest Department and WWF are the stakeholders. Therefore, the main features of the revised bridge design are presented to the representatives of these organizations during the EIA preparation.

The perspective of stakeholders plays an important role in the evaluation of any development project. Similarly, in the Project a robust stakeholder engagement framework is employed to determine the concerns and recommendations of stakeholders.

5.2 Consultation with Sindh Wildlife Department

The consultation with the official of Sindh Forest Department Mr. Adnan Hamid Khan (Deputy Chief Conservator) was carried out by the consultant during the environmental assessment wherein the main features of project were briefed. The comprehensive suggestions/feedback given by an official of Sindh Wildlife Department are described below and the picture of consultation with Sindh Wildlife Department is shown in Figure-13.

- The project was appreciated by the Sindh Wildlife Department
- The engineering design of the bridge should cater to the high flow intensity and legal compliance must be complied.
- The height of the bridge over the main river course should be considered based on high flood level and should be set on the higher side.
- Sindh Wildlife Department (SWD) should be taken on-board during the entire period of construction and a plan for the protection and conservation of ecology must be strictly implemented in association with this department.
- Indus Dolphin which is the most important species of the project area and ranked as endangered. Blind Dolphins are facing a number of threats including pollution.
- Mating season of dolphins is between July and August and the breeding season is between April and June. The construction of bridge or any activity inside the main river channels should be carried out carefully and the necessary measures must be taken to avoid harm to the dolphins.
- Acoustic devices must be placed during the bridge construction for the protection of dolphins.
- Discharge or disposal of any solid/liquid/fluid must be banned in the waterway.
- Avoid water pollution, especially oil and grease.
- Avoid or minimize as much as possible construction activities in migratory birds' season.



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Figure 13: Consultation with Sindh Wildlife Department

5.3 Consultation with Sindh Forest Department

The consultation with the official of Sindh Forest Department (Aftab Ahmed Arain, Conservator) was carried out by the consultant during the environmental assessment wherein the main features of project was briefed. The comprehensive suggestions/feedback given by officials of Sindh Forest Department are described below and the picture of consultation with Sindh Forest Department is shown in Figure-14.

- The representative of SFD has expressed a positive opinion on the revised bridge design.
- He further informed that there is no reserved or riverine forest area lying in the project alignment.
- Sindh Forest Department (SFD) should be taken on-board during the period of construction.
- The tree plantation along with right of way (RoW) should be carried out to compensate construction pollution.
- Nursery should be developed for indigenous species nearby project site.



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Figure 14: Consultation with Sindh Forest Department

5.4 Consultation with WWF

The consultation with the representative of WWF Mr. Imran Malik (Project Officer Sukkur) was carried out by the consultant during the environmental assessment wherein the main features of project were briefed. The comprehensive suggestions/feedback given by representative of WWF are described below and the picture of consultation with WWF is shown in Figure-15.

- Minimum cut off bund should be carried out under project.
- Monitoring and endangered habitat rescue plan should be developed.
- Birds monitoring should be carried out during the migratory bird season.
- Regular monitoring of Indus River nearby bridge site should be carried out through Qualified Experts.
- Work during night hours should be minimized.
- Ecological Safety Protection Plan should be in place before resume of construction work.
- Appropriate design should be developed without disturbing the surroundings.



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Figure 15: Consultation with WWF

5.5 Consultation with Sindh Environmental Protection Agency

The consultations with the officials of Sindh Environmental Protection Agency (Mr. Imran Sabir (Director – Technical Head Office Karachi) and Mr. Ajmal Tunio (Regional In-charge Sukkur) were carried out by the consultant during the environmental assessment wherein the main features of project were briefed. The comprehensive suggestions/feedback given by officials of Sindh Environmental Protection Agency are described below and the picture of consultation with Sindh Environmental Protection Agency is shown in Figure-16.

- The representatives appreciated the project and have positive opinion for this effort for the betterment of surroundings and endangered species.
- Communities' passageway of riverine area should not be disturbed.
- The resettlement plan should be strictly followed.
- Regular monitoring and reporting must be carried out.
- Community safety during the construction should be considered under top priority.
- Water sprinkling and dust pollution control should be strictly carried out.
- Local employment should be preferred for skilled and unskilled workers.
- Record of EHS statistics should be maintained at site.
- Safety awareness signages should be placed nearby project site.
- Safety barrication should be carried out for construction site.
- Safe traffic management mechanism should be in place.
- The work during the night hours should be carried out carefully.



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- Efforts should be made at every stage to develop a proper mechanism for pollution control systems.
- Water conservation and treatment should be adopted at every stage of the project to avoid pollution.
- Appropriate monitoring and protection measures should be taken for the protection of aquatic ecosystem
- Jobs should be provided to locals as a priority.
- Sustainable tree plantation must be carried out as per international standards.



Figure 16: Consultation with SEPA

CHAPTER 6: PROJECT ALTERNATIVES

Consideration of an alternative is a key component in the EIA process and most guidelines use terms such as ‘reasonable’, ‘practicable’, ‘feasible’ or ‘viable’ to define the range of alternatives that should be considered. Alternatives are essentially, different ways in which the developer can feasibly meet the Project’s objectives, for example by carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. At the more detailed level, alternatives merge into mitigating measures where specific changes are made to the project design or to methods of construction or operation to avoid, reduce or remedy environmental effects. All EIA systems also require developers to consider mitigation (i.e. measures to avoid, reduce and remedy significant adverse effects).

Alternatives and mitigation therefore cover a spectrum ranging from a high level to very detailed aspects of Project design. The “No Project” scenario is also required to be considered as the baseline against which the environmental effects of the Project should be considered.

This section presents an analysis of the following alternatives from the perspective of economic and environmental considerations:

6.1 Rationale for Site Selection

Since work has already started on the project and the only modification is the length of the main bridge over the Indus River. At this stage discussion of alternate of the project is irrelevant. However, the increase in the bridge length will bring positive impact on the project in the shape of reduced the risk of flood damages and protection of Indus dolphins.

The Ghotki Kandhkot Bridge Project (GKRB Project), already under construction is a very important infrastructure project being constructed over river Indus. Implementation of enhancement project will also help to smooth movement of water during high flow on indus river.

6.2 Alternative Sites

No alternate site can be considered for environmental assessment at this stage. As already explained the project is under construction. However, keeping in view the hindrance for dolphin movement across the bridge and flood event the length of the bridge is proposed to enhance from bank to bank of river (12.2 Km).

Sindh Works & Services Department (hereinafter referred to as SW&SD) initially planned to construct 31.2 km connection between N-5 and N55 highways in shape of road and bridge at the point of Ghotki on one side and Kandhkot on the other side, the access road from Kandhkot side would have link with Jacobabad-Kandhkot Road to divert the Balochistan bound traffic

towards the shorter route of Jacobabad instead of moving via Shikarpur. In the initial plan of project, the bridge was only 2.15 km, revised to 03 km with extensive river training work. However, later on keeping in view the extreme flood events due to the climate change and removal of hindrance for Indus dolphin (an endangered species) movement across the river, it is decided that bridge will be from Bank-to-Bank bridge (12.2km).

6.3 Benefit of Bank-to-Bank Length Bridges on River

The following benefits are expected by increasing the length of the bridge to 12.2 km from bank-to-bank of the river.

6.3.1 Ease in Passing the Flood Water

During the floods of 2022, it was observed that those bridges which were constructed bank to bank length like Jhurrek-Mullakatiyar road bridge, Sukkur bypass road bridge, Hyderabad bypass bridge over River Indus passed the flood water smoothly without any afflux but the bridges like Khairpur-Larkana, Qazi Ahmad-Amri and Dadu-Moro created problems and caused pressure on the flood protective embankments along upstream of the bridges and the lag time increased.

Keeping in view of the above, it can be said that any constraint in the waterway negatively affects embankments and will raise the water level on upstream. Figure-17 shows the map of Guddu Barrage during the floods of 2010 wherein conditions can be observed.



Figure 17: Guddu Barrage Before and After Flood in 2010

6.3.2 Movement of Indus Dolphin across the River

The Indus River dolphin, also known as the "blind dolphin" due to its poor eyesight, is primarily found in the Indus River in Pakistan. Its movement across the river largely depends on various factors such as water flow, availability of prey, breeding patterns, and human activities.

These dolphins are known to travel long distances in search of food, which mainly consists of fish. They often move upstream and downstream within their habitat, following the seasonal variations in water levels and fish migration patterns.

Human activities such as dam and bridge construction, pollution, and habitat degradation have significantly impacted the movement of Indus River dolphins. Dams, barrages and bridges of short span have created barriers to their natural movement, fragmenting their habitat and restricting their ability to access suitable breeding and feeding grounds.

The proposed enhancement of length of bridge over Indus river (12.2 Km) from bank to bank will have a positive impact on the movement of Indus dolphins and other species across the river comparative to the earlier length of bridge (2.15 km).

CHAPTER 7: SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

7.1 Environmental Evaluation Process

Identification and assessment of the anticipated environmental impacts of the project is the most important component of the EIA study. For this project, the potential impacts due to the implementation of the project on the physical, ecological, and socio-economic environment are studied. Once these potential impacts are identified, it is followed by identification of mitigation measures to mitigate the Project's adverse environmental effects. Positive impacts are also studied and enhanced measures are proposed to make the project further beneficial.

7.1.1 Approach Applied for Impact Identification

Various tools are used to define a comprehensive and consistent method to capture the potential impacts of a Project. However, it is now widely recognized by EIA practitioners that impact evaluation is not a purely objective and quantitative exercise. It has a subjective element; often based on judgment and values as much as scientific criteria.

The description of each impact has following features:

- Definition of the impact using an impact statement identifying the Project activity or activities that causes the impact, the pathway or the environmental parameter that is changed by the activity, and the potential receptors of the impact.
- Description of the sensitivity and importance value of the receiving environment or receptors (based on the stakeholder consultations undertaken)
- Extent of change associated with the impact.
- Description of appropriate mitigation and management measures and potential effectiveness of the proposed measures.
- Characterization of the level of uncertainty in the impact assessment.

An assessment has been carried out for the potential impacts that could rise if no mitigation measures were incorporated within the project. Based on observation during field visit, discussions with proponent of the project and stakeholders during consultation, impression drawn from the primarily monitoring conducted for air and noise quality, availability of water sources and secondary data for all components of the environment, significant impacts were enlisted. Later, five evaluation factors were set for the impact assessment for each environmental issue which are as follow:

- Magnitude of the impact
- Prevalence (extent) of the impact
- Duration and/or frequency of the impact
- Risk of serious environmental damage
- Importance of the issue in question

7.1.2 Potential Impacts

Potential impact is any possible impact expected to rise from the implantation of a project on any component of the environment (Physical, ecological & socio-economic). Characterization of potential impacts is done on the basis of significance, probability, and prevalence in the surrounding environment. Various parameters to be taken into account in impact prediction, evaluation and decision-making include:

- i. Nature: (positive, negative, direct, indirect)
- ii. Magnitude: (high, moderate, low)
- iii. Extent/location: (area/volume, distribution)
- iv. Timing: (construction, operation, immediate, delayed etc.)
- v. Duration: (short term, long term, intermittent)
- vi. Reversibility/irreversibility
- vii. Likelihood: (probability, uncertainty, or confidence level).

A very important factor in evaluation of potential impacts is their significance level. Various indicators are used to determine the significance of an impact like compliance with standards, its duration, impacts on local community, biological components of environment etc. The criteria used in this report to define the significance of impacts in terms of low, Moderate, and severe impacts are as follows:

- a. Negligible/No Impact: An impact is considered negligible where a resource or community will not be affected in any way by a particular activity.
- b. Low: An impact where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, very minor effect on community
- c. Medium: Moderate significance means that will have a noticeable effect on a particular resource or community of the area. Effective mitigation measures are proposed to bring the severity of such impact to the minimum possible level.
- d. High: An impact is considered of major significance where an accepted limit or standard may be exceeded, or where continuous damage is predicted to a resource or community. Such impacts may also involve compensation along with mitigation to decrease their severity.

7.1.3 Mitigation and Enhancement Measures

Wherever the Project is likely to result in unacceptable impact on the environment, additional mitigation measures are proposed (over and above the inherent design measures included in the Project description). In addition, good practice measures may be proposed, however these are unlikely to change the impact significance. In the case of positive impacts, management measures are suggested to enhance the benefits to be gained. Where mitigation measures are required, the impact will be rated again to show the residual impact after implementation of management controls.

The following mitigation hierarchy will be utilized in selecting practical mitigation measures for unacceptable impacts as follows (in order of preference):

- Avoid the impact wherever possible by removing the cause(s)
- Reduce the impact as far as possible by limiting the cause(s)
- Ameliorate the impact by protecting the receptor from the cause(s) of the impact.
- Providing compensatory measures to offset the impact, particularly where an impact is of high significance and none of the above are appropriate.

The adverse environmental impact mitigation measures are proposed based on experience from other similar projects, knowledge of the subject, brainstorming and discussion with stakeholders as well as experts. The main aim of the mitigation measures is to modify and reduce the severity of the adverse environmental impacts to a minimum possible level with optimal cost and latest techniques.

7.1.4 Residual Impacts

Every development project may have some impact which may not be fully addressed through mitigation measures and even compensation. Incorporation of suggested mitigation measures may reduce the magnitude of the environmental impacts of the project but sometimes, it may fail in bringing them within acceptable limits. The residual impacts refer to those remaining impacts after mitigation measures have been applied and compensation paid.

7.1.5 Monitoring Requirements (Parameters & Frequency)

Environmental impact assessment is a process where impacts are predicted, mitigations measures are proposed to mitigate the adverse impacts during the design, construction and operation phases of the project. To assure that the mitigation measures proposed are working well, a monitoring program is developed. The monitoring program/plan also proposes the frequency/interval of samples and parameters to be monitored. The purpose of the monitoring is to confirm that the impact is within the prescribed limits and to provide timely information if acceptable limits/standards are violated.

7.2 Project Area and Study Area (Area of Influence)

The project area is the area that will be possibly directly impacted by the project. It includes areas where major construction activities are proposed for the project main structures, the establishment of construction and labor camps, waste disposal areas, etc.

The study area is a wider area where indirect impacts of the project are studied. The study area depends on many factors relating to the environmental settings, type of resources and project-related parameters. Construction-related and subsequently traffic-borne noise and air pollution may influence areas at large distances away from the primary areas (project area). The project construction, as well as operational activities, may have a variety of direct and indirect effects on the physical, ecological, and human resources of the surrounding environment. This study area will take into consideration the impacts of the project on the surrounding environment.

7.3 Impact Characteristics (Assessment of Significance)

The assessment of effects and identification of residual significance takes account of any incorporated mitigation measures adopted due to any impact of project activities and is largely dependent on the extent and duration of change, the number of people or size of the resource affected, and their sensitivity to the change. Impacts can be both adverse and beneficial and the methodology defined below has been applied to define both beneficial and adverse impacts of the project.

The criteria for determining significance are specific for each environmental and social aspect but generally, the magnitude of each impact is defined along with the sensitivity of the receptor. Generic criteria for impact Characterization are given in Table-12.

Table 12: Impact Characteristics Criteria

Impact Characteristics	Category
Nature of the impact	Direct: The environmental parameter is directly changed by the project. Indirect: The environmental parameter changes as a result of the change in another parameter.
Duration of the impact	Short term: Lasting only till the duration of the project such as noise from the construction activities. Medium-term: Lasting for a period of a few months to a year after the project before naturally reverting to the original condition such as contamination of soil or water by fuels or oil.
Impact Characteristics	Category
	Long term: Lasting for a period much greater than medium-term impacts before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical Location of the impact	Local: Within the area of the project i.e. operation site and access road. Regional: Within the boundaries of the project area. National: Within the boundaries of the country.
Timing	Construction and/or Operation
Likelihood of the impact	Qualitatively measured on a scale of: Almost certain: Impact is expected to occur under most circumstances. Likely: Impact will probably occur under most circumstances. Possibly: Impact may occur at some time.



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	Unlikely: Impact could occur at some time. Rare: Impact may occur but only under exceptional circumstances.
Consequence severity of impact	Rated as: Major: When an activity causes irreversible damage to a unique environmental feature; affects an entire population or species of flora or fauna in sufficient magnitude so as to cause a decline in abundance or change in distribution over more than one generation; has long-term effects (years) on socio-cultural or economic activities of regional significance. Moderate: When an activity causes long-term (period of years) reversible damage to a unique environmental feature; affects a portion of a population of flora or fauna causing reversible damage or change in abundance or distribution over one generation; has short term effects (months) on sociocultural or economic activities of regional significance. Minor: When an activity causes short term (period of few months) reversible damage to an environmental feature; slight reversible damage to a few species of flora or fauna within a population over a short period of time; has short-term (months) effects on socio-cultural or economic activities of local significance. Negligible: When no measurable damage to the physical, socio-economic, or biological environment above the existing level of impacts occurs.
Significance of the impact	Categorized as High, Medium, or Low Based on the consequence, likelihood, reversibility, geographical extent, duration, level of public concern and conformance with legislative or statutory requirements.

7.4 Environmental & Social Screening Checklist

During the planning stage of the enhancement project, a rapid assessment was conducted using REA Checklist templates, for screening of environmental and social impacts. The outcome of the rapid environmental assessment is given below.

- I. No cultural heritage site has been noted or reported within the project alignment or vicinity.
- II. The proposed alignment of GKRB traverses through the Indus Dolphin Game Reserve as well as its buffer area. This dolphin game reserve was also declared as Ramsar wetland of International Importance in 2000.
- III. The bridge main alignment passes through buffer area of Indus Dolphin Game Reserve.
- IV. No reserved or riverine forest area lies in the project alignment. Jangam Belo reserved forest lies at least 3-4 km from the main alignment.
- V. This enhancement phase alignment will be on existing right of way on Indus River from bank to bank.
- VI. No conflicts are reported, noted & anticipated. The area is deprived of development activities.
- VII. The land inside the river bunds (riverine area) and river channel belongs to Government of Sindh.
- VIII. During bridge construction, impacts like dust emissions, noise nuisance due to bridge construction is envisaged in the immediate environment of the project. These impacts may create nuisance for aquatic ecosystem and workplace workers.
- IX. During the construction of the main bridge over Indus River, the river flow will be diverted, if necessary. Same will be done in consultation with Irrigation department.
- X. Concerns of unchecked fuel, oil & lubricant spills in soil & waterways cannot be ruled out.
- XI. Adequate sanitary facilities and drainage in the workers camps will be required.
- XII. Construction workers, tool/plant operators will regularly be trained in safeguards.
- XIII. Safe practices and proper disposal of chemicals will be proposed in the EMP.
- XIV. Some degree of fugitive dust and fumes from asphalt mix during construction is a matter of concern. Impacts will be minimal & in short duration, only during construction phase.
- XV. Social concerns during construction are very minimal and of short duration.
- XVI. A comprehensive traffic safety management plan will be required to implement on project alignment to prevent any hazardous driving conditions.
- XVII. Locals' employment will be given high priority, which will also curtail work camp size and reduce volume of solid waste generation.

7.5 Screening of Potential Impacts (Design, Construction & Operation)

The following Environmental aspects will be taken into account in the designing, construction and operation phases of Project so that these may not impact the environment in both construction and operational phases.

7.5.1 Incursion into Protected Areas

The 170 km stretch of the River Indus between two irrigation barrages Guddu and Sukkur is designated as national protected area for Indus dolphin and is known as Indus Dolphin Game Reserve. The total area of the reserve is 125,000 ha and has a 3 km buffer zone on the floodplains. According to recent estimates in 2011, the reserve holds a population of approximately 918 dolphins.

Indirect human impacts on the Indus Dolphin Game Reserve are difficult to assess but can be identified from human activities. These include agrochemical use from agriculture in the surrounding area. Common crops grown in the region are cotton, wheat and sugarcane. Agrochemical use for agricultural production is common. Cotton requires high applications of fertilizers and pesticides that is a major source of water pollution due to leaching into the ecosystem.

An assessment of threats indicated that grass collection, fishing, fuelwood cutting and grazing are the most impending threats. The extent of tree cutting is expected to be throughout the Indus Dolphin Game Reserve in the Kacha area.

Significant impacts are posed by threats such as grazing and fuelwood collection and perceived flooding due to heavy rains. Fishing, flooding and fuelwood collection were also reported as having long-term effects on the ecosystem. Hunting is predicted to remain as a constant pressure and threat given that the social and political conditions which supported it were not likely to change in the next five years.

Impact No 1: Incursion into Protected Areas						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	significance	+/
	High	Long term	Possible	High	Medium	-



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Mitigation measures:

- i. A detailed ecological management plan is prepared.
- ii. Effective measures shall be taken to protect the environment and control pollution so that management of regional ecology is ensured at the time of demobilization of construction machinery.
- iii. The monitoring protocols for the regular assessment of ecological is established and to be implemented to upgrade information regarding Indus Dolphin Game Reserve.
- iv. The ecological integrity of the Game Reserve will be maintained by improved ecological interventions related to eliminating/reducing harmful practices (pollution, hunting / poaching, illicit cutting, illegal fishing practices, forest fires etc.).
- v. A 'no-hunting, no-trapping, no-harassment' policy is strictly enforced at the project sites.
- vi. Any nesting grounds of wildlife and birds will be relocated/protected.
- vii. Strict administrative measures will be taken against any illegal animal hunting and poaching in such areas for anyone associated with the construction activities.
- viii. Firewood, woody plants and shrubs shall not be used as fuel during construction.
- ix. Personnel and vehicle movements will be restricted to the construction site, camp and approved access roads.
- x. The awareness sessions will be conducted regularly for the sustainable use of natural resources for the local communities living in and around the Indus Dolphin Game Reserve.
- xi. Effluents discharge into the water body shall not be carried out.

7.5.2 Loss of Forests

The 170 km river stretch between Guddu and Sukkur barrages (the dolphin game reserve) contains some riverine forests. These forests along river Indus get annual inundation during monsoon. This is evident in the Indus Dolphin Game Reserve that local communities not only cut the forest trees for their own use to meet the fuel needs but also sell the wood at regular and large scale to people outside who are part of timber mafia.

Irrespective of located away from the reserved forest, the project alignment may affect the riverine trees e.g. *Tamarix aphylla* which are grown in numbers along the banks of river channels. There are other species as well grow in riverine area.

Impact No 2: Loss of Forests.

Project Phase: Construction Phase

Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Medium	Long Term	Possible	Moderate	Medium	-

Mitigation measures:

- i. Enumeration of all trees located in ROW of project alignment is already done. Although all the areas required for the bridge is belonging to the Government.
- ii. Care will be taken to make sure bird habitats are not destroyed. If there is no option available, rehabilitate them in other neighboring trees.
- iii. Tree and vegetation removal will be avoided as much as possible.
- iv. The regular monitoring will be carried out by HSE engineer & ecologist for nest survey before vegetation removal.
- v. Tree plantation will be carried out near the river training works at a ratio of 10 new trees per each tree cut.
- vi. Plantation will be carried out with indigenous species.

7.5.3 Impact on Fauna

The riparian forests of the Indus River have a unique freshwater ecosystem that supports both aquatic and terrestrial biodiversity. It includes approximately 15 species of reptiles, 16 species of mammals, 150 species of avifauna, 67 species of avifauna and 4 species of amphibians are reported in Sindh. Indus River dolphin is the only endangered species among animal species located close to the project area. Barramundi (*Lates calcarifer*) and Hilsa (*Tenulosa ilisha*) are two commercially and migratory important fish species in Indus River. Hilsa (Palla) is an anadromous fish that lives in the sea and travels to Indus reportedly as far as up to Multan for breeding.

Construction works of bridge in River Indus may generate sediment load in the river. Erosion from the construction works and material storage sites also increase the sediment load into the river. Sediment concentrations above natural levels can cause mortality of plankton and fish; for fish, damaged gills and sediment clogging of gill chambers eventually leads to death, which in turn will influence the availability of dolphin's diet.

Impact No 3: Impact on Fauna.

Project Phase: Construction Phase

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Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Medium	Short Term	Possible	Moderate	Medium	-
Mitigation measures: i. The cofferdams and silt curtains will be used (where feasible) to minimize discharge of sediment into the river. ii. Riprap and geotextile will be used for slope protection. iii. Siltation and erosion from earthworks near the river will be controlled through the use of silt traps iv. All excavated material as well as material stockpiles will be maintained at least 500m from the edge of the river. v. Discharges from material storage sites, batching plants, construction yards and construction camps into the river will not be carried out. vi. Contractor will comply with the measures devised in the EMP on soil erosion and sediment control.						

7.5.4 Impact of underwater noise level on dolphin's vocalization and behavior

For dolphins, sound serves three main functions: (i) it provides information about their environment, (ii) it is used for communication and (iii) it enables the remote detection of prey. The sounds generated by dolphins often extend beyond the range audible to the human ear. Vocalizations of Dolphins will be in range of 125-173 (dB at 1m) for whistles and 218-228 (dB at 1m) for clicks. Piling for the foundation works for bridges takes place during the construction period. Piling through rotary drilling generates considerably less underwater noise as compared to pile driving, however, may have potential to impact dolphins as this noise is capable of masking dolphin's vocalization.

Impact No 4: Impact of underwater noise levels on dolphin's vocalization and behavior						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Medium	Short Term	Possible	Moderate	Medium	-
Mitigation measures: i. The use of rotary drilling will be preferred for the construction of foundation which produces less underwater noise levels.						



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- ii. An exclusion zone of about 500 m radius will be monitored for at least 30 minutes before the start of piling.
- iii. In case dolphins are observed in the exclusion zone, piling works will be delayed until they have left the area. If dolphins enter the exclusion zone after piling has commenced, piling works would cease until they have left.
- iv. Piling work will adopt a 'soft start'; using a low energy start to the piling operations to give dolphins an opportunity to leave the area, gradually ramp up the sound levels to scare the dolphins and other cetaceans away before piling commences,
- v. Use of sounds to chase away the dolphins not to come close to the construction site
- vi. Construction activities at river bridge will be carried out in recommended months of Sindh Wildlife Department.
- vii. Pile boring will be conducted during non-monsoon season time (winter, summer, pre-monsoon and post monsoon).
- viii. Regular monitoring of the worksite for dolphins trapped in, or in danger will be done through HSE engineer & ecologist to relocate them.
- ix. River flow will not be blocked at all times for free movement of dolphins.
- x. All barges transporting construction material and workers will have proper guards installed to prevent injury and death of dolphins and other aquatic fauna.
- xi. The contractor will implement the above mitigation measures and monitoring under the supervision of Ecologist.

7.5.5 Risk of dolphin collision with construction vehicles

Most of the water borne construction activities will be taken up for the construction of bridge; hence barge will be used to transport personnel, fuel and smaller construction material. There is a risk of collision between dolphins and barge.

Impact No 5: Risk of dolphin collision with construction vehicles						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/
	Medium	Short Term	Possible	Low	Medium	-
Mitigation measures:						
i.	Ensure all personnel involved in construction activities should be made aware of the presence of dolphins and the potential risks associated with their operations.					
ii.	Training programs should include information on local dolphin's life, their habitats, and behaviors.					



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- iii. Establish designated routes and zones for carrying construction material and activities.
- iv. Avoid areas known to be frequently used by dolphins.
- v. Implement and enforce speed limits in areas where dolphins are known to inhabit or transit.
- vi. Use of sounds to chase away the dolphins not to come close to the construction site.

With the above mitigation measures, the adverse impacts with risk of dolphin collision have been assessed as minimal.

7.5.6 Incursion into Wetlands

The dolphin game reserve also declared as Ramsar wetland of International Importance and upstream and downstream of Guddu Barrage and its pond areas provide an ample opportunity for migratory birds to roost and use as staging ground in winter. The shallow ponds are the attraction for ducks and waders while deep water areas provide food for fish eating birds.

This stretch of the Indus River and nearby shoals and agricultural lands act as wintering grounds for many migratory birds, and habitat for many resident birds. The birds, particularly greater spotted eagle and long-tailed grass warbler, the two threatened species may be affected due to movement of construction traffic; noise generated from construction activities, removal of natural vegetation from the construction areas. However, due to the vast habitat range of these birds along Indus River in Sindh and generally these birds are not confined to a particular location, the project is not expected to have any significant impacts on these two threatened species. If any construction activities disturb their roosting, hunting and feeding grounds, they move to another lesser or undisturbed areas without any difficulty. People do not hunt or poach these two species of birds as they do not have any food or economic values. The presence of avifauna in the project area will increase during the winter months, with the arrival of migratory birds.

Impact No 6: Incursion into Wetlands						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Minor	Short Term	Possible	Low	Low	-



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Mitigation measures:

- i. The contractor will introduce and enforce a Code of Conduct and raise awareness about the protection of birds among the work force to reduce impacts such as disturbance and poaching.
- ii. Noise from construction activities will be reduced by providing mufflers or acoustic enclosures for high noise generating equipment.
- iii. The appropriate and economically quietest available plant and equipment will be used.
- iv. The noise will be reduced by enclosure noisy equipment and placement an enclosure around the noise source.
- v. The fit and maintained earth-moving and other vehicles such as excavators, front-end loaders, etc. will be used at project.
- vi. Bird monitoring will be conducted within the project area during the season to monitor the status of avifauna in the project area and the impacts of habitat loss. If any of the threatened species are in the project area during the monitoring, it will be informed to the contractor and workers for not disturbing these birds.
- vii. The implementation of the mitigation measures and monitoring plan will be carried out by HSE Engineer and Ecologist.

7.5.7 Land Acquisition

The land inside the river bunds (riverine area) and river channel belongs to Government of Sindh and the alignment of enhancement of bridge is same on existing right of way (RoW). Hence, no land acquisition is anticipated for this phase.

7.5.8 Topsoil Erosion

Construction work areas will be a concern wherever any excavation is done as this will expose bare soils and provide a source of material that can be eroded.

The construction activities will be mainly confined to the project alignment only for a short duration, hence the impact of erosion during construction and development phase is minor.

Impact No 7: Topsoil Erosion

Project Phase: Construction Phase

Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/
	Minor	Short Term	Possible	Low	Low	-



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Mitigation measures:

- i. Siltation and erosion from earthworks near the river will be controlled using silt traps.
- ii. Excavation of earth should be limited.
- iii. Stockpile should be covered with tarpaulin or with appropriate material to avoid dust dispersions.
- iv. Water sprinkling will be regularly carried out.
- v. High heap of soil stockpile will be avoided.

7.5.9 Water Contamination

Lubricants that enter the ground and water environment will render the area unusable and may pollute river/canal surface water and groundwater. Roadside unpaved areas, stream channels etc. can be polluted by fuel and lubricants and asphalt entering these systems.

The main concerns will be from containers such as bitumen drums and plastic materials that may be brought on site as wrapping materials.

Barges will be used for transport of personnel. There is a risk of water pollution from these activities through accidental spillage of fuels, hazardous material and bilge water.

Impact No 8: Water Contamination						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Medium	Short Term	Possible	Medium	High	-



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Mitigations measures:

- i. Appropriate spillage prevention measures to be implemented to avoid and contain any spillage and pollution of the water.
- ii. Cofferdams will be used for construction of bridge piers.
- iii. All areas for storage of hazardous materials to be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory stipulation.
- iv. Construction works will be carried out ensuring that no debris or excavated soil are released in water.
- v. Ensure Spill Prevention and Response Plan is prepared and implemented in case of any incident of spill.
- vi. Washing down water from machinery repair areas will be treated into the septic tank system for treatment.
- vii. Fuel handling and filling will be carried out at the dedicated area and not be permitted within or adjacent to watercourses.
- viii. New soil will be brought in as required so that the ground surface is re-established.
- ix. Fuel tanks will be covered with dyke wall with an extra 10% of the storage capacity of the fuel tank. The area will be lined with an impervious base.
- x. Install grease traps on the site, wherever needed, to prevent flow of oily water.
- xi. Spill cleaning kit (shovels, bags and absorbent materials) will be available near fuel and oil storage areas.

7.5.10 Water Consumption and Conservation

Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for such activities is being met from ground water & tube wells. Conservation practices will nevertheless be adopted during the entire course of construction.

Potential sources of impacts on the hydrology and ground water quality during the construction phase are as follows:

- Soil runoff from the site leading to off-site contamination (particularly during rainy season).
- Improper disposal of construction debris leading to off-site contamination of water resources.
- Spillage of oil and grease from the vehicles and wastewater stream generated from onsite activities such as vehicles washing, workshop etc.

Impact No 09: Water Consumption and Conservation

Project Phase: Construction Phase

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Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/
	Medium	Short Term	Possible	Low	Low	-
Mitigation Measures - The wastewater will be treated into the septic tank prior to discharge from site/camp. - The storm water diversion channels will be developed to divert storm runoff from flowing over the construction areas. - Regular monitoring of water consumption will be carried out. - Appropriate tanks will be utilized for storage of water to avoid leakage.						

7.5.11 Solid Waste Management

Typical solid waste generated during construction include waste concrete, steel scrap, wooden scaffolding, empty cement bags, excavated soil, wood remains etc. Solid waste generated during land clearance and Earth-fill material will be in large quantities. This waste has the potential to have a negative impact on the surroundings if not properly managed and disposed of. It is likely to block nearby drainage channels that can ultimately cause localized flooding during the monsoon. Irregular storage of this waste may harm the workers at the site as well. Windblown debris is a nuisance to the nearby dwelling units. Poor waste management practices would result in short term, and long-term negative impact on the aesthetics of the surrounding.

Impact No 10: Solid Waste Management						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/
	Low	Short Term	Possible	Low	Low	-
Mitigation measures: To mitigate impacts from construction waste, following measures will be required to adopt good construction site housekeeping practices: - A Comprehensive Waste Management Plan for Construction phase is developed and to be implemented for bridge construction works. - Construction sites will be equipped with temporary refuse bins, and construction waste will be collected on a daily basis and contained in a temporary designated waste storage area on each site.						

- iii. Designated waste storage areas will be developed at the distance of 500 m of waterways.
- iv. Waste will be regularly collected from the collection points to designated storage for further disposal at district administration waste disposal facilities.
- v. Hazardous waste generated during the construction works (if any) shall be disposed off at SEPA Approved facilities.
- vi. Upon completion of activities at a construction site, all solid wastes will be completely removed, and the site will be re-contoured or prepared for natural re-vegetation.

7.5.12 Air Pollution

Construction activities that may lead to dust generation include cutting and excavation; transportation and tipping of cut materials; transportation of raw materials; handling and storage of aggregates in concrete plants; concrete batching; construction of structures and associated activities.

Temporary dust nuisance, measurable as Total Suspended Particulates (TSP) and Respirable Suspended Particulates (RSP), may generate as a result of construction activities during the construction phase. Among all construction activities, site formation has the highest potential of causing dust nuisance. Dust from haulage vehicles as they bring road materials to site may be a problem for communities during the dry season.

Given the scale and dispersed nature of the Project construction these impacts will be localized to each construction site and small scale in nature.

Impact No 11: Air Pollution						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Low	Short Term	Possible	Low	Low	-



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Mitigation Measures

- i. Dust Abatement Plan will be implemented at site.
- ii. Vehicles carting hauling soil, sand, and other loose materials will be covered from top and maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the vehicle).
- iii. Water sprinkling on all unsealed roads will be carried.
- iv. Traffic speeds on all unpaved surfaces will be reduced to 20 km per hour or less.
- v. Paved roads will be cleaned frequently.
- vi. Wheel washers will be installed for vehicle exit onto paved road from unpaved.
- vii. Maintenance plan of vehicles and machinery will be implemented.
- viii. Natural vegetation will be retained as much as possible.
- ix. Stockpiles will be adequately wet, cover with plastic to avoid dust.
- x. Standard construction equipment and vehicles will be used.
- xi. Maintenance of equipment and vehicles including engine tuning, filter cleaning, etc. will be carried out as per recommended schedule.

7.5.13 Noise Impacts

The noise generation is anticipated from bridge piling, improper silencing of vehicles and equipment used on construction site. These will impact on workforce, communities as well as river habitat. These construction activities are expected to produce noise levels in the range of 70 – 80 dB(A), and may cause discomfort to workforce, nearby communities residents as well as birds and river habitat.

Impact No 12: Noise impacts						
Project Phase: Construction Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Low	Short Term	Possible	Low	Low	-



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Mitigation measures:

- i. All construction vehicles, machineries and equipment to be installed with suitable silencers.
- ii. Project construction zone to be barricaded and proper signs boards to be displayed
- iii. Unauthorized personnel will not be allowed to access construction zone.
- iv. Onsite workers associated with construction activities will be provided with adequate 'personal protective equipment' (PPE) to reduce their probability of high noise exposure.
- v. Advanced available quietest plant and equipment will be mobilized that can economically undertake the work required.
- vi. Regular maintenance of the equipment will be carried out.
- vii. Workers' exposure to high noise levels will be reduced by rotating workers' tasks.
- viii. Noise monitoring will be done from 7.5 m away from source after applying above measures to assess the noise within SEQS limits.

7.5.14 Health and Safety Concerns

Construction phase activities may result in severe health and safety hazards and health conditions. It is important to note that the untrained workers may cause harm to themselves as well as others due to lack of awareness and skills.

Temporary breeding habitats for mosquito vectors and rodents can be created in areas of stagnant water that may remain in discarded solid waste such as plastics, old tires and metal containers that may be allowed to accumulate around worker camps. Worker camps can be unhygienic and affect worker health from poor sanitation and lack of potable water.

The possibility for the transmission of communicable diseases (such as STI's and HIV/AIDS) to the local community is rare because local people will be hired on priority for the project. There will be a risk to community health and safety due to the transport, storage, and use and/or disposal of materials such as fuel and other chemicals during construction.

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Impact No 13: Health and Safety Concern

Project Phase: Construction Phase

Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Medium	Short Term	Possible	Low	Medium	-

Mitigation Measures

- i. Only skilled workers will be allowed to work at the construction sites.
- ii. Provision of first aid facilities for workers at site for meeting the emergency needs of workers.
- iii. Emergency response training will be given to employees and evacuation drills should be scheduled and conducted.
- iv. Ensure that hazards associated with manual lifting are controlled by proper lifting techniques, work rotation system will reduce the chances of being exposed to work related stress associated with construction activities.
- v. Unauthorized personnel will not be allowed to access the project site without permission and safety permits.
- vi. Arrangement of proper first aid unit and emergency vehicle to take affected personnel to the nearest medical facility.
- vii. Workers will be facilitated by providing appropriate work specific PPE's.
- viii. Construction area will be barricaded to avoid accidents and will be properly drained to avoid stagnant water that could harbor mosquitoes and other disease vectors.
- ix. Accidents records will be maintained.
- x. Use of signage must be implemented.
- xi. Camp and construction areas will be provided with appropriate septic sanitation facilities and potable water.
- xii. No untreated human waste should be allowed to enter streams.
- xiii. Local employment will be provided to reduce the hazards of exacerbating malaria and dengue fever.

7.5.15 Generation of employment in the project area

Around 300 skilled and non-skilled workers will be required during construction on continuous basis, and about 400 workers during peak time. The project offers good opportunities for local employment as unskilled and skilled construction workers.



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Impact No. 14: Generation of Employment

Project Phase: Construction Phase

Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	Medium	Short Term	Possible	Low	Low	+

Enhancement measures:

- i. Ensure preferential recruitment of local candidates provided they have the required skills and qualifications.
- ii. Include an assessment of the contractor's demonstrated commitment to domestic and local procurement and local hiring in the tender evaluation process.
- iii. Coordinate recruitment efforts related to non-skilled labor, including for non-skilled labor positions required by contractors.
- iv. Employing local people will also diffuse the conflicts between migrant workers and local community.

Good practice measures:

Determine what is 'fair and transparent' in recruitment and in distribution of jobs between different community groups, in consultation with local communities and their leaders.

7.5.16 Community Safety Risks

Increase in road accidents to people are expected to increase after the improvement of the roads. Failure of bridges over Indus or its river training structures from earthquakes or floods would result in fatalities and failure of culverts and bridges over canals an uncontrolled release of water.

Impact No. 01: Community Safety Risks due to both Accidental and Natural causes						
Project Phase: Operational Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/
	Medium	Long Term	Possible	Low	Low	-
Mitigation Measures • Properly designed speed bumps, speed signs and possibly traffic signals will be installed within settlements. • A proper road safety program will be developed. • Emergency preparedness plan will be made to deal with such incidents of earthquake and floods.						

7.5.17 Dolphin Habitat Fragmentation

Before construction of barrages on Indus, Dolphins are reported to inhabit entire Indus basin. Construction of barrages and diversion of water for irrigation has resulted into fragmentation of dolphins' habitat and finally extirpation of dolphins in many river sections of Indus and its tributaries. Currently dolphin population is limited to lower Indus in Sindh with river reach between Guddu and Sukkur is a protected area for dolphin.

The original bridge of 2.15 km may have created hindrance in the free movement of the dolphin. However, with the revised extended bridge over the entire river width will remove this shortcoming.

Impact No. 22: Dolphin Habitat Fragmentation						
Project Phase: Operational Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/
	Medium	Long Term	Possible	Low	Low	+



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Mitigation Measures

Due to the construction of bridge over entire width of the river (Bank to Bank), further fragmentation of dolphins will not occur as they will move freely between the columns of bridge over River Indus along the water.

7.5.18 Improved Accessibility

The project will achieve the prime objectives of sustainable development in facilitating dedicated, safe, secure and speedy travel along the National Highways, besides upgrading and modernizing the infrastructure facilities of the fast-growing section by identifying the bottlenecks and removing the constraints to smooth flow of traffic.

At present the road distance between Ghotki and Kandhkot via Guddu Barrage is 151 km. with the construction of this bridge, the distance from Ghotki to Kandhkot will be drastically reduced to 42 km from 151 km thus saving of 108 km would have time saving of around 2 hr.

Impact No. 2 Improved Accessibility						
Project Phase: Operational Phase						
Potential Impacts	Magnitude	Duration	Probability	Consequences	Significance	+/-
	High	Long Term	Possible	Low	High	+



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Enhancement Measures

- i. Clear Signage and Road Markings: Use clear and visible signage to indicate speed limits, directions, hazards, and pedestrian crossings. Road markings should also be distinct and easy to understand.
- ii. Traffic Calming Measures: Integrate speed bumps, roundabouts, and chicanes strategically to encourage lower speeds and safer driving behavior.
- iii. Pedestrian Crossings and Walkways: Designate safe crossing points for pedestrians, including zebra crossings etc.
- iv. Roadside Safety Features: Install guardrails, crash barriers, and clear zones to minimize the impact of accidents and protect road users from hazards such as steep slopes or water bodies.
- v. Lighting: Ensure adequate lighting along the bridge to enhance visibility, particularly at night or in low-light conditions, reducing the risk of accidents.
- vi. Speed Management: Implement speed limit controls through signage, speed cameras, or physical measures to encourage compliance with safe speed limits.
- vii. Regular Maintenance: Maintain roads regularly to repair potholes, remove debris, and address any other hazards promptly to ensure road safety standards are upheld.
- viii. Public Education and Awareness: Conduct campaigns to educate road users about safe driving practices, pedestrian safety, and the importance of adhering to traffic rules and regulations.

CHAPTER 8: ENVIRONMENTAL MANAGEMENT PLAN

8.1 Background Information

The potential environmental impacts during the construction and operation phases of bridge project on various environmental components such as social, ecological and physical environment were predicted during the EIA study. This EIA document has also identified mitigation measures to minimize the environmental impacts of the project, keeping these effects within acceptable limits.

The EMP (Environmental Management and Monitoring Plan) has been designed to address how the measures will be implemented. It defines the responsibilities of a project team; develops a system of checks and balances; proposes actions that are to be taken by each role player; and lays down the required documentation, communication, and monitoring procedures.

8.1.1 Objectives and Purpose of EMP

The purpose of this EMP is not only to address the expected environmental impacts of the proposed project, but also to enhance project benefits and to introduce standards of good practice to be adopted for the proposed project.

The primary objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures that are identified in the EIA.
- Define the responsibilities of the project team and to provide a means for effective communication of environmental issues between them.
- Identify monitoring parameters in order to ensure the effectiveness of the mitigation measures guidelines.

It is worth mentioning that the project is already under execution and the management is in place.

8.2 Environmental Management Monitoring Plan

Detailed Environmental Management Plan for construction and operation phases is given in Table-13. Meanwhile on the other hand the detailed Environmental Monitoring Plan for construction and operational phases is given in Table-14.



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Table 13: Environmental Management (Mitigation) Plan for Construction & Operation Phases

S. No.	Aspect	Probable Impact	Safeguards and Mitigations	Responsibility	Supervised by
Construction Phase					
1.1	Incursion into Protected Areas	Disturbance of the habitat of endangered species like Indus dolphin and other migratory birds	• A detailed ecological management plan is prepared. Effective measures shall be taken to protect the environment and control pollution so that restoration of regional ecology is ensured at the time of demobilization of construction machinery. • The monitoring protocols for the regular assessment of ecological is established and to be implemented to upgrade information in the national and international databases regarding Indus Dolphin Game Reserve. • The ecological integrity of the Game Reserve will be maintained by improved ecological interventions	EPC Contractor – HSE Engineer & Ecologist	GKRB - Project Manager



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			related to eliminating/reducing harmful practices (pollution, hunting / poaching, illicit cutting, illegal fishing practices, forest fires etc.). • A 'no-hunting, no-trapping, no-harassment' policy is strictly enforced at the project sites. • Any nesting grounds of wildlife and birds will be relocated/protected. • Strict administrative measures will be taken against any illegal animal hunting and poaching in such areas for anyone associated with the construction activities. • Firewood, woody plants and shrubs shall not be used as fuel during construction. • Personnel and vehicle movements will be		
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			restricted to the construction site, camp and approved access roads. • The awareness sessions will be conducted regularly for the sustainable use of natural resources for the local communities living in and around the Indus Dolphin Game Reserve. • Effluents discharge into the water body shall not be carried out.		
1.2	Loss of Forest	The project alignment may affect the riverine trees	• Enumeration of all trees located in ROW of project alignment is already done. Although all of the areas required for the bridge is kaccha belonging to the Government. • Vegetation clearance shall be	EPC Contractor – HSE Engineer & Ecologist	GKRB - Project Manager



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			limited to the extent required for execution of works. Care will be taken to make sure bird habitats are not destroyed. If there is no option available, rehabilitate them in other neighboring trees. • The regular monitoring will be carried out by HSE engineer & ecologist for nest survey before vegetation removal. • Tree plantation will be carried out near the river training works at a ratio of 10 new trees per each tree cut.		
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			Plantation will be carried out with indigenous species		
1.3	Impacts on Fauna	Construction works of bridge in River Indus may generate sediment load into the river. Erosion from the construction works and material storage sites also increases the sediment load to the river. Sediment concentrations above natural levels can cause mortality of plankton and fish.	- The cofferdams and silt curtains will be used (where feasible) to minimize discharge of sediment into the river. - Rock riprap and geotextile will be used for slope protection. - Siltation and erosion from earthworks near the river will be controlled through the use of silt traps - All excavated material as well as material stock piles will be maintained at least 100m from	EPC Contractor – HSE Engineer & Ecologist	GKRB - Project Manager



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			the edge of the river. • Fish salvage will be conducted using a seine net and/or dip net and the fish released unharmed downstream. • Discharges from material storage sites, batching plants, construction yards and construction camps into the river will not be carried out. • Contractor will comply with the measures devised in the EMP on soil erosion and sediment control		
1.4	Underwater noise due to construction	Impact of underwater noise levels on dolphin's vocalization and behavior	• The use of rotary drilling will be preferred for the	EPC Contractor – HSE Engineer & Ecologist	GKRB - Project Manager



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			construction of foundation which produces less underwater noise levels. • Monitoring an exclusion zone of about 500 m radius for at least 30 minutes before the start of piling. • In case dolphins are observed in the exclusion zone, piling works will be delayed until they have left the area. If dolphins enter the exclusion zone after piling has commenced, piling works would cease until they have left; • Piling work will adopt a 'soft start'; using a low energy		
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			start to the piling operations to give dolphins an opportunity to leave the area, gradually ramp up the sound levels to scare the dolphins and other cetaceans away before piling commences, • Use of sounds to chase away the dolphins not to come close to the construction site • Construction activities at river bridge will be carried out in recommended months of Sindh Wildlife Department. • Pile boring will be conducted during		
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			non-monsoon season time (winter, summer, pre-monsoon and post monsoon). • Regular monitoring of the worksite for dolphins trapped in, or in danger will be done through HSE engineer & ecologist to relocate them. • River flow will not be blocked at all times for free movement of dolphins. • All barges transporting construction material and workers will have proper guards installed to prevent injury and death of		
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			dolphins and other aquatic fauna. The contractor will be implementing the above mitigation measures and monitoring under the supervision of Ecologist.		
1.5	Risk of dolphin Collision with construction vehicles	Water borne construction activities will be taken up for the construction of bridge; hence barges will be used to transport personnel, fuel and smaller construction material. There is a risk of collision between dolphins and barges.	- Ensure all personnel involved in construction activities should be made aware of the presence of dolphins and the potential risks associated with their operations. - Training programs should include information on local dolphin's life, their habitats, and behaviors.	EPC Contractor – HSE Engineer & Ecologist	GKRB - Project Manager



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			• Establish designated routes and zones for carrying construction material and activities. • Avoid areas known to be frequented use by dolphins. • Implement and enforce speed limits in areas where dolphins are known to inhabit or transit. Restrict barges speed within 15 km/h. • Use of sounds to chase away the dolphins not to come close to the construction site. • Use of proper guards installed barges for movement & transportation.		
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1.6	IncurSION Wetland	into	The birds may be affected due to movement of construction traffic; noise generated from construction activities, removal of natural vegetation from the construction areas	• The contractor will introduce and enforce a Code of Conduct and raise awareness about the protection of birds among the work force to reduce impacts such as disturbance and poaching. • Noise from construction activities will be reduced by providing mufflers or acoustic enclosures for high noise generating equipment. • The appropriate and economically quietest available plant and equipment will be used. • The noise will be reduced by	EPC Contractor – HSE Engineer & Ecologist	GKRB - Project Manager
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			Enclosure noisy equipment and placement an enclosure around the noise source. • The fit and maintained earth-moving and other vehicles such as excavators, front-end loaders, etc. will be used at project. • Bird monitoring will be conducted within the project area during migratory bird season to monitor the status of avifauna in the project area and the impacts of habitat loss. If any of the threatened species are in the project area during the monitoring, it will be		
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			informed to the contractor and workers for not disturbing these birds. The implementation of the mitigation measures and monitoring plan will be carried out by HSE Engineer and Ecologist.		
1.7	Soil Contamination	A lot of heavy machinery is used for digging the soil, transportation of raw material/construction material and transport of workers. A significant amount of solvents and lubricants oil is used and stores at the project site. Any accidental release of such material can contaminate the soil and surrounding environment.	- Prepare a Spill Prevention and Response Plan. - Appropriately mark fuel tanks by content and store in dyke areas. - Install grease traps on the site, wherever needed, to prevent flow of oily water. - Spill cleaning kit (shovels, bags, and absorbent materials)	EPC Contractor – HSE Engineer	GKRB - Project Manager



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			will be available near fuel and oil storage areas. • Carry cleanup kits in all fuel trucks. • The bottom of any soak pit or septic tank shall be at least 10 m above the groundwater table.		
1.8	Water Contamination	A lot of water will be used and the discharge from construction activities has the potential to contaminate river and thus adversely affecting the Indus Dolphin and other biotic life in the river.	• Build separate pits at sites for temporary handling of contaminated soil and water. • Store fuels and lubricants in covered and dyked areas, underlain with impervious lining. • Spill control kits should be available near fuel and oil storage areas. • Remove contaminated soil from the site and dispose to ensure protection of water sources.	EPC Contractor – HSE Engineer	GKRB - Project Manager



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			• Construct bottom of soak pit or septic tank at least 500 meters away from water sources. • Use silt traps to prevent contamination of river and streams. • Construct Proper washrooms for the workers. • Proper waste management practices to be implemented. • Sewage should not be let exposed in open areas.		
1.9	Water Consumption & Conservation	Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for such activities is being met from ground water & tube wells. The possible potential impact will be soil runoff from the site leading to off-site contamination (particularly during rainy season), improper disposal of construction debris leading to off-site contamination of	• The wastewater will be treated into the septic tank prior to discharge from site/camp. • The storm water diversion channels will be developed to divert storm runoff from flowing over the construction areas.	EPC Contractor – HSE Engineer	GKRB - Project Manager



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		water resources and spillage of oil and grease from the vehicles and wastewater stream generated from onsite activities such as vehicles washing, workshop etc	• Regular monitoring of water consumption will be carried out. • Appropriate tanks will be utilized for storage of water to avoid leakage		
1.10	Disposal of Solid Waste	The extent of environmental Impacts of the solid waste would depend upon their disposal practices indiscriminate disposal of solid waste would lead to surface as well as ground water pollution. The major sources of solid waste, associated with the construction of the project are solid waste from workers' camps, construction debris and waste, waste mechanical equipment and parts, used oil from machinery and transport and waste construction chemicals.	• A Comprehensive Waste Management Plan for Construction phase is developed and to be implemented for bridge construction works. • Construction sites will be equipped with temporary refuse bins, and construction waste should be collected on a daily basis and contained in a temporary designated waste storage area on each site. • Designated waste storage areas will be	EPC Contractor – HSE Engineer	GKRB - Project Manager



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			developed at the distance of 500 m of waterways. • Waste will be regularly collected from the collection points to designated storage for further disposal at district administration waste disposal facilities. • Hazardous waste generated during the construction works (if any) shall be disposed off at SEPA Approved facilities. • Waste generated during site clearance activities shall be disposed off at the empty low-lying areas. • Upon completion of activities at a construction site all solid wastes will be completely removed, and the site will be		
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			re-contoured or prepared for natural re-vegetation.		
1.11	Air Pollution	The main sources of air pollution (in particular dust and particulate matter) are; Construction material stock piles earthen materials and sand, blown by wind if openly stored, transportation of construction materials like earthen materials, sand, in uncovered trucks, blown by wind and vibration, land clearing, excavation, dumping, spreading, grading and compaction, fugitive dust emissions from concrete batching plants, movements of construction machinery and construction materials transport vehicles over unpaved areas. Major sources of other principal pollutants including CO, Sox, NOx and VOC would be construction machinery, equipment and construction materials transport vehicles.	- Develop and implement an Air Pollution Control Plan. - Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer). - Install and maintain all vehicles and machinery with appropriate emission control equipment. - To the extent possible, use new and low emission equipment and vehicles.	EPC Contractor – HSE Engineer	GKRB - Project Manager



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			• Purchase best quality fuel and lubes and where possible use lead free oil and lubes. • Reduce traffic speeds to 20 km per hour or less.		
1.12	Noise Pollution and Vibration	Construction noise includes Noise from operation of construction machinery and equipment for the construction activities including excavation and demolition work, site preparation work, foundations and concrete placement, erection of metal structures, installation of mechanical and electrical equipment and building maintenance or repair work. Noise from movement of vehicles within, entering or leaving a construction site. Noise would have an adverse impact on Indus dolphin and other aquatic life in the river.	• All construction vehicles, machineries and equipment to be installed with suitable silencers. • Project construction zone to be barricaded and proper signs boards to be displayed • Unauthorized personnel will not be allowed to access construction zone. • Onsite workers associated with construction activities will be provided with	EPC Contractor – HSE Engineer	GKRB - Project Manager



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			adequate 'personal protective equipment' (PPE) to reduce their probability of high noise exposure; • Advanced available plant and equipment will be mobilized that can economically undertake the work required. • Regular maintenance of the equipment will be carried out. • Workers' exposure to high noise levels will be reduced by rotating workers' tasks. • Noise monitoring will be done from 7.5 m away from source after applying above measures to assess the noise within SEQs limits		
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1.13	Health & Safety	i. All construction vehicles, machinery and equipment to be installed with suitable silencers. ii. Project construction zone to be barricaded and proper sign boards to be displayed iii. Unauthorized personnel will not be allowed to access construction zone. iv. Onsite workers associated with construction activities will be provided with adequate 'personal protective equipment' (PPE) to reduce their probability of high noise exposure; v. Advanced available plant and equipment will be mobilized that can economically undertake the work required. vi. Regular maintenance of the equipment will be carried out. vii. Workers' exposure to high noise levels will be reduced by rotating workers' tasks. viii. Noise monitoring will be done from 7.5 m away from source after applying above measures to assess the noise within SEQs limits	• Only skilled workers will be allowed to work at the construction sites. • Provision of first aid facilities for workers at site for meeting the emergency needs of workers. • Emergency response training will be given to employees and evacuation drills should be scheduled and conducted. • Ensure that hazards associated with manual lifting are controlled by proper lifting techniques, work rotation system will reduce the chances of being exposed to work related stress associated with construction activities.	EPC Contractor – HSE Engineer	GKRB - Project Manager
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			• Unauthorized personnel will not be allowed to access the project site without permission and safety permits. • Arrangement of proper first aid unit and emergency vehicle to take affected personnel to the nearest medical facility. • Workers will be facilitated by providing appropriate work specific PPE's. • Construction areas will be barricaded to avoid accidents and will be properly drained to avoid stagnant water that could harbor mosquitoes and other disease vectors. • Accidents records will be maintained.		
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			• Use of signage must be implemented. • Camp and construction areas will be provided with appropriate septic sanitation facilities and potable water. • No untreated human waste should be allowed to enter streams. • Local employment will be provided to reduce the hazards of exacerbating malaria and dengue fever. • Community Health and Safety Plan Safety Plan will be implemented at site.		
1.14	Socio-economic Impacts	The project will directly and indirectly contribute to prosperity and well-being of the people employed by the Project/local and the province of Sindh.	• Ensure preferential recruitment of local workers • Include an assessment of the contractor's demonstrated	EPC Contractor – HSE Engineer	GKRB - Project Manager



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			commitment to domestic and local procurement and local hiring in the tender evaluation process. Determine what is considered to be 'fair and transparent' in recruitment and in distribution of jobs between different community groups, in consultation with local communities and their leaders.		
Operation Phase					
2.1	Community Safety Risk	The road accidents to people are expected to increase after the improvement of the roads.	- Properly designed speed bumps, speed signs and possibly traffic signals will be installed within settlements. - A proper road safety program will be developed. - Emergency preparedness plan will be prepared to	GKRB - O&M Engineer	GKRB - Project Manager



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			deal with such incidents of earthquake and floods.		
2.2	Improved Accessibility	The project will achieve the prime objectives of sustainable development in facilitating dedicated, safe, secure and speedy travel along the National Highways, besides upgrading and modernizing the infrastructure facilities of the fast-growing section by identifying the bottlenecks and removing the constraints to smooth flow of traffic.	• Clear Signage and Road Markings: Use clear and visible signage to indicate speed limits, directions, hazards, and pedestrian crossings. Road markings should also be distinct and easy to understand. • Traffic Calming Measures: Integrate speed bumps, roundabouts, and chicanes strategically to encourage lower speeds and safer driving behavior. • Pedestrian Crossings and Walkways: Designate safe crossing points for pedestrians,	GKRB - O&M Engineer	GKRB - Project Manager



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			including zebra crossings etc. • Roadside Safety Features: Install guardrails, crash barriers, and clear zones to minimize the impact of accidents and protect road users from hazards such as steep slopes or water bodies. • Lighting: Ensure adequate lighting along the bridge to enhance visibility, particularly at night or in low-light conditions, reducing the risk of accidents. • Speed Management: Implement speed limit controls through signage, speed cameras, or physical measures to encourage		
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			compliance with safe speed limits. • Regular Maintenance: Maintain roads regularly to repair potholes, remove debris, and address any other hazards promptly to ensure road safety standards are upheld. • Public Education and Awareness: Conduct campaigns to educate road users about safe driving practices, pedestrian safety, and the importance of adhering to traffic rules and regulations.		
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ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



Table 14: Environmental Management (Monitoring) Plan for Construction & Operation Phases

Aspect	Monitoring Parameters	Monitoring Frequency	Reporting Frequency	Monitoring Responsibility	Supervision Responsibility
Construction and Operation Phases					
Protected Areas	- Counting number, occurrence assessment, and presence of infants will be monitored within a 2 km buffer area from bridge location. - Check monitoring checklist of ecological protection and management plan. - Check the record of nesting relocated and awareness session.	Continuously (During bridge construction works)	Monthly	EPC Contractor-HSE Engineer & Ecologist	GKRB – Project Manager
Forest	- Check the inventories of trees remove/relocated. - Check monitoring checklist trees and nursery visits. - Visual inspection of nursery and tree plantation. - Check the implementation of adherence of the - mitigation measures proposed in EMP. - Check Tree survival of Plantation Site	Continuously (During bridge construction works)	Monthly	EPC Contractor-HSE Engineer & Ecologist	GKRB – Project Manager



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Fauna	- Visual inspection of wastewater and solid waste management practices. - Check the dust and siltation control measures. - Check monitoring checklist of ecological protection and management plan. - Check the implementation of adherence of the mitigation measures proposed in EMP.	Continuously (During bridge construction works)	Monthly	EPC Contractor-HSE Engineer & Ecologist	GKRB – Project Manager
Dolphin & Underwater Noise	- Check the implementation of adherence of the mitigation measures proposed in EMP. - Check Noise levels on decibels (dB) scale over a range of frequencies which the level is measured (1μPa²/Hz for Peak, SEL and RMS) noise levels using hydrophones (At a distance of 250m and 500m from pier construction locations).	Continuously (During bridge construction works)	Monthly	EPC Contractor-HSE Engineer & Ecologist	GKRB – Project Manager
Dolphin Collision Risk	- Check the implementation of adherence of the mitigation measures proposed in EMP. - Check the record of staff awareness sessions.	Continuously (During bridge construction works)	Monthly	EPC Contractor-HSE Engineer & Ecologist	GKRB – Project Manager



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	Visual inspection of speed limit, construction route and use of sounds chase way.				
Wetlands	- Visual inspection of noise control measures on machinery - Check record of mobilization of machinery - Check record of bird monitoring (during migratory season). - Check the implementation of adherence of the mitigation measures proposed in EMP.	Continuously (During bridge construction works)	Monthly	EPC Contractor-HSE Engineer	GKRB – Project Manager
Soil	- Check native soil conservation procedures and activities - Visual inspection of material storage containment. - Visual inspection of implementation of stockpile and earthworks mitigation measures proposed in EMP - Visual inspection of water sprinkling and dust control. - Check location of stockpiles distance from waterways.	Weekly	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
Water Contamination	- Check wastewater treatment system at all sources of discharges (camp, construction sites, etc.). - Check availability of spillage collection kit.	Weekly	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager



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	- Visual inspection of locations of wastewater treatment from waterways. - Check chemical and fuel storage secondary containment.				
Water Consumption & Conservation	- Check storm water diversion system - Check record of water consumption - Check the implementation of adherence of the mitigation measures proposed in EMP.	Weekly	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
Solid Waste Management	- Housekeeping and construction debris management. - Waste Storage Practices. - Waste Disposal Mechanism	Weekly	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
Ambient and Noise Air	- Check vehicle, equipment and machinery fitness, emissions and noise. - Check the implementation of adherence of the mitigation measures proposed in EMP.	Weekly	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
	Water sprinkling	Daily	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
Human Health and Safety	HSE inspection of mitigation measures proposed in EMP.	Daily	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
	Staff and contractors' Qualification.	Before Mobilization	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager



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	HSE toolbox talk and training records.	Daily	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
	Speed limit.	Daily	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
Employment	- Check record of skilled and unskilled labor. - Check percentage of local labor.	Weekly	Quarterly	EPC Contractor-HSE Engineer	GKRB – Project Manager
Operation Phase					
Community Safety	- Check placement of speed bumps, speed signs and possibly traffic signals will be installed within settlements. - Check emergency preparedness plan availability with O&M Team - Check record of emergency and response actions.	Bi-monthly	Quarterly	GKRB O&M Engineer	GKRB – Project Manager
Improved Accessibility	- Check use of clear and visible signage to indicate speed limits, directions, hazards, and pedestrian crossings. - Check calming measures integrated speed bumps, roundabouts, and chicanes.	Bi-monthly	Quarterly	GKRB O&M Engineer	GKRB – Project Manager



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- Check designated safe crossing points.
- Check installation of guardrails, crash barriers, and clear zones.
- Check lighting and awareness related to dolphin and birds' protection and safety.



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8.3 Environmental Monitoring and Sampling Plan

The environmental monitoring and sampling plan is given in Table-15.

Table 15: Environmental Monitoring and Sampling Plan

Components	Parameters	Locations	Frequency	Responsibility	Supervision
Ambient Air Quality	SO ₂ , NO, NO ₂ , CO, Suspended Particulate Matter, PM ₁₀ and PM _{2.5}	Construction sites, batching plant, material storage site	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager
Ambient Noise Level	Noise level monitoring as per SEQS	Construction Sites, construction camp Sites, on both banks of The river, near batching plan	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager
Drinking Water Quality	Sampling and testing monitoring as per SEQS	Drinking water source(s)	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager
Surface Water Quarterly	Color, temperature, turbidity, EC, hardness, chloride, nitrate, BOD, COD, pH, TDS, DO, SS and Grease & Oil, heavy metals	Two locations, which include the right and left bank of river	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager
Gaseous Emissions (Generators)	CO, SO _x , NO _x , PM	Construction site(s) and camps	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager
Gaseous Emissions	CO, Smoke & Noise	Construction site(s) and camps	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager



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(Machinery & Vehicles)					
Ground Water Quality	DO, BOD, COD, turbidity, pH, TOC, TDS, TSS, EC, As, Coliform, Hardness, oil and grease)	Construction site	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager
Wastewater	pH, TSS, BOD, COD, TDS, Oil & Grease	Discharge point(s)	Quarterly	EPC Contractor-HSE Engineer	GKRB-Project Manager

Conclusion

The proposed enhancement of length of bridge over Indus River will have long term positive impacts due to construction of bridge (bank to bank). After utilizing the environmental and social tools and analysis of the observed/recorded data for the EIA Study, it has been determined that the implementation of the proposed enhancement project will have many beneficial impacts.

Under this EIA study following aspects have been covered.

- Review of relevant legislative requirements applicable on the revised bridge design.
- Review, documentation and analysis of the existing baseline conditions in project surrounding areas.
- Identification, documentation and analysis of environmental and social impacts associated with the proposed project construction and operations.
- Identification and documentation of mitigation safeguards to minimize the adverse environmental impacts of the proposed project construction and operations.

Therefore, this EIA study concludes the following:

The project will ensure smooth flow during high flood season and maintaining the ecological balance of the aquatic ecosystem. The project will facilitate mobility of both people and goods between Ghotki and Kandhkot cities and provide a shortest link between N5 and N55 by constructing the bridge over Indus River. In addition, the project will also help in betterment of environment by saving fuel consumption and subsequently reduction in carbon emissions.

Additionally, a detailed EMMP identifies all the possible impacts associated with construction and operational phases of the proposed enhancement project and mitigation safeguards are integral part of the plan to minimize adverse impacts associated with the project. Based on the point discussed above it is concluded that the proposed enhancement project will not have any significant long term adverse impacts onto the existing environment, if the strict implementation of the Environmental Management and Monitoring Plan (EMMP) be ensured during the construction and operations. The impacts identified were mostly short term, site specific and would be easily managed by implementation of the EMMP in this EIA document.

Annexures

	ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT	
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Annexure 1: Sindh Environmental Protection Act, 2014



The Sindh Government Gazette

Published by Authority

KARACHI THURSDAY MARCH 20, 2014

PART-IV

PROVINCIAL ASSEMBLY OF SINDH

NOTIFICATION

KARACHI, THE 20th MARCH, 2014.

NO.PAS/Legis-B-06/2014-The Sindh Environmental Protection Bill, 2014 having been passed by the provincial Assembly of Sindh on 24th February, 2014 and assented by the Governor of Sindh on 19th March, 2014 is hereby published as an Act of the legislature of Sindh

THE SINDH ENVIRONMENTAL PROTECTION ACT, 2014

SINDH ACT NO.VIII OF 2014

AN ACT

to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development.

WHEREAS it is expedient to provide for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, promotion of sustainable development, and for matters connected therewith and incidental thereto;

Preamble

PART-I

It is hereby enacted as follows:-

1. Environmental (1) This Act may be called the Sindh Protection Act, 2014.

Short title and commencement



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



- (2) It extends to the whole of the Province of Sindh.
(3) It shall come into force at once

2. In this Act, unless there is anything repugnant in the subject or context-

Definitions

- (i) "adverse environmental effect" means impairment of, or damage to, the environment and includes—
(a) impairment of, or damage to, human health and safety to biodiversity or property;
(b) pollution; and
(c) any adverse environmental effect as may be specified in the rules or regulations made under this Act;
- (ii) "Agency" means the Sindh Environmental Protection Agency established under section 5 of this Act;
- (iii) "agricultural waste" means waste from farm and agricultural activities including poultry, cattle farming, animal husbandry residues from the use of fertilizers, pesticides and other farm chemicals and agricultural runoff;
- (iv) "air pollutant" means any substance that causes pollution of air and includes soot, smoke, dust particles, odor, light, electro-magnetic, radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substances and radioactive substances;
- (v) "biodiversity" or "biological diversity" means the variability among living organisms from all sources, including inter-alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems;
- (vi) "biosafety" means the mechanism developing through policy and procedure to ensure human health and the environmentally safe application of biotechnology;
- (vii) "Council" means the Sindh Environmental Protection Council established under section 3 of this Act;
- (viii) "discharge" means spilling, leaking, pumping, depositing, seeping, releasing, flowing-out, pouring, emitting, emptying or dumping into the land, water or atmosphere;
- (ix) "ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit;



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- (x) "effluent" means any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapour;
- (xi) "emission standards" means the permissible standards established by the Agency for emission of air pollutants and noise and for discharge of effluent and waste;
- (xii) "environment" means-
- (a) air, water, land and natural resources;
 - (b) all layers of the atmosphere;
 - (c) all organic and inorganic matters and living organisms;
 - (d) ecosystems and ecological relationships;
 - (e) buildings, structures, roads, facilities and works;
 - (f) all social and economic conditions affecting community life; and
- (g) the inter-relationship between any of the factors in sub-clause (a) to (f) made under this Act;
- (xiii) "environmental aspect" means an organization's activities or services that can interact with the environment;
- (xiv) "environment audit" means a systemic scrutiny of environmental performance of an organization, factory, company or manufacturing and production unit regarding to its operations;
- (xv) "environmental impact assessment" means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigation and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed;
- (xvi) "Environmental Management Plan" means a site specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with the environmental legislation;
- (xvii) "Environmental Protection Order" means an order passed under Section 21 made under this Act.
- (xviii) "Environmental Protection Tribunal" means the Environmental Protection Tribunal constituted under section 25 of this Act ;



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- (xvix) "Environmental Review" means a quantitative and qualitative assessment of documents submitted by proponent, comments from public and Government agencies or organizations;
- (xx) "factory" means any premises in which industrial activity is being undertaken;
- (xxi) "genetically modified organism" means any organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology and which does not occur naturally through mating and or recombination and includes both living and non-living modified organisms;
- (xxii) "Government" means the Government of Sindh;
- (xxiii) "Government Agency" includes:-
- (a) A department, attached department or any other office of Government; and
 - (b) A development authority, local authority, company body corporate established or control by Government;
- (xxiv) "Court" means the Court of the Judicial Magistrate First Class;
- (xxv) "hazardous substance" means-
- (a) a substance or mixture of substances, other than a pesticide as defined in the Agricultural Pesticides Ordinance, 1971 (II of 1971), which, by reason of its chemical activity or toxic, explosive, flammable, corrosive, radioactive or other characteristics, causes, or is likely to cause, directly or in combination with other matters an adverse environmental effect; and
 - (b) any substance which may be prescribed as a hazardous substance;
- (xxvi) "hazardous waste" means waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste, hospital waste, nuclear waste, obsolete pesticides and persistent organic pollutants;
- (xxvii) "hospital waste" means waste medical supplies and materials of all kinds, and waste blood, tissue, organs and other parts of the human and animal bodies, from hospitals, clinics, laboratories and veterinary facilities;



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



- (xxviii) "industrial activity" means any operation or process for manufacturing, making, formulating, synthesising, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal, or for mining, for oil and gas exploration and development, or for pumping water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purposes;
- (xxix) "industrial waste" means waste resulting from an industrial activity;
- (xxx) "initial environmental examination" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment;
- (xxxi) "local authority" means any agency set up or designated by Government, by notification in the official Gazette, to be a local authority for the purposes of this Act;
- (xxxii) "local council" means a local council constituted or established under a law relating to local government;
- (xxxiii) "motor vehicle" means any mechanically propelled vehicle adapted for use upon land whether its power of propulsion is transmitted thereto from an external or internal source, and includes a chassis to which a body has not been attached, and a trailer, but does not include a vehicle running upon fixed rails;
- (xxxiv) "municipal waste" includes sewage, refuse, garbage, waste from abattoirs, sludge and human excreta and the like;
- (xxxv) "noise" means the intensity, duration and character of sounds from all sources, and includes vibration;
- (xxvi) "non degradable plastic products" means a plastic product which are made from the non-biodegradable substances;
- (xxxvii) "nuclear waste" means waste from any nuclear reactor or nuclear plant or other nuclear energy system, whether or not such waste is radioactive;



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(xxxviii) "Oxo-biodegradable Plastic Products" means a plastic product made of a polymer by adding a pro-degrading additive containing a transition metal salt, except cobalt, which cause the plastic to degrade and bio-grade from oxidative and cell mediated phenomena either simultaneously or successfully;

(xxxix) "person" means any natural person or legal entity and includes an individual, firm, association, partnership, society, group, company, corporation, co-operative society, Government Agency, non-governmental organization, community-based organization, village organization, local council or local authority and, in the case of a vessel, the master or other person having for the time being the charge or control of the vessel;

(xxxi) "pollution" means the contamination of air, land or water by the discharge or emission of effluent or wastes or air pollutants or noise or other matter which either directly or indirectly or in combination with other discharges or substances alters unfavorably the chemical, physical, biological, radiational, thermal or radiological or aesthetic properties of the air, land or water or which may, or is likely to make the air, land or water unclean, noxious or impure or injurious, disagreeable or detrimental to the health, safety, welfare or property of persons or harmful to biodiversity;

(xli) "prescribed" means prescribed by rules made under this Act;

(xlii) "project" means any activity, plan, scheme, proposal or undertaking involving any change in the environment and includes-

- (a) construction or use of buildings or other works;
- (b) construction or use of roads or other transport systems;
- (c) construction or operation of factories or other installations;
- (d) mineral prospecting, mining, quarrying, stone-crushing, drilling and the like;
- (e) any change of land use or water use; and
- (f) alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations;



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



- (xliii) "proponent" means the person who proposes or intends to undertake a project;
- (xliv) "regulations" means regulations made under this Act;
- (xlv) "rules" means rules made under this Act;
- (xli) "sewage" means liquid or semi-solid wastes and sludge from sanitary conveniences, kitchens, laundries, washing and similar activities and from any sewerage system or sewage disposal works;
- (xlvii) "Schedule Plastic Products" means all types of flexible plastic packaging and disposable plastic products made of Polythene, Polypropylene, Polystyrene and Poly-ethylene Terephthalate (PET), used for food and non-food items, like shopping bags, garbage bags, snacks packs, water and milk packaging, shrink wraps, bubble pellet wraps, films, liners, woven or non-woven bags, mulch films;
- (xlviii) "Sindh Environmental Quality Standards" means standards established by the Agency under clause (e) of sub-section(1) of section 6 and approved by the Council under clause (c) of sub-section(1) of section 4 made under this Act;
- (xlix) "standards" means qualitative and quantitative standards for discharge of effluent and wastes and for emission of air pollutants and noise either for general applicability or for a particular area, or from a particular production process, or for a particular product, and includes the Sindh Environmental Quality Standards, emission standards and other standards established under this Act and the rules and regulations;
- (i) "strategic environmental assessment" mean an analysis of a proposed policy, legislation, plan or programme to determine whether the principles of sustainable development have been integrated therein and to identify its likely environmental effects and such components as require an initial environmental examination or environmental impact assessment;
- (ii) "sustainable development" means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs;



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



- (iii) "trans-boundary environmental impacts" means environmental impact arising from beyond the boundaries or limits of Sindh province and causing any adverse environmental impact or pollution in the air, land, water and coaster water of Sindh province;
- (iii) "waste" means any substance or object which has been, is being or is intended to be, discarded or disposed-of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.
- (iv) "waters (coastal waters, internal waters, territorial waters and historical waters)" means such limits of the waters adjacent to the land territory as may be specified in the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976).

PART-II

THE SINDH ENVIRONMENTAL PROTECTION COUNCIL.

3. (1) The Government of Sindh shall, by notification in the official Gazette, establish a Council to be known as the Sindh Environmental Protection Council consisting of-

**Establishment
of the Sindh
Environmental
Protection
Council.**

- (i) Chief Minister or such other person as the Chief Minister may nominate in this behalf. **Chairperson**
- (ii) Minister-in-charge of the Environment Protection Department. **Vice Chairperson**
- (iii) Additional Chief Secretary, Planning and Development Department, Government of Sindh. **Ex-officio member**
- (iv) Secretaries of the Environment, Finance, Public Health Engineering, Irrigation, Health, Agriculture, Local Government, Industries, Live Stock and Fisheries, Forest and Wildlife, Energy, Education, Departments of Government of Sindh and the divisional commissioners of Sindh. **Ex-officio members**



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- | | | |
|------|---|-----------------------------|
| (v) | Such other persons not exceeding twenty- five as Government may appoint from representatives of the Chambers of Commerce and Industry and industrial associations, representatives of the Chambers of Agriculture, the medical and legal professions, trade unions, non-governmental organizations concerned with the environment and sustainable development, and scientists, technical experts and educationists. | Non-official members |
| vi) | Director General, Sindh Environment Protection Agency | Member / Secretary |
| vii) | Two Members of the Provincial Assembly of Sindh amongst the eleven Members of the Standing Committee on Environment nominated by the Speaker | Members |

2) The Members of the Council, other than ex-officio members, shall be appointed in accordance with the prescribed procedure.

(3) A non-official member, unless he sooner resigns or is removed, shall hold office for a term of three years and shall be eligible for re-appointment but shall not hold office for more than two terms.

(4) The Council shall frame its own rules of procedure.

(5) The Council shall hold meetings, as and when necessary, but not less than two meetings, shall be held in a year.

(6) The Council may constitute committees of its members and entrust them with such functions as it may deem fit, and the recommendations of the committees shall be submitted to the Council for approval.

(7) The Council, or any of its committees, may invite any technical expert or representative of any Government Agency or non-governmental organization or other person possessing specialized knowledge of any subject for assistance in performance of its functions.



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4. (1) The Council shall-

- (a) co-ordinate and supervise the enforcement of the provisions of this Act and other laws relating to the environment in the province;
- (b) approve comprehensive provincial environmental and sustainable development policies and ensure their implementation within the framework of a conservation strategy and sustainable development plan as may be approved by Government from time to time;
- (c) approve the Sindh Environmental Quality Standards;
- (d) provide guidelines for the protection and conservation of species, habitats, and biodiversity in general, and for the conservation of renewable and non-renewable resources.
- (e) coordinate integration of the principles and concerns of sustainable development into socio-economic and development policies, plans and programmes at the provincial, district and local levels;
- (f) consider the annual Sindh Environment report and give appropriate directions thereon and cause it to be laid before the Provincial Assembly;
- (g) deal with inter-provincial and federal-provincial issues, and liaise and coordinate with other Provinces through appropriate inter-provincial forums regarding formulation and implementation of standards and policies relating to environmental matters with an inter-provincial impact;
- (h) provide guidelines for biosafety and for the use of genetically modified organisms; and
- (i) assist the Federal Government or Federal Agency in implementation and or administration of various provision of United Nation Convention on Laws on Seas, 1980 (UNCLOS) in coastal waters of the province;

(2) The Council may, either itself or on the request of any person or organization, direct the Agency or any Government Agency to prepare, submit, promote or implement projects for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, and the sustainable development of resources or to undertake research in any specified aspect of environment.



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PART III THE SINDH ENVIRONMENTAL PROTECTION AGENCY

5. (1) Government shall, by notification in the Official Gazette, establish the Sindh Environmental Protection Agency, to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations made thereunder.

**Establishment
of the Sindh
Environmental
Protection
Agency.**

(2) The Agency shall be headed by a Director General who shall be appointed by Government on such terms and conditions as it may determine.

(3) The Agency shall have such administrative, technical and legal staff as Government may specify, to be appointed in accordance with such procedure as may be prescribed.

(4) The powers and functions of the Agency shall be exercised and performed by the Director General.

(5) The Director General may, by general or special order, delegate any of these powers and functions to staff appointed under sub-section (3).

(6) For assisting the Agency in the discharge of its functions Government shall establish Advisory Committees for various sectors and appoint as members thereof eminent representatives of the relevant sector, educational institutions, research institutes and non-governmental organizations.

6. (1) The Agency shall –

**Functions of the
Agency.**

- (a) administer and implement the provisions of this Act and the rules and regulations;
- (b) prepare, in co-ordination with the appropriate Government Agency or local council and, in consultation with the concerned Advisory Committees where established, environmental policies for the approval of the Council;
- (c) take all necessary measures for the implementation of the environmental policies approved by the Council;
- (d) prepare and publish an annual Sindh Environment Report on the state of the environment in the province;
- (e) prepare or revise and establish the Sindh Environmental Quality Standards with approval of the Council;



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Provided that before seeking approval of the Council, the Agency shall publish the proposed Sindh Environmental Quality Standards for public opinion in accordance with the prescribed procedure:

(f) ensure enforcement of the Sindh Environmental Quality Standards;

(g) where the quality of ambient air, water, land or noise so requires, the Agency may, by notification in the Official Gazette establish different standards for discharge or emission from different sources and for different areas and conditions as may be necessary:

Provided that where these standards are less stringent than the Sindh Environmental Quality Standards, prior approval of the Council shall be obtained;

(h) establish systems and procedures for surveys, surveillance, monitoring, measurement, examination, investigation, research, inspection and audit to prevent and control pollution, and to estimate the costs of cleaning up pollution and rehabilitating the environment in various sectors;

(i) take measures to promote research and the development of science and technology which may contribute to the prevention of pollution, protection of the environment, and sustainable development;

(j) issue licences, approval for the consignment, handling, transport, treatment, disposal of, storage, handling or otherwise dealing with hazardous substances;

(k) certify laboratories as approved laboratories for conducting tests and analysis and one or more research institutes as environmental research institutes for conducting research and investigation for the purposes of this Act;

(l) identify the needs for and initiate legislation in various sectors of the environment;

(m) provide assistance to relevant Federal and Provincial Government Agencies in the management of environment accidents and natural and environmental disasters, including conduct of inquiry thereto;

(n) render advice and assistance in environmental matters including such information and data available with it as may be required for carrying out the purposes of this Act:

Provided that the disclosure of such information shall be subject to the restrictions specified in Part XI (Access to Information);



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- (o) assist Government Agencies, local councils, local authorities and other persons to implement schemes for the proper disposal of wastes so as to ensure compliance with the Sindh Environmental Quality Standards;
 - (p) provide information and guidance to the public on environmental matters;
 - (q) recommend environmental courses, topics, literature and books for incorporation in the curricula and syllabi of educational institutions;
 - (r) promote public education and awareness of environmental issues through mass media and other means including seminars and workshops;
 - (s) establish and maintain mechanisms, including its own website, to disseminate information, subject to the provisions of this Act, regarding policies, plans and decisions of the Government, the Council and the Agency, relating to the environment;
 - (t) specify safeguards for the prevention of accidents and disasters which may cause pollution, collaborate with the concerned persons in the preparation of contingency plans for control of such accidents and disasters, and co-ordinate implementation of such plans;
 - (u) review and approve mitigation plans and give guidance and directions, where necessary, relating to clean up operations ordered under this Act;
 - (v) encourage the formation and working of non-governmental organizations, community organizations and village organizations to prevent and control pollution and promote sustainable development;
 - (w) take or cause to be taken all necessary measures for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution and promotion of sustainable development; and
 - (x) perform any function that the Council may assign to it.
- (2) The Agency may-
- (a) undertake inquiries or investigation into environmental issues, either of its own accord or upon complaint from any person or organization;
 - (b) request any person to furnish any information or data relevant to its functions;



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- (c) initiate, with the approval of Government, requests for foreign assistance in support of the purposes of this Act and enter into arrangements with foreign agencies or organizations for the exchange of material or information and participate in international seminars or meetings;
- (d) recommend to Government and the Council the adoption of financial and fiscal programmes, schemes or measures for achieving environmental objectives and goals and the purposes of this Act, including -
 - (i) taxes, duties, cesses and other levies; and
 - (ii) incentives, prizes, awards, rewards, subsidies, tax exemptions, rebates and depreciation allowances;
- (e) establish and maintain laboratories to help in the performance of its functions under this Act and to conduct research in various aspects of the environment and provide or arrange necessary assistance for the establishment of similar laboratories in the private sector;
- (f) arrange, in accordance with such procedure as may be prescribed, financial assistance for projects designed to facilitate in discharge of its functions; and
- (g) acquire assistance of concerned authorities of district administration and other relevant agencies, departments and police assistance for enforcement of this Act.

Power of the Agency

7. Subject to the provisions of this Act, the Agency may-

- (a) lease, purchase, acquire, own, hold, improve, use or otherwise deal in and with any property both moveable and immovable;
- (b) sell, convey, mortgage, pledge, exchange or otherwise dispose of its property and assets;
- (c) fix and realize fees, rates and charges for rendering any service or providing any facility, information or data under this Act or its rules and regulations;
- (d) enter into contracts, execute instruments, incur liabilities and do all acts or things necessary for proper management and conduct of its business;
- (e) appoint, with the approval of Government and in accordance with such procedures as may be prescribed, such advisers, experts and consultants as it considers necessary for the efficient performance of its functions on such terms and conditions as it may deem fit;
- (f) summon and enforce the attendance of any person and require him to supply any information or document needed for the conduct of any enquiry or investigation into any environmental issue;

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- (g) Director General may authorize any officer or official to enter and inspect or under a search warrant issued by Environmental Protection Tribunal or a Court, search at any time, any land, building, premises, vehicle or vessel or other place where or in which there are reasonable grounds to believe that an offence under this Act has been, or is being, or likely to be committed;
- (h) take samples of any materials, products, articles or substances or of the effluent, wastes or air pollutants being discharged or emitted or of air, water or land in the vicinity of the discharge or emission;
- (i) arrange for the testing and analysis of samples at a certified laboratory;
- (j) confiscate any article used in the commission of the offence where the offender is not known or cannot be found within a reasonable time:

Provided that the powers under clauses (f), (g), (h) (i), and (j) shall be exercised in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898) or the rules and regulations and under the direction of the Environmental Protection Tribunal or a Court; and

- (k) establish the Sindh Environmental Co-ordination Committee comprising the Director-General as its Chairman and such other persons as Government shall appoint as its members to exercise such powers and perform such functions as shall be delegated or assigned to it by Government for carrying out the purposes of this Act and for ensuring coordination among Government Agencies in implementation of environmental policies.

PART IV SINDH SUSTAINABLE DEVELOPMENT FUND

8. (1) There shall be established a Sindh Sustainable Development Fund.

**Establishment of
the Sindh
Sustainable
Development
Fund.**

- (2) The Sindh Sustainable Development Fund shall be derived from the following sources, namely—

- (a) allocations and grants made or loans advanced by the Government of Sindh or by the Federal Government;
- (b) aid and assistance, grants, advances, donations and other non-obligatory funds received from foreign governments, national or international agencies, and non-governmental organizations; and



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(c) voluntary contributions from private, corporate, multinational organizations and other persons.

(d) Any fees generated under the provision of this act including the fines imposed against contraventions including penalties.

(3) The Sindh Sustainable Development Fund shall be utilized, in accordance with such procedures as may be prescribed for -

(a) providing financial assistance to projects designed for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, the sustainable development of resources and for research in any specified aspect of the environment; and

(b) any other purposes which, in the opinion of the Board, will help achieve environment objectives and the purposes of this Act.

9. (1) The Sindh Sustainable Development Fund shall be managed by a Board known as the Provincial Sustainable Development Fund Board consisting of— **Management of the Sindh Sustainable Development Fund.**

(i) Additional Chief Secretary, Planning and Development Department, Government of Sindh, **Chairperson**

(ii) Such officers of Government, not exceeding five (05), as Government may appoint including Secretaries of the Environment, Finance, Industries and Local Government Departments, Government of Sindh. **Ex-officio Members**

(iii) Such non-official persons, not exceeding five (05), as Government may appoint, including representatives of the Chambers of Commerce and Industry, non-governmental organizations and major donors. **Non-official Members**

(iv) Director General, Sindh Environmental Protection Agency. **Secretary/ Member**

(2) The members of the Board, other than ex-officio member shall be appointed in accordance with the prescribed procedure.



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(3) A non-official member of the Board, unless he sooner resigns or is removed, shall hold office for a term of three years and shall be eligible for re-nomination, but shall not hold office for more than two terms.

(4) The Board shall frame its own rules of procedure with the approval of Government.

(5) In accordance with such procedures and such criteria as may be prescribed, the Board shall have the power to —

- (a) sanction financial assistance for eligible projects;
- (b) invest moneys held in the Sindh Sustainable Development Fund in such profit-bearing Government bonds, saving schemes and securities as it may deem suitable; and
- (c) take such measures and exercise such powers as may be necessary for utilization of the Sindh Sustainable Development Fund for the purposes specified in sub-section (3) of section 8.

(6) The Board shall constitute committees of its members to undertake regular monitoring of projects financed from the Sindh Sustainable Development Fund and to submit progress reports to the Board which shall publish an Annual Report incorporating its annual audited accounts and performance evaluation based on the progress reports.

10.(1) The Agency shall maintain proper accounts of the Sindh Sustainable Development Fund and other relevant records and prepare annual statement of accounts in such form as may be prescribed. **Accounts**

(2) The accounts of the Sindh Sustainable Development Fund shall be audited annually by the Auditor General of Pakistan.

PART V PROHIBITIONS AND ENFORCEMENT

11. (1) Subject to the provisions of this Act and the rules and regulations, no person shall discharge or emit or allow the discharge or emission of any effluent, waste, pollutant, noise or any other matter that may cause or likely to cause pollution or adverse environmental effects, as defined in section 2 of this Act, in an amount, concentration or level which is in excess to that specified in Sindh Environmental Quality Standards; or, where applicable, the standards established under Section 6(1)(g)(i); or direction issued under Section 17, 19, 20 and 21 of this Act; or any other direction issued, in general or particular, by the Agency.

**Prohibition of
certain
discharges or
emissions and
compliance with
standards.**

(7)



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(2) All persons, in industrial or commercial or other operations, shall ensure compliance with the Environmental Quality Standards for ambient air, drinking water, noise or any other Standards established under section 6(1)(g)(i); shall maintain monitoring records for such compliances; shall make available these records to the authorized person for inspection; and shall report or communicate the record to the Agency as required under any directions issued, notified or required under any rules and regulations.

(3) Monitoring and analysis under sub-section (1) and (2), shall be acceptable only when carried out by the Environmental Laboratory certified by the Agency as prescribed in the rules.

12. No person shall import hazardous waste into Sindh province or its coastal, internal, territorial or historical waters, except acquiring prior approval of the Agency.

Prohibition of import of hazardous waste.

13. Subject to the provisions of this Act, no person shall import, generate, collect, consign, transport, treat, dispose of, store, handle or otherwise use or deal with any hazardous substance except-

Handling of hazardous substances.

(a) under a licence issued by the Agency; or

(b) in accordance with the provisions of any other law, rule, regulation or notification for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Government is a party.

14. (1) Subject to the provisions of this Act and the rules and regulations, no person shall cause any act, deed or any activity, including-

Prohibition of action adversely affecting Environment.

(a) recycling or reuse of hospital waste and infectious waste;

(b) disposal of solid and hazardous wastes at unauthorized places as prescribed;

(c) dumping of wastes or hazardous substances into coastal waters and inland water bodies;

(d) release of emissions or discharges from industrial or commercial operations as prescribed;

(e) recycling or reuse or recovery of hazardous wastes or industrial by-products in an unauthorized or non-prescribed manner or procedure; and

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(f) any activity which may cause adverse environmental affect due to trans boundary projects of Province of Sindh.

which lead to pollution or impairment of or damage to biodiversity, ecosystem, aesthetics or any damage to environment and natural resources as defined in section 2 (xxxvi) of this Act.

(2) No person shall generate, handle, transport, dispose of or handle the hospital waste and infections waste except in accordance with the Hospital Waste Management Rules and in such manner as may be prescribed.

(3) No person shall import, manufacture, stockpile, trade, supply, distribute or sell any scheduled plastic product which is non-degradable. The scheduled plastic products must be oxo-biodegradable and the pro-degradant used must be approved by the Agency or any other department or agency and in such manner as prescribed.

15. (1) Subject to the provisions of this Act, no person shall operate or manufacture a motor vehicle or class of vehicles from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Sindh Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6.

**Regulation of
motor vehicles.**

(2) For ensuring compliance with the standards mentioned in sub-section (1), the Agency may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as prescribed.

(3) For ensuring compliance with the standards mentioned in sub-section (1), the Agency may direct that any manufacturer of motor vehicle or class of vehicles shall use such manufacturing standard or design or pollution control devices or other equipment or undergo such testing as may be prescribed.

(4) Where a direction has been issued by the Agency under sub-section (2) and (3) in respect of any motor vehicles or class of motor vehicles, no person shall operate or manufacture any such vehicle till such direction has been complied with.

16. (1) The monitoring, testing and analysis carried out in compliance or for the enforcement of any provisions of this Act.

**Certified
Environmental
Laboratory**

(2) The laboratory or organization having any facility for environmental monitoring, testing and analysis and intend to perform under sub-section (1) shall register with the Agency in accordance with the Environmental Laboratory Certification Rules as prescribed.



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PART VI ENVIRONMENTAL EXAMINATIONS AND ASSESSMENTS

17. (1) No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment, and has obtained from the Agency approval in respect thereof.

**Initial
environmental
examination
and
environmental
impact
assessment.**

(2) The Agency shall –

- (a) review the initial environmental examination and accord its approval, subject to such terms and conditions as it may prescribe, or require submission of an environmental impact assessment by the proponent; or
- (b) review the environmental impact assessment and accord its approval subject to such terms and conditions as it may deem fit to impose or require that the environmental impact assessment be re-submitted after such modifications as may be stipulated or decline approval of the environmental impact assessment as being contrary to environmental objectives.

(3) Every review of an environment impact assessment shall be carried out with public participation and, subject to the provisions of this Act, after full disclosure of the particulars of the project.

(4) The Agency shall communicate its approval or otherwise within a period of two months from the date that the initial environmental examination is filed, and within a period of four months from the date that the environmental impact assessment is filed complete in all respects in accordance with the regulations, failing which the initial environmental examination or, as the case may be, the environmental impact assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations:

(5) The provisions of sub-sections (1), (2), (3) and (4) shall apply to such categories of projects and in such manner as prescribed:

(6) The Agency shall maintain separate registers for initial environmental examination and environmental impact assessment projects, which shall contain brief particulars of each project and a summary of decisions taken thereon, and which shall be open for inspection to the public during office hours.



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18. (1) All provincial government agencies, departments, authorities, local councils and local authorities responsible for formulating policies, legislation, plans and programmes to be implemented in Sindh province which may cause any environmental impact in the jurisdiction of the province shall, before submitting the same to the competent authority for approval, forward to the Sindh Environmental Protection Agency a strategic environment assessment containing —

**Strategic
environmental
assessment.**

- (a) description of the objectives and features of the proposed policy, legislation, plan or programme that are in consonance with the principles of sustainable development;
 - (b) assessment of the adverse environmental effects, if any, likely to be caused during implementation of the policy, legislation, plan or programme along with proposed preventive, mitigation and compensatory measures;
 - (c) analysis of possible alternatives; and
 - (d) identification of those components of the policy, legislation, plan or programme, if any, in respect of which specific environmental impact assessment need to be carried out in due course.
- (2) The Agency shall, in consultation with the concerned Government Agencies and Advisory Committees where established, review the strategic environment assessment, within sixty (60) days of its filing, and prepare a report containing its comments and recommendations in respect thereof which shall be forwarded to the initiating Government Agency, authority, local council or local authority and duly considered by it and the competent authority before approval or otherwise of the proposed policy, legislation, plan or programme.
- (3) The provisions of sub-sections (1), and (2) shall apply to such categories of policies, plans and programmes and in such manner as may be prescribed.

19. (1) The Agency shall carry out or arrange environmental monitoring of all projects in respect of which it has approved an initial environmental examination or environmental impact assessment to determine whether the actual environmental impact exceeds the level predicted in the assessment and whether the conditions of the approval are being complied with.

**Environmental
monitoring.**

(2) For purposes of sub-section (1), the Agency may require the person in charge of a project to furnish such information as it may specify pertaining to the environmental impact of the project, including quantitative and qualitative analysis of -



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(a) discharge of effluents, wastes, emissions of air pollutants, noise and any other matter or action that may be found offensive under section 14 from the project on daily, weekly, monthly or annual basis;

(b) ambient quality of the air, water, noise and soil before, during and after construction and during operation of the project.

(3) On review of the data collected by it and information provided, the Agency may issue such directions to the person in charge as it may consider necessary to ensure compliance with the conditions of the approval.

20. (1) The Agency shall from time to time require the person in charge of a project to furnish, within such period as may be specified, an environmental audit or environmental review report or environmental management plan containing a comprehensive appraisal of the environmental aspects of the project.

Environmental Audit and Review

(2) The report of a project prepared under sub-section (1) shall include -

(a) analysis of the predicted qualitative and quantitative impact of the project as compared to the actual impact;

(b) evaluation of the efficacy of the preventive, mitigation and compensatory measures taken with respect to the project; and

(c) recommendations for further minimizing or mitigating the adverse environmental impact of the project.

(3) Based on its review of the environmental audit report, the Agency may, after giving the person in charge of the project an opportunity of being heard, direct that specified mitigation and compensatory measures be adopted within a specified time period and may also, where necessary, modify the approval granted by it under section 17.

PART VII ENVIRONMENTAL PROTECTION ORDER

21. (1) Where the Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of any provision of this Act, the rules or regulations or of the conditions of a licence, or is likely to cause, or is causing or has caused an adverse environmental effect, the Agency may, after giving the person responsible for such

Environmental Protection Order.

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ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



discharge, emission, disposal, handling, act or omission an opportunity of being heard, by order direct such person to take such measures as the Agency may consider necessary within such period as may be specified in the order.

(2) In particular and without prejudice to the generality of the foregoing power, such measures may include —

- (a) immediate stoppage, preventing, lessening or controlling the discharge, emission, disposal, handling, act or omission, or to minimize or remedy the adverse environmental effect;
- (b) installation, replacement or alteration of any equipment or thing to eliminate, control or abate on a permanent or temporary basis, such discharge, emission, disposal, handling, act or omission;
- (c) action to remove or otherwise dispose of the effluent, waste, air pollutant, noise, or hazardous substances;
- (d) action to restore the environment to the condition existing prior to such discharge, disposal, handling, act or omission, or as close to such condition as may be reasonable in the circumstances, to the satisfaction of the Agency; and
- (e) impose a penalty as prescribed.

(3) Notwithstanding the provisions of sub-section (1), in an emergency situation where, for reasons to be recorded, the Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of the provisions of this Act and that circumstances of the case warrant immediate action in the public interest, it may pass an ad-interim order of the nature described in sub-sections (1) and (2) by providing reasonable opportunity of hearing.

PART VIII

OFFENCES AND PENALTIES

22. (1) Whoever contravenes or fails to comply with the provisions of sections 11, 17, 18 and 21 or any order issued there under shall be punishable with a fine which may extend to five million rupees, to the damage caused to environment and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues:

Provided that if the contravention of the provisions of section 11 also constitutes a contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2).

Penalties.



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(2) Whoever contravenes or fails to comply with the provisions of sections 13, 14, 15 and 16 or any rule or regulation or conditions of any license, any order or direction, issued by the Agency, shall be punished with a fine, and in case of continuing contravention or failure with an additional fine which may extend to ten thousand rupees for every day during which such contravention continues.

(3) Where an accused has been convicted of an offence under sub-sections (1) and (2), the Environmental Protection Tribunal and Court shall, as the case may be, in passing sentence, take into account the extent and duration of the contravention or failure constituting the offence and the attendant circumstances.

(4) Where an accused has been convicted of an offence under sub-sections (1) or (2), the Environmental Protection Tribunal or Court, as the case may be, shall endorse a copy of the order of conviction to the concerned trade or industrial association, if any, or the concerned Provincial Chamber of Commerce and Industry or the Federation of Pakistan Chambers of Commerce and Industry.

(5) Where a person convicted under sub-sections (1) and (2) had been previously convicted for any contravention of this Act and its rules or regulations, the Environmental Protection Tribunal, as the case may be, may, in addition to the punishment awarded thereunder-

- (a) sentence him to imprisonment for a term that may extend up to three years;
- (b) order the closure of the factory;
- (c) order confiscation of the facility, machinery and equipment, vehicle or substance, record, document or other object used or involved in contravention of the provisions of this Act;
- (d) order such person to restore the environment at his own cost, to conditions existing prior to the contravention or as close to such conditions as may be reasonable in the circumstances to the satisfaction of the Agency; and
- (e) order that compensation be paid to any person or persons for any loss, or damage to their health or property suffered by such contravention.

(6) The Director General or an officer generally or specially authorised by him in this behalf may, on the application of the accused, compound an offence under this Act with the permission of the Environmental Protection Tribunal or Court in accordance with such procedure as prescribed.



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(7) Where the Director General is of the opinion that a person had contravened any provision of this Act, he may, subject to the rules, by notice in writing to that person require him to pay to the Agency a penalty in the amount set out in the notice for each day the contravention continues.

23. Where any contravention of this Act has been committed by a body corporate, and it is proved that such offence has been committed with the consent or connivance of, or is attributed to any negligence on the part of, any director, partner, manager, secretary or other officer of the body corporate, such director, partner, manager, secretary or other officer of the body corporate, shall be deemed guilty of such contravention along with the body corporate and shall be punished accordingly:

**Offences by
body
corporate.**

Provided that in the case of a company as defined under the Companies Ordinance, 1984 (XLVII of 1984), only the Chief Executive as defined in the said Ordinance shall be liable under this section.

Explanation.— For the purposes of this Section, "body corporate" includes a firm, association of persons and a society registered under the Societies Registration Act, 1860 (XXI of 1860), or under the Co-operative Societies Act, 1925 (VII of 1925).

24. Where any contravention of this Act has been committed by any Government Agency, local authority or local council, and it is proved that such contravention has been committed with the consent or connivance of, or is attributable to any negligence on the part of, the Head or any other officer of Government Agency, local authority or local council, such Head or other officer shall also be deemed guilty of such contravention along with the Government Agency, local authority or local council and shall be liable to be proceeded against and punished accordingly.

**Offences by
Government
Agencies, local
authorities or
local councils.**

PART IX ENVIRONMENTAL PROTECTION TRIBUNALS AND COURTS

25. (1) Government may, by Notification in the Official Gazette, establish as many Environmental Protection Tribunals as it considers necessary and, where it establishes more than one Environmental Protection Tribunal, it shall specify territorial limits within which, or the class of cases in respect of which, each one of them shall exercise jurisdiction under this Act.

**Environmental
Protection
Tribunals.**

(2) An Environmental Protection Tribunal shall consist of a Chairperson who is, or has been, or is qualified for appointment as a Judge of the High Court to be appointed after consultation with the Chief Justice of the High Court and two members to be appointed by Government, of which at least one shall be a technical member nominated from amongst the officers of the Agency with suitable professional qualifications and experience in the environmental field.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



(3) For every sitting of the Environmental Protection Tribunal, the presence of the Chairperson and not less than one Member shall be necessary.

(4) A decision of an Environmental Protection Tribunal shall be expressed in terms of the opinion of the majority of its members, including the Chairperson, or if the case has been decided by the Chairperson and only one of the members and there is a difference of opinion between them, the decision of the Environmental Protection Tribunal shall be expressed in terms of the opinion of the Chairperson.

(5) An Environmental Protection Tribunal shall not, merely by reason of a change in its composition, or the absence of any member from any sitting, be bound to recall and rehear any witness who has given evidence, and may act on the evidence already recorded by, or produced, before it.

(6) An Environmental Protection Tribunal may hold its sittings at such places within its territorial jurisdiction as the Chairperson may decide.

(7) No act or proceeding of an Environmental Protection Tribunal shall be invalid by reason only of the existence of a vacancy in, or defect in the constitution, of, the Environmental Protection Tribunal.

(8) The terms and conditions of service of the Chairperson and members of the Environmental Protection Tribunal shall be such as may be prescribed.

26. (1) An Environmental Protection Tribunal shall exercise such powers and perform such functions as are, or may be, conferred upon or assigned to it by or under this Act or the rules and regulations.

(2) All contraventions punishable under sub-section (1) of section 22 shall exclusively be triable by an Environmental Protection Tribunal.

(3) An Environmental Protection Tribunal shall not take cognizance of any offence triable under sub-section (2) except on a complaint in writing by—

- (a) the Agency or any Government Agency or local council; and
- (b) any aggrieved person, who has given notice of not less than thirty days to the Agency, of the alleged contravention and of his intention to make a complaint to the Environment Protection Tribunal.

**Jurisdiction
and powers of
Environmental
Protection
Tribunals.**



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



(4) In exercise of its criminal jurisdiction, the Environmental Protection Tribunal shall have the same powers as are vested under the Code of Criminal Procedure, 1898 (Act V of 1898).

(5) In exercise of the appellate jurisdiction under section 27 the Environmental Protection Tribunal shall have the same powers and shall follow the same procedure as an appellate court in the Code of Civil Procedure, 1908 (Act V of 1908).

(6) In all matters with respect to which no procedure has been provided for in this Act, the Environmental Protection Tribunal shall follow the procedure laid down in the Code of Civil Procedure, 1908 (Act V of 1908).

(7) An Environmental Protection Tribunal may, on application filed by any officer duly authorised in this behalf by the Director General, issue bailable warrant for the arrest of any person against whom reasonable suspicion exists, of his having been involved in contravention punishable under sub-section (1) of section 22:

Provided that such warrant shall be applied for, issued and executed in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898):

Provided further that if the person arrested executes a bond with sufficient sureties in accordance with the endorsement on the warrant he shall be released from custody, failing which he shall be taken or sent without delay to the officer in-charge of the nearest jurisdiction police station.

(8) All proceedings before the Environmental Protection Tribunal shall be deemed to be judicial proceedings within the meaning of sections 193 and 228 of the Pakistan Penal Code (Act XLV of 1860), and the Environmental Protection Tribunal shall be deemed to be a court for the purpose of sections 480 and 482 of the Code of Criminal Procedure, 1898 (Act V of 1898).

(9) No court other than an Environmental Protection Tribunal shall have or exercise any jurisdiction with respect to any matter to which the jurisdiction of an Environmental Protection Tribunal extends under this Act and the rules and regulations.

(10) Where the Environmental Protection Tribunal is satisfied that a complaint made to it under sub-section (3) is false and vexatious to the knowledge of the complainant, it may, by an order, direct the complainant to pay to the person complained against such compensatory costs which may extend to one hundred thousand rupees.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



27. (1) Any person aggrieved by any order or direction of the Agency under any provision of this Act or the rules or regulations may prefer an appeal with the Environmental Protection Tribunal within thirty days of the date of communication of the impugned order or direction to such person.

**Appeals to the
Environmental
Protection
Tribunal.**

(2) An appeal to the Environmental Protection Tribunal shall be in such form, contain such particulars and be accompanied by such fees as prescribed.

28. (1) Any person aggrieved by any final order or by any sentence of the Environmental Protection Tribunal passed under this Act may, within thirty days of communication of such order or sentence, prefer an appeal to the High Court.

**Appeals from
orders of the
Environmental
Protection
Tribunal.**

(2) An appeal under sub-section (1) shall lie before the High Court of Sindh.

29. (1) Notwithstanding anything contained in the Code of Criminal Procedure, 1898 (Act V of 1898), or any other law for the time being in force, but subject to the provisions of this Act, all contraventions punishable under sub-section (2) of section 22 shall exclusively be triable by the Court of Judicial Magistrate of First Class having of First Class having jurisdiction.

**Jurisdiction of
Judicial
Magistrate.**

(2) A Judicial Magistrate shall be competent to impose any punishment specified in sub-sections (2) and (4) of section 22.

(3) A Judicial Magistrate shall not take cognizance of an offence triable under sub-section (1) except on a complaint in writing by—

- (a) the Agency; and
- (b) any aggrieved person.

30. Any person aggrieved by any final order or sentence passed by a Judicial Magistrate under section 28 may, within thirty days from the date of the communication of such order or sentence, appeal to the Court of the District and Sessions Judge defined as Green Court under this Act, whose decision thereon shall be final.

**Appeals from
orders of the
Judicial
Magistrate.**



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



PART X PUBLIC PARTICIPATION

31. (1) The Agency shall cause relevant details of any proposed project regarding which an Environmental Impact Assessment has been received to be published, along with an invitation to the public to furnish their comments thereon within a specified period.

Public participation.

(2) In accordance with such procedure as may be prescribed, the Agency shall hold public hearings to receive additional comments and hear oral submissions.

(3) All comments received under sub-sections (1) and (2) shall be duly considered by the Agency while reviewing the environmental impact assessment or strategic impact assessment, and decision or action taken thereon shall be communicated to the persons who have furnished the said comments.

PART XI GENERAL

32. The Agency may, by notification in the official Gazette, make and amend the schedule.

Power to make and amend schedule.

33. No suit, prosecution or other legal proceedings shall lie against Government, the Council, the Agency, the Director General of the Agency, members, officers, employees, experts, advisors, committees or consultants of the Agency or Environmental Protection Tribunal or Court or any other person for anything which is done or intended to be done in good faith under this Act or rules or regulations.

Indemnity

34. Any dues recoverable by the Agency under this Act and rules or regulations shall be recoverable as arrears of land revenue.

Dues recoverable as arrears of land revenue.

35. The provisions of this Act shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force.

Act to override other laws.

36. The Sindh Environment Protection Agency may, by notification in the Official Gazette, make rules for carrying out the purposes not in consistence of this Act with the approval of Government.

Power to make rules.

37. (1) For carrying out the purposes of this Act, the Agency may, by Notification in the Official Gazette and with the approval of Government, make regulations not inconsistent with the provisions of this Act or the rules.

Power to make regulations.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



(2) In particular and without prejudice to the generality of the foregoing power, such regulations may provide for —

- (a) submission of periodical reports, data or information by any Government Agency, local authority or local council in respect of environmental matters;
- (b) preparation of emergency contingency plans for coping with environmental hazards and pollution caused by accidents, natural disasters and calamities;
- (c) appointment of officers, advisors, experts, consultants and employees;
- (d) levy of fees, rates and charges in respect of services rendered, actions taken and schemes implemented;
- (e) monitoring and measurement of discharges and emissions;
- (f) categorization of projects to which, and the manner in which sections 17, 18 and 20 applies;
- (g) laying down of guidelines for preparation of initial environmental examination, environmental impact assessment and strategic environmental assessment, and development of procedures of their filing, reviews and approval.
- (h) laying down standard operating procedures for environmental sampling, examination of water, waste water, gaseous emissions, solid waste and noise;
- (i) providing procedures for handling hazardous substances; and
- (j) installation of devices in, use of fuels by, and maintenance and testing of motor vehicles for control of air and noise pollution.

	ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT	
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Annexure 2: SEPA (Environmental Assessment) Regulations, 2021



GOVERNMENT OF SINDH SINDH ENVIRONMENTAL PROTECTION AGENCY

Karachi dated the 03rd September, 2021

NOTIFICATION

NO.EPA/TECH/739/2021:- In exercise of the powers conferred by section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of Government, is pleased to make the following regulations, namely:-

1. Short title and commencement

- (1) These regulations may be called the Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021.
- (2) They shall come into force at once.

2. Definitions. -

- (1) In these regulations, unless there is anything repugnant in the subject or context
 - (a) "Act" means the Sindh Environmental Protection Act, 2014 (VIII of 2014);
 - (b) "Agency" means the Sindh Environmental Protection Agency as defined under section 2(ii);
 - (c) "Director General" means the Director General of the Agency;
 - (d) Environmental Checklist means rapid environmental assessment or environmental screening through a prescribed checklist in respect of projects having least/minimal impacts on the environment.
 - (e) "Firm" means the Environmental Consulting Firm registered by the Agency.
 - (f) "Environmentally sensitive area" means a location, large or small, that has significant environmental values that contribute to maintaining biological diversity and integrity, have intrinsic or attributed scientific, historical or cultural heritage value, or are important in providing amenity, harmony or sense of community, ecosystem as declared by Agency.
 - (g) "Protected area" means any area which safeguards the earth's precious bio-diversity, protected areas of natural beauty and conservation of cultural significance as declared by relevant authority;
 - (h) "Schedule" means the Schedules provided in these regulations;



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



- (i) "Urban area" means an area within the limits of a town, municipality or city as determined by the Agency on the basis of population and environmental issues

- (2) All other words and expressions used but not defined in these regulations shall have the same meaning as are assigned to them in the Act.

3. Projects requiring Environmental Checklist (EC)

A proponent of a project falling in any category listed in Schedule-I shall file environmental checklist with the Agency and the provisions of section 17 shall apply to such projects.

4. Projects requiring an Initial Environmental Examination (IEE)

A proponent of a project falling in any category listed in Schedule-II shall file an IEE with the Agency, and the provisions of section 17 shall apply to such projects.

5. Projects requiring an Environmental Impact Assessment (EIA)

A proponent of a project falling in any category listed in Schedule-III shall file an EIA with the Agency, and the provisions of section 17 shall apply to such projects.

6. Projects not requiring an Environmental Assessment

- (1) A project not falling in any category listed in Schedules-I, II and III shall not be required to file an EC, IEE or EIA
- (2) Notwithstanding anything contained in sub-regulation (1), the Agency may direct the proponent of a project, whether or not listed in Schedule I or II or III, to file an EC or IEE or EIA, for reasons to be recorded in such direction:

Provided that no such direction shall be issued without the recommendations in writing of the Advisory Committee constituted under regulations 21.

7. Preparation of environmental assessment report

- (1) The Agency may issue guidelines for preparation of an EC or IEE or EIA reports including guidelines of general applicability, and sectoral guidelines indicating specific assessment requirements for planning, construction and operation of projects relating to particular sector.
- (2) The Agency may issue guidelines for preparation scope of an Environmental Management Plan(EMP) or Environmental Audit(EA).
- (3) Where guidelines have been issued under sub-regulation (1) & (2), an EC, IEE or EIA or EMP or EA shall be prepared, to the extent practicable, in accordance therewith and the proponent shall justify any departure therefrom.

8. Review Fees

The proponent shall pay, at the time of submission of an EC, IEE or EIA or EMP or BTS tower a non-refundable review fee to the Agency as prescribe in Schedule-IV.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



9. Filing of report

- (1) Two hard copies and two electronic copies for an EC or IEE or EIA report shall be filed with the Agency by the proponent. The Agency may require the proponent to submit additional copies, as and when required during the review process.
- (2) Every EC, IEE and EIA shall be accompanied by -
 - (a) an application, in the form prescribed in Schedule-V;
 - (b) Copy of receipt showing payment of review fee as prescribed in Schedule-IV

10. Preliminary Scrutiny

- (1) Any report filed by the proponent or applicant shall be returned, if found incomplete in terms of Regulation 9.
- (2) Notwithstanding anything contained in sub-regulation (1) of regulation 12, the Agency may require the proponent to submit an additional information at any stage during the review process.

11. Public participation

- (1) In the case in an EIA, the Agency shall issue a public notice to be published in widely circulated English or Urdu or Sindhi national newspaper and in a local newspaper of general circulation in the area affected by the project, mentioning the type of project, its exact location, the name and address of the proponent and the date, time and place of public hearing for inviting comments from primary stakeholders.
- (2) The date fixed under sub-regulation (1) shall not be earlier than ten days from the date of publication of the notice.
- (3) The Agency shall also ensure the circulation of the EIA, where necessary, to the concerned Government Agencies and solicit their comments thereon.
- (4) All comments received by the Agency from the public or any Government Agency shall be duly considered before issuance of decision.
- (5) The Agency may issue guidelines indicating the basic techniques and measures to be adopted to ensure effective public consultation, involvement and participation in EIA assessment.

12. Review process

- (1) Notwithstanding anything contained in sub section (4) of Section 17, the Agency shall make every effort to conclude its review process of the EA, EMP or environmental checklist within fifteen days, of the IEE within thirty days, and of the EIA within sixty days after receiving of complete case.
- (2) In reviewing an EIA, the Agency shall consult such Committee of Experts be constituted for the purpose by the Director General, and may also solicit views of concerned Advisory Committee, if any, constituted by the Agency.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



- (3) The Director General may, where considers it necessary, constitute a committee to inspect the site of the project and submit its report on such matters as may be specified.
- (4) In reviewing the IEE, the Director General may constitute a committee of the officers from within the Agency, on case to case basis, in view of the jurisdiction and location of the project for the purpose to extend final recommendation about the approval or rejection of the IEE.
- (5) The review of the IEE or EIA by the Agency shall be based on quantitative and qualitative assessment of the documents and data furnished by the proponent, comments from the public and Government Agencies received under regulation 12, and views of the committees mentioned in sub-regulations (2) and (3) above.
- (6) EMP, EA, EC shall be reviewed as per guidelines issued by SEPA

13. Decision

- (1) The documentary evidence in the form of videos (soft copies) of public hearing shall be submitted by the proponent within three days after conclusion of public hearing to the Agency.
- (2) On completion of the review process, the decision of the Agency shall be communicated to the proponent in the form prescribed in Schedule-VI or in case of an IEE or EMP or environmental checklist or environmental audit in the form prescribed in Schedule-VII in case of an EIA.

14. Conditions of approval

- (1) Every approval of an EC or IEE or EIA or EMP or EA shall, in addition to such conditions as may be imposed by the Agency, be subject to the condition that the project shall be designed, constructed or operated and mitigatory and other measures adopted, strictly in accordance with the EC or IEE or EIA or EMP or EA, unless any variations thereto have been specified in the approval by the Agency.
- (2) Where the Agency accords its approval subject to certain conditions, the proponent shall submit an undertaking to the Agency, before commencing operation of the project, in the form prescribed in Schedule-VIII that the conditions of approval, and the requirements in the IEE or EIA relating to design and construction, adoption of mitigation and other measures have been duly complied with.

15. Validity period of Approval

- (1) The approval accorded by the Agency under section 17 read with sub-regulation (2) of regulation 15 shall be valid, for commencement of construction, for a period of three years from the date of issue.
- (2) If construction is commenced during the initial three years validity period, the



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



validity of the approval shall stand extended for a further period of three year.

- (3) The proponent may apply to the Agency for extension in the validity periods mentioned in sub-regulations (1), (2), which may be granted by the Agency in its discretion for such period not exceeding three years at a time, if the conditions of the approval do not require significant change:

Provided that the Agency may require the proponent to submit a fresh IEE or EIA, if in its opinion changes in location, design, construction and operation of the project so warrant.

16. Entry and Inspection

- (1) For the purpose of verification of any matter relating to the review or to the conditions of approval of an EC or IEE or EIA or EMP or EA list prior to, before or during and after commencement of construction or operation of a project, duly authorized staff of the Agency shall be entitled to enter and inspect the project site, factory building and plant and equipment installed therein.
- (2) The proponent shall ensure full cooperation of the project staff at site to facilitate the inspection, and shall provide such information as may be required by the Agency for this purpose and pursuant thereto.

17. Cancellation of approval

- (1) Notwithstanding anything contained in these regulations, if, at any time, on the basis of information or report received or inspection carried out, the Agency is of the opinion that the conditions of an approval have not been complied with, or that the information supplied by a proponent in the approved EC or IEE or EIA or EMP or EA list is incorrect, it shall issue notice to the proponent for show cause within two weeks of receipt thereof as to why the approval should not be cancelled.
- (2) In case no reply is received or if the reply is considered unsatisfactory, the Agency may, after giving the proponent an opportunity of being heard -
- (i) require the proponent to take such measures and to comply with such conditions within such period as it may specify, failing which the approval shall stand cancelled; or
 - (ii) cancel the approval.
- (3) On cancellation of the approval, the proponent shall cease construction or operation of the project forthwith.
- (4) Any action taken under this regulation shall be without prejudice to any other action that may be taken against the proponent under the Act or rules or regulations or any other law for the time being in force.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



18. Registers of EC or IEE and EIA projects

Separate Registers to be maintained by the Agency for EC or IEE and EIA projects shall be in the form prescribed in Schedule-IX.

19. Environmentally sensitive areas

- (1) The Agency may designate an area to be an environmentally sensitive area,
- (2) Notwithstanding anything contained in regulations 3 and 5, the proponent of a project situated in an environmentally sensitive area shall be required to file an EIA with the Agency.

20. Environmental assessment guidelines

- (1) The Agency may from time to time issue guidelines to assist proponents and other persons involved in the preparation of environmental assessment.
- (2) Where guidelines have been issued under sub-regulation (1), the projects shall be planned and prepared, to the extent practicable, in accordance therewith and any departure therefrom justified in the IEE/EIA pertaining to the project.

21. Environmental Assessment Advisory Committee. -

The agency may constitute one or more Committees for the purpose of rendering advice on implementation and enforcement of Section 17, which may include experts of relevant field, civil society, academia, environmental experts, representative of Administrative Department, legal expert and experts from natural resources.

22. Repeal and Savings.

- (1) The Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations 2014, shall, on commencement of these regulations, stand repealed.
- (2) All orders made, notification issued, actions taken under the repealed Regulations shall remain in force until amended, altered or repealed by the provisions of these regulations.

DIRECTOR GENERAL
SINDH ENVIRONMENTAL PROTECTION
AGENCY



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



SCHEDULE-I

(See Regulation 3)

List of projects requiring Environmental Screening (through check list)

- a. Subject to the compliance with concerned zoning laws:
 - i. Construction of residential and commercial buildings having total covered area from 60,000 sq.foot to 100,000 sq.foot
 - ii. Housing Schemes covering an area from 05 acres to 15 acres.
 - iii. Ware Houses for Non-Hazardous substances having total area from 1000 sq.yards to 5,000 sq.yards
 - iv. Warehouse for Fertilizers
 - v. Marriage Halls/Banquet/Restaurants/Baking facilities having total area more than 500 sq.yards
 - vi. Motor vehicle workshops/Service Stations having total area of more than 500 sq.yards.
- b. Construction/Reconstruction/Rehabilitation of roads in urban area from 500 meters to 01 kilometres and in rural area from 500 meters to 05 kilometres.
- c. Construction of Flyover, underpasses and bridges of length from 100 meters to 500 meters
- d. On-farm dams and fish farms
- e. Pulses mills
- f. Flour Mills
- g. Lining of existing minor canals and /or water courses.
- h. Canal cleaning
- i. Forest harvesting operations
- j. Rain harvesting projects
- k. Health care units of less than 50 beds
- l. BTS Tower
- m. Lime Kilns
- n. Ice factories and cold storage.
- o. Cotton oil mill
- p. Construction of LPG, CNG, LNG filling station and petrol pumps
- q. Carpet manufacturing units
- r. Rain harvesting projects
- s. Industrial Effluent Treatment Plant
- t. Sanitary Landfill site up to 500 tons/day



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



Schedule-II (See Regulation 4)

List of projects requiring an Initial Environmental Examination

A. Agriculture, Livestock and Fisheries

1. Poultry, livestock and fish farms
2. Warehousing for pesticides and pharmaceuticals
3. Projects involving packaging, formulation, cold storage and warehouse of agricultural, livestock and fish products.
4. Construction & Operation of Slaughter houses

B. Energy

1. Hydroelectric power generation up to 25 MW
2. Thermal power generation up to 100 MW
3. Coal fired power plants with capacity up to 50 MW
4. Transmission lines up to 132 KV, and grid stations
5. Waste-to-energy generation projects including bio-mass up to 25 MW
6. Construction of Coal Handling and storage facilities
7. Handling, Transportation & Storage of Biofuel Facility
8. Handling and storage of edible grains and seeds
9. All Renewable energy Projects (excluding Protected/Sensitive area under any law)

C. Oil and Gas projects:

1. Oil and gas 2D/3D Seismic survey and drilling activities (on and off shore)
2. Oil and gas extraction projects including exploration and production located outside the environmentally sensitive/protected areas
3. Oil & Gas transmission gathering, storage, separation & transportation system
4. Construction of CNG, LPG Petroleum and LNG bulk storage facility
5. Oil blending and recycling units

D. Manufacturing and processing

1. Ceramics and glass units
2. Food processing units
3. Pharmaceutical units.
4. Rice mills, ghee/oil mills, Cotton ginning
5. Man-made fibers and resin projects



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



6. Tanning and leather finishing projects
7. Manufacturing of apparel, textile garments units, including weaving, spinning, dyeing, bleaching and printing
8. Woodwork units manufacturing products
9. Steel re-rolling mills
10. Waste recycling plants
11. Battery manufacturing plant
12. Brick Kilns
13. Marble processing units
14. Stone Crushing units

E. Mining and mineral processing

1. Commercial extraction of sand, gravel, limestone, clay, Sulphur and other minerals not included in Schedule I.
2. Crushing, grinding and separation processes
3. Metal Smelting plant production capacity up to 20 tons/day

F. Transport

1. Construction of flyovers, underpasses and bridges having length more than 500 meters to 1000 meters in urban areas and more than 5km in rural areas
2. Bus terminals/ railway station/ metro stops and construction & operation of transport related terminals
3. Rehabilitation or rebuilding or reconstruction of existing roads more than one kilometers in urban areas and more than 5 km from rural areas

G. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of less than 25 million cubic meters of surface area less than 4 square kilometers
2. Irrigation systems and drainage system with the area of less than 15,000 hectares
3. Flood protection bunds

H. Water supply and filtration

Water supply schemes and filtration plants

I. Waste disposal and wastewater treatment

1. Solid and Non-hazardous waste with annual capacity up to 10,000 tonnes (excluding municipal landfill sites and commercial facilities) including Garbage Transfer station/composting plant



**ENVIRONMENTAL IMPACT ASSESSMENT
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BRIDGE PROJECT**



2. Wastewater treatment for sewerage treatment facility less than 100 mgd
3. Hospital waste disposal facilities including incineration units owned by Hospitals for own use excluding commercial facility.

J. Urban development

1. Housing schemes more than 15 acres to 50 acres
2. Residential, Commercial multistory High rise construction projects having covered area more than 100,000 sq.feet to 500,000 sq.feet.
3. Laboratories
4. Hospitals, health care unit of more than 50 beds
5. Construction of Educational and Academic institutions.

K. Other projects

Any other project for which filing of an IEE is required by the Agency under sub-regulation (2) of Regulation 6.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



SCHEDULE III

(See Regulation 5)

List of projects requiring an EIA

A. Energy

1. Hydroelectric power generation more than 50 MW
2. Thermal power generation more than 100 MW
3. Coal power projects more than 50 MW
4. Transmission lines above 132 KVA and distribution projects.
5. Nuclear power plants
6. Wind, Solar or renewable energy projects if falls under any environmental sensitive and protected area.

B. Oil and Gas projects

1. Oil Petroleum refineries.
2. LPG and LNG Terminals Projects
3. Coal Handling Terminals Projects

C. Manufacturing and processing

1. Cement plants
2. Chemical manufacturing industries
3. Fertilizer plants
4. Steel Mills
5. Sugar Mills and Distilleries
6. Establishment of Industrial estates & Export processing zones
7. Petrochemicals complex
8. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, printing and publishing, paints and dyes.

D. Mining and mineral processing

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Metal Smelting plant production capacity more than 20 tons/day

E. Transport

1. Airports
2. Construction of highway, motor ways, major roads (Intercity roads) more than one km and above



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



3. Ports and harbor development
4. Mass transit projects
5. Railway works
6. Construction of Flyover, underpass and bridges having total length more than one km.

F. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of 25 million cubic meters and above having surface area of 4 square kilometers and above
2. Irrigation and drainage projects serving more than 15,000 hectares and above

G. Water supply and filtration

Public water supply schemes and filtration plants.

H. Waste Disposal and treatment

1. Facilities for handling, storage or disposal of hazardous or toxic wastes or radioactive waste (including landfill sites, incineration units, etc.)
2. Solid waste municipal landfill sites.
3. Combine Effluent Treatment Plant
4. Domestic wastewater treatment plant more than 100mgd

I. Urban development and tourism

1. Housing schemes above 50 acres
2. Residential, Commercial High rise buildings subject to compliance of building bylaws of relevant organizations more than 500,000 sq.feet
3. All Projects located in High Density Zones notified by Government and relevant land controlling organization, irrespective of their size.
4. Commercialization of major corridors/roads in urban centers
5. Large Scale public facilities
6. Large-scale tourism development projects

J. Environmentally Sensitive Areas

All projects situated in environmentally sensitive areas being identified by the Agency.

K. Other projects

1. Any other project for which filing of an EIA is required by the Agency under sub-regulation (2) of Regulation 5.
2. Any other project likely to cause an adverse environmental effect.



**ENVIRONMENTAL IMPACT ASSESSMENT
FOR
ENHANCEMENT OF GHOTKI KANDHKOT
BRIDGE PROJECT**



**Schedule-IV
(See Regulation 8)**

Project Cost (In million)	Review Fee
Up to 20	Rs. 50,000
Above 20 up to 100	Rs. 100,000
Above 100 up to 200	Rs. 200,000
Above 200 up to 500	Rs. 400,000
Above 500	Rs. 600,000
Review fee for Environmental Checklist or EMP shall be Rs. 40,000/=	
Review fee for BTS Tower shall be 20,000/=	

*

Note:

The fee shall be payable into the “Sindh Sustainable Development Fund” account
Details are as under:

A/C Title: Sindh Sustainable Development Fund

Account Number: 03084572626100

Bank: Sindh Bank

Branch Code: 0308-Korangi Industrial Area



**ENVIRONMENTAL IMPACT ASSESSMENT
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ENHANCEMENT OF GHOTKI KANDHKOT
BRIDGE PROJECT**



SCHEDULE VI
[See Regulation 13(2)]

Decision on IEE/Environmental Check List

1. Name and address of proponent _____
 2. Description of project _____
 3. Location of project _____
 4. Date of filing of IEE _____
 5. After careful review of the IEE, the Agency has decided –
 - (a) to accord its approval, subject to the following conditions:

 - or (b) that the proponent should submit an EIA of the project, for the following reasons –

- Dated _____

Tracking no. ____

Director-General
Sindh Environmental Protection Agency
(with official stamp/seal)



**ENVIRONMENTAL IMPACT ASSESSMENT
FOR
ENHANCEMENT OF GHOTKI KANDHKOT
BRIDGE PROJECT**



SCHEDULE VII

[See Regulation 13(2)]

Decision on EIA

1. Name and address of proponent _____
 2. Description of project _____
 3. Location of project _____
 4. Date of filing of EIA _____
 5. After careful review of the EIA, and all comments thereon, the Federation Agency has decided –
 - (a) to accord its approval, subject to the following conditions:

 - or (b) that the proponent should submit an EIA with the following modifications-

 - or (c) to reject the project, being contrary to environmental objectives, for the following reasons:

- Dated _____

Tracking no. ____

Director-General
Sindh Environmental Protection Agency
(with official stamp/seal)



**ENVIRONMENTAL IMPACT ASSESSMENT
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SCHEDULE VIII
[See Regulation 14(2)]

Undertaking

I, (full name and address) as proponent for (name, description and location of project) do hereby solemnly affirm and declare that the conditions of approval and the requirements in the IEE or EIA relating to design and construction, adoption of mitigation and other measures and other relevant matters have been duly complied with in the design and construction of the project.

Signature, name and

designation of proponent
(with official stamp/seal)

Witnesses(full names and addresses)



**ENVIRONMENTAL IMPACT ASSESSMENT
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SCHEDULE IX
(See Regulation 18)
Form of Registers for EC, IEE and EIA projects

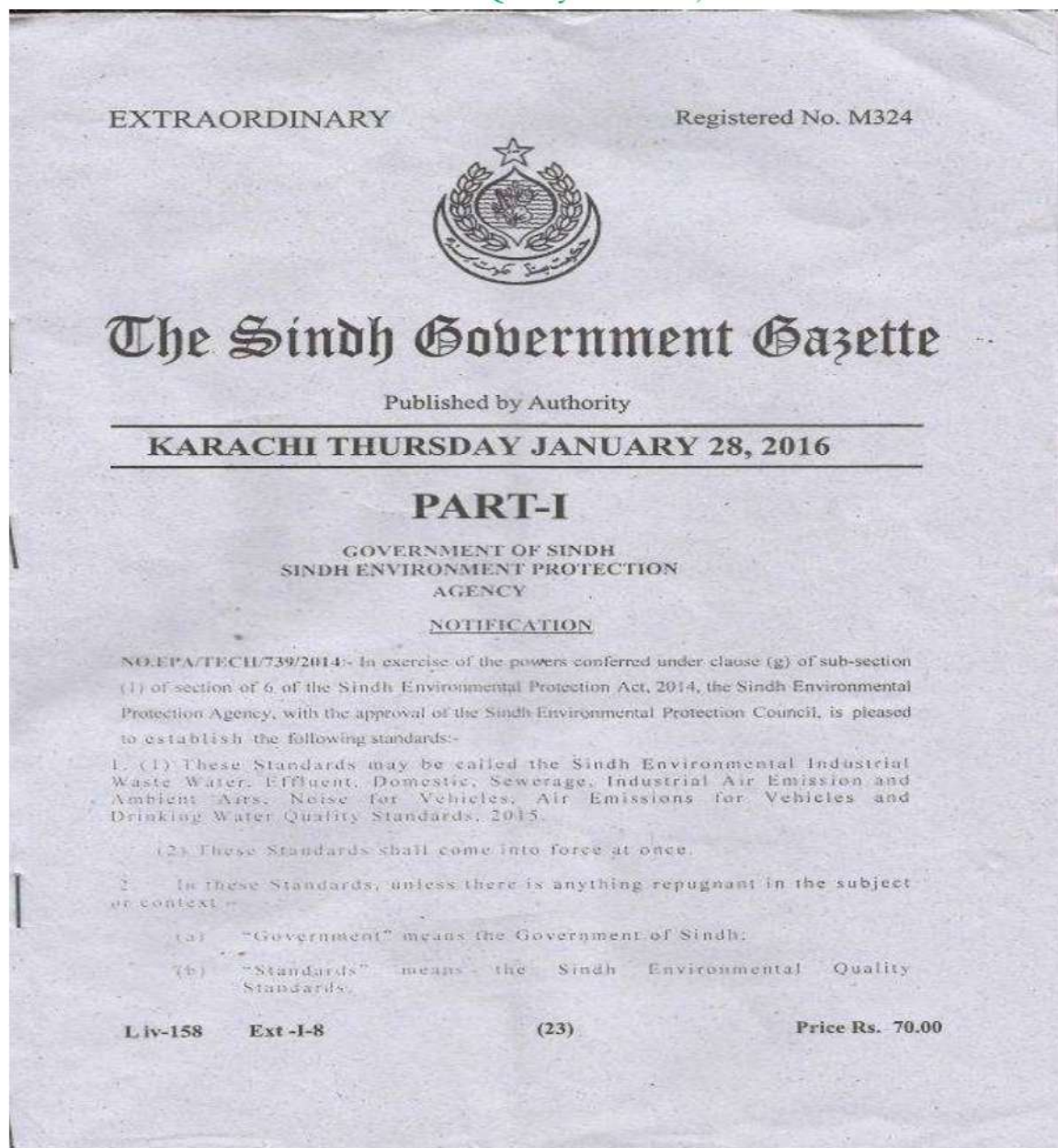
<u>S. No.</u>	<u>Description</u>	<u>Relevant Provisions</u>
1	2	3
1.	Tracking number	
2.	Category type (as per Schedules I or II)	
3.	Name of proponent	
4.	Name and designation of contact person	
5.	Name of consultant	
6.	Description of project	
7.	Location of project	
8.	Date of submission of IEE/EIA	
9.	Date of public hearing / technical presentation	
10.	Date of committee of experts for schedule-II projects	
11.	Approval granted (Yes/No)	
12.	Date of approval granted or refused	



**ENVIRONMENTAL IMPACT ASSESSMENT
FOR
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BRIDGE PROJECT**



Annexure 3: The Sindh Environmental Quality Standards, 2016





ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



PART-I

THE SINDH GOVT. GAZETTE EXT. JAN. 28, 2016

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SINDH ENVIRONMENTAL QUALITY STANDARDS FOR MUNICIPAL AND LIQUID INDUSTRIAL EFFLUENTS (mg/l, UNLESS OTHERWISE DEFINED)

S. No.	Parameter	Standards		
		Into Inland Waters 3	Into Sewage Treatment ⁽⁵⁾ 4	Into Sea ⁽¹⁾ 5
1.	Temperature 40°C or Temperature Increase *	≤3°C	≤3°C	≤3°C
2.	pH value (H ⁺)	6-9	6-9	6-9
3.	Biochemical Oxygen Demand (BOD) ₅ at 20°C ⁽³⁾	80	250	80**
4.	Chemical Oxygen Demand (COD) ⁽¹⁾ ...	150	400	400
5.	Total Suspended Solids (TSS) ...	200	400	200
6.	Total Dissolved Solids (TDS)	3500	3500	3500
7.	Oil and Grease	10	10	10
8.	Phenolic compounds (as phenol)	0.1	0.3	0.3
9.	Chloride (as Cl ⁻)	1000	1000	SC***
10.	Fluoride (as F ⁻)	10	10	10
11.	Cyanide (as CN ⁻) total	1.0	1.0	1.0
12.	An-ionic detergents (as MBAS) ⁽²⁾	20	20	20
13.	Sulphate (SO ₄ ²⁻)	600	1000	SC***
14.	Sulphide (S ²⁻)	1.0	1.0	1.0
15.	Ammonia (NH ₃)	40	40	40
16.	Pesticides ⁽³⁾	0.15	0.15	0.15
17.	Cadmium ⁽⁴⁾ ..	0.1	0.1	0.1
18.	Chromium (trivalent and hexavalent) ⁽⁴⁾ ..	1.0	1.0	1.0
19.	Copper ⁽⁴⁾ ...	1.0	1.0	1.0
20.	Lead ⁽⁴⁾	0.5	0.5	0.5
21.	Mercury ⁽⁴⁾	0.01	0.01	0.01
22.	Selenium ⁽⁴⁾	0.5	0.5	0.5
23.	Nickel ⁽⁴⁾ ..	1.0	1.0	1.0
24.	Silver ⁽⁴⁾	1.0	1.0	1.0
25.	Total toxic metals ...	2.0	2.0	2.0
26.	Zinc ...	5.0	5.0	5.0
27.	Arsenic ⁽⁴⁾	1.0	1.0	1.0
28.	Barium ⁽⁴⁾	1.5	1.5	1.5
29.	Iron ...	8.0	8.0	8.0
30.	Manganese ...	1.5	1.5	1.5
31.	Boron ⁽⁴⁾	6.0	6.0	6.0
32.	Chlorine ...	1.0	1.0	1.0



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



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Explanations:

1. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Sindh Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent.
 2. Methylene Blue Active Substances; assuming surfactant as biodegradable.
 3. Pesticides include herbicides, fungicides, and insecticides.
 4. Subject to total toxic metals discharge should not exceed level given at S. N, 25.
 5. Applicable only when and where sewage treatment is operational and BOD₅=80mg/l is achieved by the sewage treatment system.
 6. Provided discharge is not at shore and not within 10 miles of mangrove or other important estuaries.
- * The effluent should not result in temperature increase of more than 3⁰C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge.
- ** The value for industry is 200 mg/l
- *** Discharge concentration at or below sea concentration (SC).

Note: 1. Dilution of liquid effluents to bring them to the STANDARDS limiting values is not permissible through fresh water mixing with the effluent before discharging into the environment.

2. The concentration of pollutants in water being used will be subtracted from the effluent for calculating the STANDARDS limits".

**"SINDH ENVIRONMENTAL QUALITY STANDARDS FOR
INDUSTRIAL GASEOUS EMISSION (mg/Nm³, UNLESS
OTHERWISE DEFINED)."**

S. No.	Parameter	Source of Emission	Standards
1	2	3	4
1.	Smoke	Smoke opacity not to exceed	40% or 2 Ringleman Scale or equivalent smoke number
2.	Particulate matter	(a) Boilers and Furnaces	
	(1)	(i) Oil fired	300
		(ii) Coal fired	500
		(iii) Cement Kilns	300



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



PART-I

THE SINDH GOVT. GAZETTE EXT. JAN. 28, 2016

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		(b) Grinding, crushing, Clinker coolers and Related processes, Metallurgical Processes, converter, blast furnaces and cupolas.	500
3.	Hydrogen Chloride	Any	400
4.	Chlorine	Any	150
5.	Hydrogen Fluoride	Any	150
6.	Hydrogen Sulphide	Any	10
7.	Sulphur Oxides ^{(2) (3)}	Sulfuric acid/ Sulphonic acid plants	
		Other Plants except power plants operating on oil and coal	1700
8.	Carbon Monoxide	Any	800
9.	Lead	Any	50
10.	Mercury	Any	10
11.	Cadmium	Any	20
12.	Arsenic	Any	20
13.	Copper	Any	50
14.	Antimony	Any	20
15.	Zinc	Any	200
16.	Oxides of Nitrogen	Nitric acid Manufacturing unit.	3000
	(3)	Other plants except power plants operating on oil or coal:	
		Gas fired	400
		Oil fired	600
		Coal fired	1200

Explanations:-

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1 percent Sulphur content in fuel oil. Higher content of Sulphur will ease standards to be pro-rated.
3. In respect of emissions of Sulphur dioxide and Nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to Standards specified above, comply with the following standards:-



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



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THE SINDH GOVT. GAZETTE EXT. JAN. 28, 2016

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A. Sulphur Dioxide

Sulphur Dioxide Background levels Micro-gram per cubic meter ($\mu\text{g}/\text{m}^3$) Standards.

Background Air Quality (SO ₂ Basis)	Annual Average	Max. 24-hours Interval	Criterion I Max. SO ₂ Emission (Tons per Day Per Plant)	Criterion II Max. ground level increment to ambient (One year Average)
Unpolluted	<50	<200	500	50
Moderately Polluted*	50	200	500	50
Low	100	400	100	10
High	100	400	100	10
Very Polluted**	100	400	100	10

* For intermediate values between 50 and 100 $\mu\text{g}/\text{m}^3$ linear interpolations should be used.

** No projects with Sulphur dioxide emissions will be recommended.

B. Nitrogen Oxide

Ambient air concentrations of Nitrogen oxides, expressed as NO_x should not be exceed the following:-

Annual Arithmetic Mean $100\mu\text{g}/\text{m}^3$
(0.05 ppm)

Emission level for stationary source discharge before missing with the atmosphere should be maintained as follows:-

For fuel fired steam generators as Nanogram (10^0 -gram) per joule of heat input:

Liquid fossil fuel	..	..	..	130
Solid fossil fuel..	..	..	..	300
Lignite fossil fuel	..	..	..	260

Note:-

Dilution of gaseous emissions to bring them to the STANDARDS limiting value is not permissible through excess air mixing blowing before emitting into the environment.



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Sindh Environmental Quality Standards for Motor Vehicle Exhaust and Noise

(i) For in-use Vehicles				
S. No.	Parameter	Standards (maximum permissible limit)	Measuring Method	Applicability
1	2	3	4	5
1.	Smoke	40% or on the Ringleman Scale during engine acceleration mode	To be compared with Ringleman Chart at a distance of 6 meters or more.	Immediate effect
2	Carbon Monoxide	6 %	Under idling conditions; Non- dispersive infrared detection through gas analyzer.	
3.	Noise	85 db (A)	Sound-meter at 7.5 meter from the source.	



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For new Vehicles

EMISSION STANDARDS FOR DIESEL VEHICLES

(a) For passenger Cars and Light Commercial Vehicles (g/Km)

Type of Vehicle	Category/Class	Tiers	CO	HC+ NOx	PM	Measuring Method	Applicability
1	2	3	4	5	6	7	8
Passenger Cars,	M 1: with reference mass (RW).	Pak-II, IDI	1.0	0.7	0.08		All imported and local manufactured
	up to 2500 kg, Cars with RW over 2500 kg, to meet NI Category standards	Pak-II DI	1.0	0.9	0.10	NEDC (ECE 15+ EUDCL)	Diesel vehicles with effect from 01-07-2012
Light Commercial Vehicles	NI-I (RW<1250 Kg)	Pak-II IDI	1.0	0.70	0.08		
		Pak-II DI	1.0	0.90	0.10		
	NI-II(1250kg< RW < 1700 Kg)	Pak-II IDI	1.25	1.0	0.12		
		Pak-II DI	1.25	1.3	0.14		
	NI-III(RW< 1700 Kg)	Pak-II IDI	1.50	1.2	0.17		
		Pak-II DI	1.50	1.6	0.20		



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Parameter Standards (maximum permissible limit) Measuring method

Noise	85 db (A)	Sound-meter at 7.5 meters from the source
-------	-----------	---

(b) For Heavy Duty Diesel Engines and Large Goods Vehicles (g/Kwh)

Type of Vehicle	Category/ Class	Tiers	CO	HC	NOx	PM	Measuring Method	Applicability
1	2	3	4	5	6	7	8	9
Heavy Duty Diesel Engines	Turks and Buses	Pak-II	4.0	1.1	7.0	0.15	ECT-R-49	All imported and local manufactured diesel vehicles with the effect 1-7-2012
Large goods Vehicles	N2(2000 and up	Pak-II	4.0	7.0	1.10	0.15	EDC	

Parameter Standards (maximum permissible limit) Measuring method

Noise	85 db (A)	Sound-meter at 7.5 meters from the Source
-------	-----------	---

Emission Standards for Petrol Vehicles (g/km)

Type of Vehicle	Category/ Class	Tier	Co	HC+ NOx	Measuring Method	Applicability
1	2	3	4	5	6	7
Passenger Cars	M 1: with reference mass (RW): upto 2500 kg. Cars with RW over 2500 kg. to meet N1 Category standards	Pak-II	2.20	0.5	NEIDC (ECT-15+ EU DCL)	All imported and new models* locally manufactured* petrol vehicles with effect from 1 st July, 2009**



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Light	NI-I (RW<1250	Pak-II	2.20	0.5	
Commercial	kg) NI-II				
Vehicles	(1250kg> kg	Pak-II	4.0	0.65	
	RW < 1700 Kg)				
		Pak-II	5.0	0.08	
	NI-III(RW>				
	1700 kg)				
Motor	2,4 strokes <	Pak-II	5.5	1.5	ECER 40
Rickshaws	150 cc				
& Motor					
Cycles					
	2,4 strokes >	Pak-II	5.5	1.3	
	150cc				

Parameter Standards (maximum permissible limit) Measuring method

Noise source 85 db (A) Sound-meter at 7.5 meters from the

Explanations:

- DI: Direct Injection.
- IDI: Indirect Injection.
- EUDCL: Extra Urban Driving Cycle.
- NEDC: New European Driving Cycle.
- ECE: Urban Driving Cycle.
- M: Vehicles designed and constructed for the carriage of passenger and comprising no more than eight seats in addition to the driver's seat.
- N: Motor vehicles with at least four wheels designed and constructed for the carriage of goods.
- * New model means both model and engine type change.
- ** The existing models of petrol driven vehicles locally manufactured will immediately switch over to Pak-II emission standards but no late than 30th June, 2012.



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PART-I

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SINDH ENVIRONMENTAL QUALITY STANDARDS FOR AMBIENT AIR

Pollutants	Time-weight average	Concentration in Ambient Air	Method of measurement
Sulphur Dioxide(SO ₂)	Annual Average*	80 µg/m ³	Ultraviolet Fluorescence method
Oxides of Nitrogen as (NO)	24 hours**	120 µg/m ³	Gas Phase Chemiluminescence
Oxides of Nitrogen as (NO ₂)	Annual Average*	40 µg/m ³	Gas Phase Chemiluminescence
O ₃	24 hours**	40 µg/m ³	Non dispersive UV absorption method
Suspended Particulate Matters (SPM)	1 hour	80 µg/m ³	High Volume
Respirable Particulate Matter PM10	Annual Average*	360 µg/m ³	Sampling (Average flow rate not less than 1 l in 3 minutes)
Respirable Particulate Matter PM2.5	24 hours**	500 µg/m ³	B-Ray absorption method
Lead Pb	Annual Average*	120 µg/m ³	B-Ray absorption method
Carbon Monoxide(CO)	24 hours**	150 µg/m ³	B-Ray absorption method
	Annual Average*	40 µg/m ³ ***	ASS Method after sampling using EPM 2000 or equivalent filter paper
	24 hours**	75 µg/m ³	Non Dispersive Infra Red (NDIR) method
	Annual Average*	1 µg/m ³	
	24 hours**	1.5 µg/m ³	



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*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week, 24 hourly and at uniform interval.

** 24 hourly/8 hourly values should be met 98% in a year, 2% of the time. It may exceed but not on two consecutive days.

***Annual Average limit of $40\mu\text{g}/\text{m}^3$ or background annual average concentration plus allowable allowance of $9\mu\text{g}/\text{m}^3$, whichever is lower.

Sindh Standards for Drinking Water Quality

Properties / Parameters	Standard Values for Sindh	WHO Standards	Remarks
Bacterial			
All water intended for drinking (e.Coli or Thermo tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards.
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards.
Treated water in the distribution system (E.coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period	Most Asian countries also follow WHO standards.
Physical			
Colour	≤ 15 TCU	≤ 15 TCU	
Taste	Non objectionable/Acceptable	Non objectionable/Acceptable	
Odour	Non	Non	



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	objectionable/Acceptable	objectionable/Acceptable
Turbidity	(5 NTU	(5 NTU
Total hardness as CaCO ₃	< 500 mg/l	---
TDS	(1000	(1000
pH	6.5 - 8.5	6.5 - 8.5
Chemical		
<i>Essential Inorganic</i>	<i>mg/Litre</i>	<i>mg/Litre</i>
Aluminium (Al) mg/l	≤ 0.2	0.2

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Antimony (Sb)	≤ 0.005 (P)	0.02	
Arsenic (As)	≤ 0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium (Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl)	< 250	250	
Chromium (Cr)	≤ 0.05	0.05	
Copper (Cu)	2	2	
<i>Toxic Inorganic</i>	<i>mg/Liter</i>	<i>mg/Litre</i>	
Cyanide (CN)	≤ 0.05	0.07	Standard for Pakistan similar to Asian developing countries
Fluoride (F)*	≤ 1.5	1.5	
Lead (Pb)	≤ 0.05	0.01	Standard for Pakistan similar to most Asian developing countries
Manganese (Mn)	≤ 0.5	0.5	
Mercury (Hg)	≤ 0.001	0.001	
Nickel (Ni)	≤ 0.02	0.02	



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Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Nitrate (NO ₃)	≤ 0.50	50	
Nitrite (NO ₂)	≤ 3 (P)	3	
Selenium (SE)	0.01 (P)	0.01	
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	---	
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Organic			
Pesticides mg/L		PSQCA No. 4639-2004, Page No. 4 Table No. 3 Serial No. 20-58 may be consulted. ***	Annex II
Phenolic compounds (as Phenols) mg/L		≤ 0.002	
Polynuclear aromatic hydrocarbons (as PAH) µg/L		0.01 (By GC/MS method)	
Radioactive			
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	

*** PSQCA: Pakistan Standards Quality Control Authority

Proviso:

The existing drinking water treatment infrastructure is not adequate to comply with WHO guidelines. The Arsenic concentrations in some parts of Sindh have been found high then Revised WHO guidelines. It will take some time to control arsenic through treatment process. Lead concentration in the proposed standards is higher than WHO Guidelines. As the piping system for supply of drinking water in urban centers are generally old and will take significant resources and time to get them replaced. In the recent past, Lead was completely phased out from petroleum



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



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products to cut down Lead entering into environment. These steps will enable to achieve WHO guidelines for Arsenic, Lead, Cadmium and Zinc. However, for bottled water, WHO limits for Arsenic, Lead, Cadmium and Zinc will be applicable and PSQCA Standards for all the remaining parameters.

Sindh Environmental Quality Standards for Noise

S. No.	Category of Area / Zone	Effective from 1 st Jan, 2015		Effective from 1 st January, 2015	
		Limit in dB(A) Leq *			
		Day Time	Night Time	Day Time	Night Time
1.	Residential Area (A)	65	50	55	45
2.	Commercial Area (B)	70	60	65	55
3.	Industrial Area (C)	80	75	75	65
4.	Silence Zone (D)	55	45	50	45

Note: 1. Day time hours: 6:00 a.m to 10:00 p.m
 2. Night time hours: 10:00 p.m to 6:00 a.m
 3. Silence zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts
 4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.
 * dB(A) Leq: Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

3. Repeal and Savings.

- (1) The provisions of the Statutory Notification dated 10th August, 2000 and 18th October, 2010, issued by the Ministry of Environment, Government of Pakistan, to the extent of the Province of Sindh are hereby repealed.
- (2) All actions taken, proceedings initiated shall be deemed to have been taken and initiated validly under the the provisions of these Rules.

DIRECTOR GENERAL
SINDH ENVIRONMENTAL PROTECTION
AGENCY

**Karachi: Printed at the Sindh Government Press
28-1-2016**

Annexure 4: Ambient Air & Noise Reports

EPA Certified Lab
EPA/LAB/Certificate-14/2024



Ref No: 10452/EGEL/SEW/2122/AW/01

Date: 13-06-2024

Report to: **M/s Sachal Engineering Works Pvt. Limited**
701, Business Center, Shahrah e Faisal,
Karachi.

SAMPLE DESCRIPTION	
Sample ID: Ambient Air Quality	Sample Type: Ambient Air
Sampling Start Date: 11-06-2024	Sampling Stop Date: 11-06-2024
Sampling Duration: 04 hrs.	Lab Report Ref. No.: 28371/EGEL/SEW/2223/048
Project ID: Ghotki-Kandhkot Road Bridge Project	Sampling Location: Near Bridge Start Point Ghotki Site.

ANALYTICAL TEST REPORT							
S. #	LOCATION	PARAMETERS TO BE ANALYZED		STANDARD	UNITS	RESULTS	TEST METHOD
				SEQS			
1	Near Bridge Start Point Ghotki Site.	Carbon Monoxide	CO	10	mg/m ³	2.1	Gas Filter Correlation
2		Oxides of Nitrogen as	NO ₂	80	µg/m ³	58.9	Chemiluminescence
3		Oxides of Nitrogen as	NO	40	µg/m ³	10.4	
4		Ozone	O ₃	130	µg/m ³	45.6	UV fluorescence
5		Respirable Particulate Matter	PM ₁₀	150	µg/m ³	139.7	Gravimetric Sampling
6		Respirable Particulate Matter	PM _{2.5}	75	µg/m ³	39.4	
7		Suspended Particulate Matter	SPM	500	µg/m ³	412.3	
8		Lead	Pb	1.5	µg/m ³	ND	Spectrophotometer
9		Sulphur Dioxide	SO ₂	120	µg/m ³	80.2	UV fluorescence
11		Noise		75	dB	62.4	Microphone

SEQS= Sindh Environmental Quality Standard for Ambient Air

BDL=Below Detection Limit

ND= Not Detected

Term & Condition:

- Issued without prejudice
- Quality was assured through self-calibration of the instrument.
- The client is responsible lawful usage of reported data in future.

Comments: Tested parameter results are within the permissible limits of SEQs established for Air Quality.

 Prepared By	 Section Incharge (EGEL)
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The Analyses based on actual site condition when sample was collected. The interpretation or opinions expressed represent the best judgment. We have no responsibility and warranty or representation in connection with which such report is used.



ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT



EPA Certified Lab
EPA/LAB/Certificate-14/2024



Ref No: 10452/EGEL/SEW/2122/AW/01

Date: 13-06-2024

Report to: M/s Sachal Engineering Works Pvt. Limited
701, Business Center, Shahrah e Faisal,
Karachi.

SAMPLE DESCRIPTION

Sample ID: Ambient Air Quality
Sampling Start Date: 11-06-2024
Sampling Duration: 04 hrs.
Project ID: Ghotki-Kandhkot Road Bridge Project

Sample Type: Ambient Air
Sampling Stop Date: 11-06-2024
Lab Report Ref. No.: 28371/EGEL/SEW/2223/047
Sampling Location: Near Bridge End Point Kandhkot Site.

ANALYTICAL TEST REPORT

S. #	LOCATION	PARAMETERS TO BE ANALYZED		STANDARD	UNITS	RESULTS	TEST METHOD
				SEQS			
1	Near Bridge End Point Kandhkot Site.	Carbon Monoxide	CO	10	mg/m ³	2.2	Gas Filter Correlation
2		Oxides of Nitrogen as	NO ₂	80	µg/m ³	53.1	Chemiluminescence
3		Oxides of Nitrogen as	NO	40	µg/m ³	10.6	
4		Ozone	O ₃	130	µg/m ³	49.7	UV fluorescence
5		Respirable Particulate Matter	PM ₁₀	150	µg/m ³	143.6	Gravimetric Sampling
6		Respirable Particulate Matter	PM _{2.5}	75	µg/m ³	42.1	
7		Suspended Particulate Matter	SPM	500	µg/m ³	428.6	Spectrophotometer
8		Lead	Pb	1.5	µg/m ³	ND	
9		Sulphur Dioxide	SO ₂	120	µg/m ³	55.9	UV fluorescence
11		Noise		75	dB	63.3	Microphone

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Prepared By

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(EGEL)

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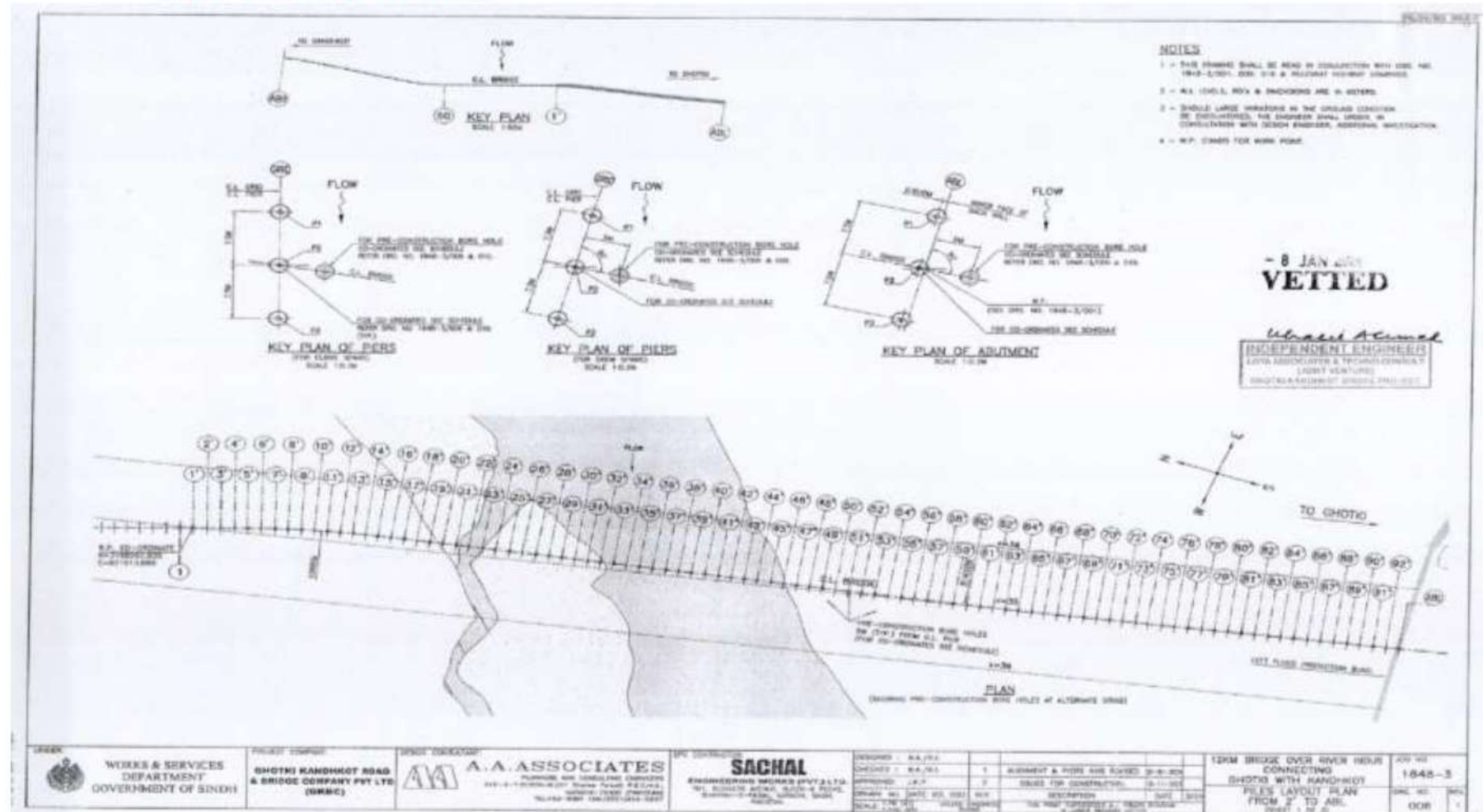




ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT

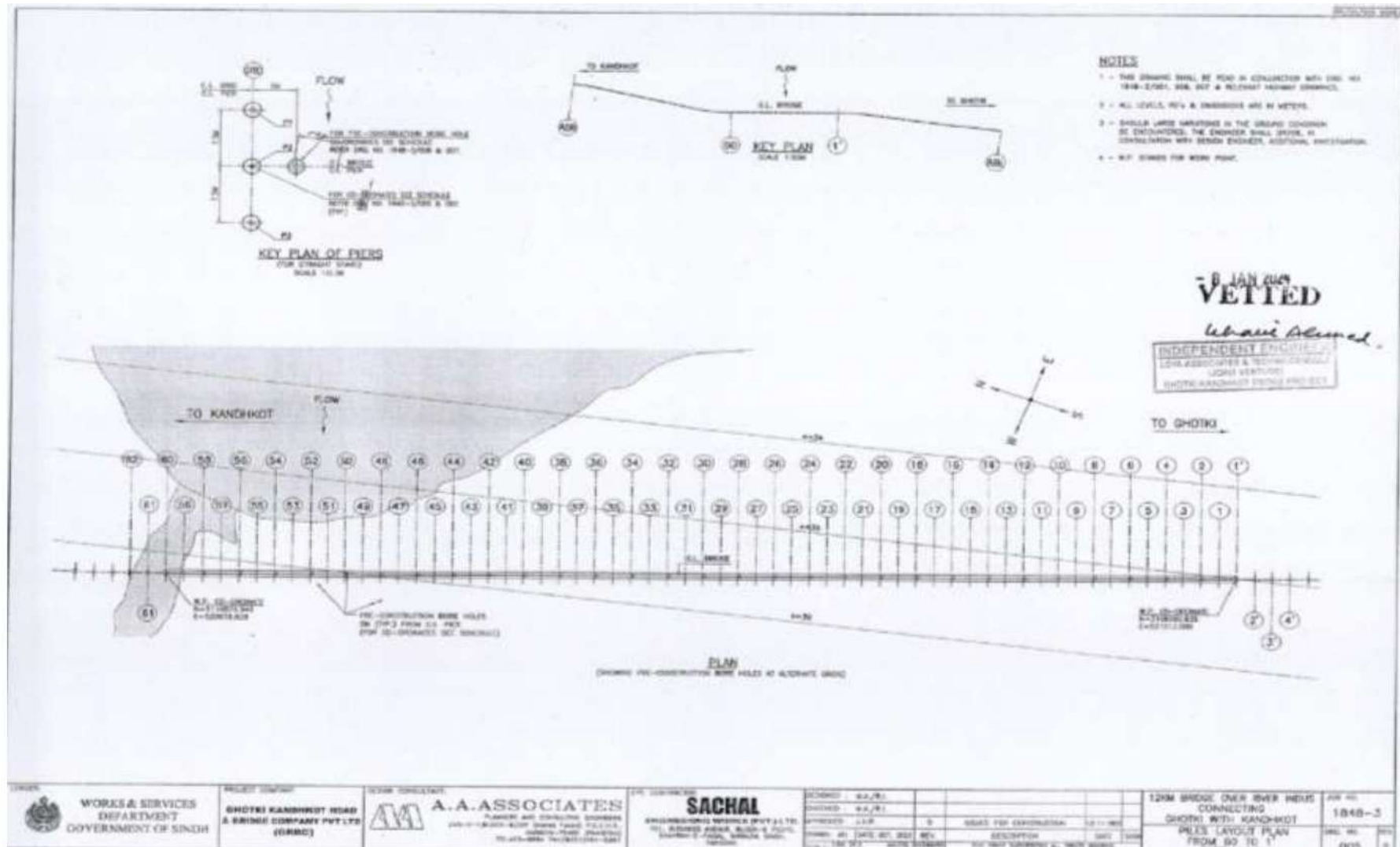


Annexure 5: Layout Plans of Revised Design





ENVIRONMENTAL IMPACT ASSESSMENT FOR ENHANCEMENT OF GHOTKI KANDHKOT BRIDGE PROJECT





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