



**ESTABLISHMENT OF A TEXTILE DYEING UNIT  
M/S PUNJAB DYEING & FINISHING**

**MOUZA THATTHA KHUDA YAR, KOT ABDUL MALIK, TEHSIL  
FEROZEWALA, DISTRICT SHEIKHUPURA, PUNJAB.**

**ENVIRONMENTAL IMPACT ASSESSMENT EIA**

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## GLOSSARY

<b>Air quality</b>	Measurement of the pollutants in the air; a description of healthiness and safety of the atmosphere.
<b>Area</b>	Area is the quantity that expresses the extent of a two-dimensional figure or shape, or planar lamina, in the plane.
<b>Compensation</b>	Includes cash payment, deferred payment, a bond, an insurance policy, stipend, payment in kind, rendition of services, grant of privileges and disturbance money, entitlement to special treatment by government and semi government entities, grant of alternative land, grant of import licenses and business, trade and commercial facilities in addition to the rehabilitation and resettlement of an affected person.
<b>Consultation</b>	Consultation refers to two-way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
<b>Coordinates contaminate</b>	Each of a group of numbers used to indicate the position of a point, line, or plane to make impure, pollute
<b>Disclosure</b>	The action of making new or secret information known
<b>Disruption</b>	Disturbance or problems which interrupt an event, activity, or process.
<b>Environmental Management</b>	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
<b>Evaluation</b>	The making of a judgment about the amount, number, or value of something; assessment.
<b>Geology</b>	A science that studies rocks, layers of soil, etc., in order to learn about the history of the earth and its life
<b>Ground water</b>	Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solid content of 10,000 milligrams per liter or less, and are not "exempted aquifers.
<b>Hazardous</b>	Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation
<b>Impact</b>	Effect on someone or something

<b>Land acquisition</b>	The process whereby a person is compelled by a public agency to cede all or part of the land a person owns or possesses, to the ownership and possession of that agency, for public purpose in return for compensation.
<b>Mitigation</b>	The action of reducing the severity, seriousness, or painfulness of something
<b>Occupational health</b>	Maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs
<b>Parking</b>	A parking garage is a building, or an area under a building, where cars can be parked.
<b>Project area</b>	The area specified by the funding and/or implementing agency according to the official gazette notification and includes the areas within the administrative limits of the federal or a provincial government.
<b>Proponent</b>	A person who advocates a theory, proposal, or course of action.
<b>Rehabilitation</b>	Include all compensatory measures to re-establish; at least lost incomes, livelihoods, living and social systems. It does not include the payment of compensation for required assets.
<b>Resettlement</b>	Means all measures taken to mitigate any and all adverse impacts, resulting due to execution of a project on the livelihood of the project affected persons, their property, and includes compensation, relocation and rehabilitation.
<b>Scope</b>	The extent of the area or subject matter that something deals with or to which it is relevant
<b>Social Environment</b>	It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact.
<b>Stakeholders</b>	Include affected persons and communities, proponents, private and public businesses, NGOS, host communities and EPA.
<b>Topography</b>	Details of the surface features of land. It includes the mountains, hills, creeks, and other bumps and lumps on a particular hunk of earth.

### LIST OF ABBREVIATION

<b>API</b>	American Petroleum Institute
<b>ASME</b>	American Society of Mechanical Engineers
<b>CO</b>	Carbon Monoxide
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>DCP</b>	Dry Chemical Powder
<b>EA</b>	Environmental Approval
<b>EC</b>	Electrical Conductivity
<b>EIA</b>	Environmental Impact Assessment
<b>EMMP</b>	Environmental Management and Monitoring Plan
<b>EMP</b>	Environmental Management Plan
<b>EPA</b>	Environmental Protection and Climate Change Department
<b>Gop</b>	Government of Punjab
<b>IEE</b>	Initial Environmental Examination
<b>IESCO</b>	Islamabad Electric Supply Company
<b>LPG</b>	Liquefied Petroleum Gas
<b>MAWP</b>	Maximum Allowable Working Pressure
<b>MDMT</b>	Minimum Design Metal Temperature
<b>NGO</b>	Non-Governmental Organizations
<b>P.W.H.T</b>	Post Weld Heat Treatment
<b>PEPA</b>	Punjab Environmental Protection Act
<b>PEQs</b>	Punjab Environmental Quality Standards
<b>PPE</b>	Personal Protective Equipment
<b>TDS</b>	Total Dissolved Solid
<b>UC</b>	Union Council
<b>UNCED</b>	United Nations Conference on the Environment and Development
<b>VOCs</b>	Volatile Organic Compounds
<b>WAPDA</b>	Water and Power Development Authority

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## **EXECUTIVE SUMMARY**

The proposed project involves the establishment of a textile dyeing and finishing unit, M/s Punjab Dyeing, located at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura, Punjab. The unit is spread over an area of 33 Marlas. The project aims to cater to the growing demand for high-quality dyed and finished textile products in the regional and national markets. The facility will employ modern dyeing and finishing technologies to ensure consistent product quality, operational efficiency, and compliance with environmental standards. Key operations at the unit will include fabric preparation, dyeing, washing, finishing, drying, and quality control. The process will utilize reactive, disperse, and vat dyes depending on fabric type, with an emphasis on minimizing chemical use and optimizing water and energy consumption. To mitigate environmental impacts, the proponent has planned installation of a Packaged Wastewater Treatment Plant for treating process wastewater to meet the Punjab Environmental Quality Standards (PEQS) before discharge. Air emissions, noise, and solid waste will also be managed through best environmental practices and in accordance with applicable regulatory requirements. The project is expected to generate direct and indirect employment opportunities for local communities, stimulate economic activity in the textile sector, and contribute to regional industrial development. Overall, Punjab Dyeing represents a step toward sustainable industrial growth in Sheikhupura District through environmentally responsible textile production.

### **I. Need of the Project**

The establishment of M/s Punjab Dyeing at Mouza Thattha Khuda Yar, Tehsil Ferozewala, District Sheikhupura arises from the growing demand for quality dyed and finished textiles in Pakistan's thriving textile industry. The project aims to strengthen local manufacturing capacity, enhance value addition, and reduce reliance on imported fabric. By adopting modern, efficient, and environmentally sustainable dyeing technologies, the unit will contribute to industrial development, employment generation, and the overall socioeconomic growth of the region.

- To meet the increasing market demand for high-quality dyed and finished fabrics in the local and export-oriented textile industry.
- To support the rapidly expanding textile and apparel sector of Punjab, which forms a major component of Pakistan's GDP and industrial output.
- To reduce dependency on imported dyed fabrics by enhancing local value addition within the textile supply chain.
- To create employment opportunities for skilled and unskilled labor in Sheikhupura and nearby areas.
- To utilize modern dyeing and finishing technologies that ensure product consistency, efficiency, and environmental compliance.
- To promote industrial growth in Sheikhupura District, identified as a key industrial hub under Punjab's industrial development plans.
- To improve export competitiveness by meeting international quality standards and delivery timelines.

- To optimize resource use through energy-efficient and water-saving technologies in the dyeing process.
- To contribute to socioeconomic development of the local area through increased income generation, ancillary businesses, and infrastructure improvement.
- To enhance Pakistan's textile sector capacity, supporting national goals for industrial diversification and sustainable production.

## **II. Policy, Legal and Administrative Framework**

The proposed project, Punjab Dyeing Unit, will comply with all applicable environmental laws, policies, acts, and regulations of the Government of Pakistan and the Government of Punjab, as well as relevant international environmental standards and best practices.

Key legislation governing the project includes the Pakistan Environmental Protection Act, 1997, and the Punjab Environmental Protection (Amendment) Act, 2012, which require environmental assessment and approval prior to project execution. The project will also adhere to the Punjab Environmental Quality Standards (PEQS) for air emissions, effluent discharge, noise, and waste management, as notified by the Punjab Environmental Protection Agency (Punjab-EPA).

In addition, the project will comply with the National Environmental Policy (2005), Pakistan Climate Change Policy (2012), and relevant industrial and occupational health and safety regulations. Internationally recognized best practices for textile dyeing operations, effluent treatment, chemical storage and handling, and resource efficiency will also be adopted to ensure sustainable and environmentally responsible operations.

Institutional coordination will be maintained with the Punjab-EPA, Department of Industries, local municipal authorities, and other relevant agencies to ensure adherence to all statutory and environmental obligations throughout the project lifecycle.

## **III. Environment Category of the Project**

Based on the Punjab Environmental Protection Act 2012 and the Review of IEE & EIA Regulations, 2022 for filing, reviewing, and approving environmental assessments, the present project is classified under Schedule II class A (6).

## **IV. PROJECT TITLE AND LOCATION**

**Title:** Establishment Of A Textile Dyeing And Finishing Unit by M/S Punjab Dyeing, Located At Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura, Punjab.

**Location:** Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura, Punjab

## **V. Project Proponent**

Mr. Faisal Javed and Mr. Muhammad Riaz are the proponent of proposed project & wants to get NOC for compliance of Section 12 to establish its business.

<b>Name</b>	Faisal Javed
CNIC	35501-04600665
Address	Khanghran Wala, Mandi Faiz Abad, Nankana Sahib
<b>Name</b>	<b>Muhammad Riaz</b>
CNIC	34501-18095221
Address	Scheme No.2, Kot Abdul Malik, Tehsil Ferozwala, District Sheikhpura.

## **VI. Brief Description of the project**

The proposed project involves the establishment of a textile dyeing and finishing unit under the name M/s Punjab Dyeing, located at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhpura, Punjab. The facility will be developed over an area of approximately 33 Marla. The unit is designed to process various types of fabrics, including cotton, polyester, and blended textiles, through stages of pre-treatment, dyeing, washing, drying, and finishing. Modern and efficient machinery will be installed to ensure high-quality output and operational sustainability. Key utilities for the project include a boiler unit for steam generation, cooling systems, water supply and storage arrangements, electrical installations, and a chemical storage area. A dedicated Packaged Wastewater Treatment Plant will be installed to treat process wastewater and ensure compliance with the Punjab Environmental Quality Standards (PEQS) before discharge. The project will also include provisions for solid waste management, air emission control, and occupational health and safety measures. All operations will be conducted in accordance with national environmental regulations and international best practices for textile manufacturing. Upon commissioning, the project is expected to create significant employment opportunities, stimulate industrial activity in the region, and contribute to socioeconomic development through value addition in the textile sector.

## **VII. Project Impacts and Recommendations for their Mitigation**

Impact assessment is crucial for project initiation as it enables the identification and comprehension of a project's potential positive and negative effects. Understanding these impacts aids in tailoring the project to maximize benefits and minimize risks. Impact assessment assists in recognizing environmental, social and economic challenges and risks and gives the directions to develop strategies that mitigate these risks and adjust the plan accordingly.

**Table 0-1: Project Impacts and their Mitigations Measure**

### **Screening of possible Impacts during Design/Pre- Construction phase**

<b>Potential Issue</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk Level</b>	<b>Residual Impact</b>
Improper site layout or facility design not considering environmental and safety aspects	Possible	Major	High	Long Term
Incorrect siting near	Rare	Major	Medium	Long Term

Potential Issue	Likelihood	Consequence	Risk Level	Residual Impact
residential areas, schools, or other sensitive receptors				
Use of substandard construction materials or non-compliance with building codes	Likely	Moderate	Medium	Long Term
Inadequate fire safety measures and emergency access provisions during design stage	Possible	Major	High	Long Term
Occupational health and safety risks to workers during site preparation, excavation, and construction	Likely	Moderate	Medium	Short Term
Dust generation, noise, and vibration from construction machinery causing community disturbance	Likely	Minor	Low	Short Term
Improper disposal of construction waste, debris, or excavated material	Possible	Moderate	Medium	Short Term
Contamination of soil or surface water due to accidental spillage of fuels, lubricants, or chemicals	Possible	Moderate	Medium	Short Term
Traffic congestion and road safety risks due to transport of construction materials and equipment	Likely	Minor	Low	Short Term
Disturbance to existing utilities (water, electricity, drainage) during construction activities	Unlikely	Moderate	Low	Short Term

**Screening of possible Impacts during Construction phase**

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
Site clearing and excavation leading to soil disturbance and erosion	Likely	Moderate	Medium	Short Term
Dust emissions from excavation, material handling, and vehicular movement	Likely	Minor	Low	Short Term
Noise and vibration from	Likely	Minor	Low	Short Term

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
construction machinery and vehicles				
Temporary degradation of air quality due to emissions from construction equipment	Possible	Moderate	Medium	Short Term
Improper disposal of construction waste and debris contaminating soil or drains	Possible	Moderate	Medium	Short Term
Risk of water contamination from accidental spillage of fuels, oils, or chemicals	Possible	Moderate	Medium	Short Term
Occupational health and safety risks to workers (injuries, exposure, heat stress)	Likely	Moderate	Medium	Short Term
Traffic congestion and road safety hazards due to transport of materials and heavy vehicles	Likely	Minor	Low	Short Term
Nuisance to local community due to noise, dust, and restricted access	Likely	Minor	Low	Short Term
Disturbance or damage to existing utility services (water, sewerage, power lines)	Unlikely	Moderate	Low	Short Term

**Screening of possible Impacts during Operational Phase**

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
Generation of wastewater containing dyes, chemicals, and suspended solids	Likely	Major	High	Long Term
Inadequate operation or malfunctioning of the Packaged Wastewater Treatment Plant leading to water pollution	Possible	Major	High	Long Term
Air emissions from boilers and machinery (SO <sub>2</sub> , NO <sub>x</sub> , CO, particulates)	Likely	Moderate	Medium	Long Term
Odor nuisance from wastewater or chemical handling areas	Possible	Minor	Low	Short Term
Improper storage,	Possible	Major	High	Short Term

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
handling, or spillage of dyes and chemicals				
Solid waste generation (sludge, packaging, filter residues) and improper disposal	Likely	Moderate	Medium	Long Term
Occupational health and safety risks to workers due to exposure to chemicals, heat, and noise	Likely	Major	High	Long Term
Noise generation from operational equipment and ventilation systems	Likely	Minor	Low	Long Term
Excessive water and energy consumption affecting resource sustainability	Possible	Moderate	Medium	Long Term
Accidental fire, explosion, or chemical reaction incidents	Unlikely	Major	Medium	Long Term
Traffic congestion from transport of raw materials and finished				

### VIII. PROPOSED MONITORING

The monitoring program is designed to ensure that the requirements of the environmental approval awarded by the EPA are met. Monitoring Program (MP) provides important information that allows for more effective planning and an adaptive response based on the assessment of the effectiveness of mitigation measures. The monitoring of various parameters will help to determine the extent to which project construction/operation activities will cause an environmental disturbance.

**Table 0-2: Proposed Monitoring Plan**

Environmental segment/element	Monitoring parameters	Reference location/monitoring point	Monitoring frequency
<b>Construction Phase</b>			
Water Quality	As prescribed by the Punjab environmental Drinking Water Quality Standards	Main Drinking Water Source	Quarterly
Ambient air	Dust, Smoke, PM,	Use of generators,	Quarterly

Environmental segment/element	Monitoring parameters	Reference location/monitoring point	Monitoring frequency
emissions	SO <sub>x</sub> , NO <sub>x</sub> , CO	movement of materials, digging or excavation.	
Waste water including Sewage	Ensure that all wastewater is treated to the level set by the PEQS.	The sewage or sanitary wastewater by the campsite and use for other construction activities.	Quarterly
Noise	The Levels prescribed as in Punjab environmental quality standards	The noise produced by the machinery during construction work.	Quarterly
Solid Waste Disposal	Ensure that all wastes are disposed of according to legal requirements of the country.	The waste material, rubble and solid waste produced by the camp site	Quarterly
<b>Operational Phase</b>			
Water Quality	As prescribed by the Punjab environmental Drinking Water Quality Standards	Main Drinking Water Source	Quarterly
Ambient air emissions	Methane and carbon dioxide, PM, CO, O <sub>3</sub>	Generator Area	Quarterly
Waste water including Sewage	Ensure that all wastewater is treated to the level set by the PEQS-Pakistan.	Main Disposal Site	Quarterly
Noise	Noise levels	Generator and parking area	Once monthly at all involved places
Solid Waste Disposal	Ensure that all wastes are disposed of according to legal requirements of the country.	Building's solid waste/ storage area	Regularly in connection with environmental and safety rounds.

## IX. Environmental Management Cost

The cost for environmental management and monitoring will be the part of contract of Contractor and Consultants respectively. However, a lump sum amount will be allocated by the project proponent as cost for environmental training and monitoring for a period of two years during construction and operation of the project.

**Table 0-3: Environmental Management Cost**

<b>Sr. No.</b>	<b>Environmental Management / Monitoring Item</b>	<b>Revised Cost (PKR)</b>
1	Air Quality & Noise Monitoring (annual)	130,000
2	Water Quality Testing (process + drinking)	120,000
3	Effluent / Wastewater Testing	90,000
4	Solid & Hazardous Waste Management (bins, disposal contracts)	170,000
5	PPE & Safety Equipment for Workers	140,000
6	Training & Awareness Programs (environmental & safety)	80,000
7	Emergency Preparedness (spill kits, firefighting, first aid)	80,000
8	Environmental Reporting & Compliance (EPA fees, audits)	90,000
<b>Total</b>	—	<b>900,000</b>

## X. Stakeholder Consultations

Consultations were carried out with the local residents, nearby business owners, and community representatives in the vicinity of M/s Punjab Dyeing, located at Mouza Thattha Khuda Yar, Tehsil Ferozewala, District Sheikhpura. The purpose of these consultations was to inform the community about the proposed textile dyeing and finishing unit and to obtain their feedback and concerns regarding potential environmental and social impacts.

The community members generally expressed a positive attitude toward the project and welcomed its establishment in their area. They viewed the proposed unit as a source of employment and economic uplift for local people, particularly for unskilled and semi-skilled labor. Residents appreciated that the project would promote industrial growth in the region and strengthen ancillary businesses, such as transport, maintenance, and raw material supply.

Some participants highlighted the importance of proper wastewater treatment, air quality management, and noise control to avoid adverse effects on nearby settlements. The proponent assured the community that a modern Packaged Wastewater Treatment Plant and environmental management measures will be implemented to comply with all Punjab Environmental Quality Standards (PEQS).

## XI. Conclusion

The study was undertaken to assess the potential environmental impacts associated with the establishment of the proposed Punjab Dyeing Unit located at Mouza Thattha Khuda Yar, Tehsil Ferozewala, District Sheikhpura. All relevant environmental aspects have been identified through baseline assessments, stakeholder consultations, and field investigations, with appropriate mitigation and management measures proposed to ensure compliance with

environmental regulations. The IEE/EIA has been prepared in accordance with the Pakistan Environmental Protection Act, 1997, the Punjab Environmental Protection (Amendment) Act, 2012, and the applicable Punjab Environmental Quality Standards (PEQS). With the adoption of the proposed Environmental Management Plan (EMP) and continuous monitoring, the project is not expected to cause any significant adverse environmental or social impacts. The inclusion of a modern Packaged Wastewater Treatment Plant, proper solid waste handling, and air and noise control measures will ensure sustainable and compliant operations throughout the project life cycle. On the contrary, the establishment of this textile dyeing and finishing unit will yield substantial socio-economic benefits, including employment generation, local business support, skills enhancement, and industrial development within Sheikhpura District. The project will also contribute to strengthening the regional textile value chain, promoting export competitiveness, and enhancing economic growth at both local and provincial levels. Moreover, the project enjoys strong community and stakeholder support, provided that environmental safeguards are effectively implemented. Overall, the proposed Punjab Dyeing Unit is environmentally viable, socially acceptable, and economically beneficial, aligning with the Government of Punjab's vision for sustainable industrial development.

## **1 INTRODUCTION**

The textile industry in Pakistan serves as a cornerstone of the national economy, contributing significantly to employment, exports, and industrial growth. Within this sector, dyeing and finishing operations play a crucial role in enhancing the quality, appearance, and market value of textile products. With growing domestic and international demand for high-quality dyed fabrics, there is an increasing need for modern, efficient, and environmentally compliant dyeing facilities. To address this industrial need, M/s Punjab Dyeing proposes the establishment of a Textile Dyeing and Finishing Unit on a land area of 33 Marla, located at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura. The proposed unit will specialize in the dyeing, washing, and finishing of fabrics using advanced machinery and controlled processes. The project aims to ensure consistent product quality, operational efficiency, and compliance with environmental standards through the adoption of modern effluent treatment systems and resource-efficient technologies. The facility will be equipped with state-of-the-art dyeing machines, washing lines, chemical dosing systems, and an Packaged Wastewater Treatment Plant to treat wastewater before disposal, in full compliance with the Punjab Environmental Quality Standards (PEQS). In addition, robust environmental management and occupational safety measures will be implemented to minimize pollution, conserve water, and ensure worker safety. Beyond improving the textile value chain, the project is expected to bring significant socioeconomic benefits, including employment generation, skill enhancement, and local economic uplift, while maintaining sustainable and environmentally responsible operations.

To fulfil the legal requirements under Section 12 of the Punjab Environmental Protection Act (Amended 2012), this Initial Environmental Examination (IEE)/Environmental Impact Assessment (EIA) report has been prepared. The study identifies and evaluates the potential environmental and social impacts of the proposed dyeing and finishing unit during both the construction and operational phases, and recommends appropriate mitigation and management measures to ensure the project's compliance and sustainability.

### **1.1 Purpose of the Report**

As per the Punjab Environmental Protection Act (PEPA), Section 12, which covers Initial Environmental Examination and Environment Impact Assessment, no project proponent is allowed to initiate construction or operations without filing the necessary documentation with the designated Government Agency under the Provincial Environmental Agencies. If the project is anticipated to cause adverse environmental effects, it necessitates an environmental impact assessment. Subsequently, approval must be obtained from the Government Agency. This requirement set forth by the Government of Punjab mandates the preparation of this Environmental Impact Assessment (EIA) Report to secure Environmental Approval (EA) from the Environmental Protection and Climate Change Department (EPA), Government of Punjab (GoP), Lahore. This report provides comprehensive information and data on the environmental, economic, and social impacts of the project, enabling its assessment and justification that the project will comply with the requirements of environmentally sustainable practices during both installation and operation stages,

as required by the Punjab Environmental Protection Act, 2012, the Punjab Environment Quality Standards, and the rules and regulations thereof.

## **1.2 Identification of Project and Proponent**

**Title:** Establishment Of A Textile Dyeing And Finishing Unit by M/S Punjab Dyeing, Located At Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhpura, Punjab.

**Location:** Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhpura, Punjab

**Proponent:** The details of the proponent are as following:

<b>Name</b>	Faisal Javed
CNIC	35501-04600665
Address	Khanghran Wala, Mandi Faiz Abad, Nankana Sahib
<b>Name</b>	<b>Muhammad Riaz</b>
CNIC	34501-18095221
Address	Scheme No.2, Kot Abdul Malik, Tehsil Ferozwala, District Sheikhpura.

## **1.3 Brief Description of Nature, Size and Location of Project**

The proposed project involves the establishment of a Textile Dyeing and Finishing Unit by M/s Punjab Dyeing, aimed at processing and finishing fabrics for the textile and apparel industry. The facility will carry out key operations including bleaching, dyeing, washing, drying, and finishing of textile materials to meet both domestic and export market demands. The project's core objective is to enhance local textile processing capacity, reduce dependency on outsourced dyeing services, and ensure environmentally responsible production through advanced wastewater treatment and pollution control measures.

The nature of the project is primarily industrial, focused on textile processing using modern machinery and controlled processes. The plant will utilize jet dyeing machines, soft flow dyeing units, hydro extractors, dryers, stenters, and finishing machines, along with chemical dosing and color mixing systems. The process will be supported by an Packaged Wastewater Treatment Plant to ensure that wastewater meets the Punjab Environmental Quality Standards (PEQS) prior to discharge. In addition, the facility will include storage tanks for chemicals and dyes, a water softening system, and safety and ventilation arrangements to ensure compliance with environmental and occupational health regulations.

The size of the project will cover an area of approximately 33 Marla accommodating the main dyeing hall, chemical and raw material storage areas, wastewater treatment section, finished goods storage, and administrative offices. The layout has been designed to maximize operational efficiency while maintaining safe working conditions and sufficient buffer zones for environmental protection.

The location of the project is at Mouza Thattha Khuda Yar, Kot Abdul Maik, Tehsil Ferozewala, District Sheikhupura, a region well-suited for industrial development due to its proximity to Lahore, availability of utilities (electricity, water, and gas), and excellent road connectivity for raw material supply and product distribution. The selected site is situated at a safe distance from major residential clusters and sensitive receptors, minimizing the risk of adverse environmental or social impacts. The area's established industrial character and accessibility to skilled labor make it a practical and sustainable choice for setting up a textile processing facility.

In summary, the proposed Punjab Dyeing Unit represents a medium-scale industrial initiative designed to strengthen the textile value chain, create local employment opportunities, and promote environmentally sustainable manufacturing practices in the region, while fully complying with national and provincial environmental laws and standards.

Establishment of a Textile Dyeing Unit  
M/S Punjab Dyeing & Finishing  
Environmental Impact Assessment EIA

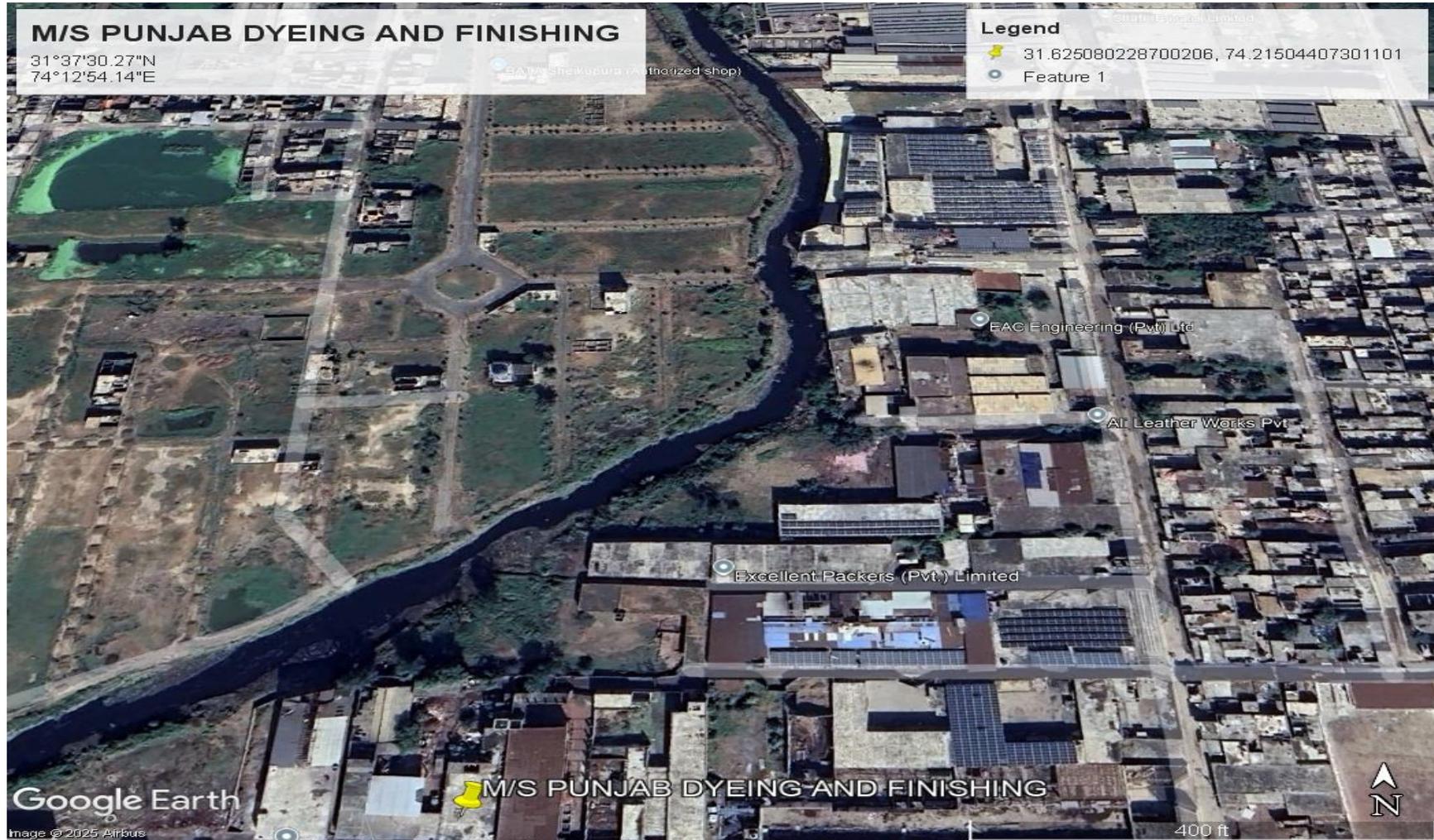


Figure 1-1: Location Map of the Project Area

## **2 SCREENING OF THE PROJECT**

Based on the Punjab Environmental Protection Act 2012 and the Review of IEE & EIA Regulations, 2022 for filing, reviewing, and approving environmental assessments, the present project is classified under Schedule II class B (2). Following list shows the projects included in Class B.

### **A. Manufacturing and Processing**

1. Cement plant
2. Chemical manufacturing units, including pharmaceuticals and cosmetic
3. Sugar mills and Distilleries
4. Food processing industries including, beverages, milk and dairy products with total cost more than Rs 200 million
5. Paper and paperboard, paper pulping, paints and dyes,

### **6. Textile units comprising of dyeing & printing**

7. Pesticides and fertilizer manufacturing units
8. Poultry waste processing units / rendering units
9. Tannery and leather units
10. Rubber projects with total cost more than Rs. 100 million
11. Battery Manufacturing and Recycling Plants
12. Ceramics and glass units
13. Electro plating and nickel/chrome plating including Surgical Units
14. Cutlery units
15. Slaughter House
16. Iron and steel rolling mills
17. Steel Furnaces
18. Smelting plants
19. Auto mobile manufacturing and assembling units
20. Resource Recovery Units

The establishment of the proposed textile dyeing and finishing Facility requires an Environmental Impact Assessment (EIA/IEE) due to the nature of its operations and potential impacts on air, water, soil, and occupational health. The assessment is essential to ensure compliance with the Pakistan Environmental Protection Act, 1997 and the Punjab Environmental Protection (Amendment) Act, 2012, while addressing environmental protection, healthcare safety, and regulatory obligations. Through this study, potential environmental and social impacts are identified, and appropriate mitigation measures are proposed for the design, construction, and operational phases. The EIA/IEE also facilitates informed decision-making, transparency, and

stakeholder participation, ensuring that the project is developed in a sustainable and environmentally sound manner.

### **3 SCOPING OF THE PROJECT**

The scoping process outlines the essential concerns and impacts requiring detailed investigation. It establishes the spatial and temporal limits, crucial concerns raised during consultations, and significant impacting factors impacting the project.

#### **3.1 Spatial and Temporal Boundaries of Environmental Assessment**

Considering spatial and temporal boundaries in environmental assessments is vital to comprehensively evaluate the impact of a project. Spatial boundaries define the area affected, aiding in recognizing the extent of impact on ecosystems and nearby communities. Temporal boundaries assess short and long-term effects, enabling an understanding of how impacts evolve over time and helping in planning mitigation measures and long-term sustainability strategies. This approach ensures accurate, detailed assessments and effective addressing of potential environmental consequences related to the project. The proposed project is located at Mouza Thatta Khuda Yar, Kot Abdul Malik, Sheikhpura.

#### **3.2 Important issues and concerns raised during Consultation**

The EIA for the proposed project incorporated a two-stage consultation process, primarily focused on one-on-one meetings. In the initial stage, the consultation was specifically directed towards engaging local government authorities, affected individuals, and local communities. The primary goal of this stage was to evaluate both the short-term and long-term impacts that might result from the new development proposed for the project in its early stages. The intent was to gather insights and perspectives from key stakeholders in the immediate vicinity to better understand potential environmental, social, and economic implications of the project. The second stage of consultations, as indicated, will be conducted through a more extensive process of public participation if deemed necessary. This broader involvement will allow for a wider outreach to the public, enabling a more comprehensive engagement to gather additional feedback, concerns, and insights from a larger cross-section of the community. This will ensure a more inclusive approach, providing an opportunity for a wider range of stakeholders to contribute their perspectives, concerns, and suggestions, which can be valuable in shaping and refining the EIA for the proposed project.

#### **3.3 Significant impacts and factors to be determined**

In a textile dyeing and finishing unit, the determination of significant environmental impacts requires a detailed assessment of the potential effects arising from the use of dyes, pigments, chemicals, and auxiliaries involved in the dyeing, bleaching, and finishing processes. Key considerations include the generation and discharge of wastewater, air emissions from boilers and dryers, solid and sludge waste management, and energy and water consumption during production operations. The quality of effluent, its treatment through a Packaged Wastewater Treatment Plant, and adherence to the Punjab Environmental Quality Standards (PEQS) are critical for minimizing pollution of nearby soil and water resources.

Occupational health and safety risks for workers are also significant, particularly due to chemical handling, exposure to steam and heat, operation of high-temperature dyeing machines, and contact with potentially hazardous substances such as acids, alkalis, and colorants. Proper use of personal protective equipment (PPE), ventilation systems, and training in chemical safety is essential to ensure a safe working environment. Additionally, noise and airborne particulate emissions from mechanical operations and material handling activities must be carefully monitored and controlled.

The study also considers potential impacts on surrounding communities, the adequacy of local infrastructure for water supply, drainage, and waste disposal, and the project's compliance with national environmental regulations. Emergency preparedness, chemical spill response, fire safety systems, and safe storage and disposal of process waste are vital to ensure the sustainability of operations. Implementing best available techniques (BAT) and environmentally responsible practices will not only safeguard human health and the environment but also enhance the long-term operational efficiency and compliance of the proposed Punjab Dyeing Unit.

### **3.4 Development of an Environmental Management Plan**

The EMP in an EIA is crucial as it outlines strategies to mitigate environmental impacts, ensures regulatory compliance, guides project operations, promotes sustainability, reduces risks, assures stakeholders, and allows for ongoing improvement and adaptation to address environmental concerns throughout the project's lifecycle.

These key parts of EMP include a clear description of the project, an outline of potential environmental impacts and risks, specific mitigation measures tailored to address these impacts, a comprehensive monitoring and reporting system to track environmental indicators, protocols for emergency response and contingency planning, details on stakeholder engagement and communication strategies, and a framework for ongoing review and updates to ensure the plan's adaptability and effectiveness over the course of the project. Together, these components form a comprehensive EMP designed to guide environmental practices, minimize adverse impacts, and maintain compliance with regulations and best practices in environmental management.

### **3.5 Development of an Environmental Management Plan**

The Environmental Management Plan (EMP) for the proposed Punjab Dyeing Unit serves as a vital framework to ensure that all potential environmental impacts arising from textile dyeing and finishing operations are effectively mitigated and managed throughout the project's lifecycle. The EMP provides clear strategies to minimize pollution, promote resource efficiency, ensure regulatory compliance, and support the sustainable operation of the facility. It outlines a structured approach for controlling emissions, treating wastewater through the Packaged Wastewater Treatment Plant, managing solid and chemical waste, and maintaining occupational health and safety

standards in accordance with the Punjab Environmental Quality Standards (PEQS) and other applicable laws.

Key components of the EMP include a detailed description of the project's operations, identification of environmental risks, and corresponding site-specific mitigation measures. The plan also establishes a comprehensive monitoring and reporting system to track air, water, and noise quality, as well as waste management performance. It integrates emergency preparedness protocols, including chemical spill management, fire safety, and contingency measures, to minimize risks to both workers and the surrounding community.

Additionally, the EMP emphasizes stakeholder engagement, capacity building, and continuous improvement, ensuring that environmental performance is regularly reviewed and updated in response to operational or regulatory changes. Through the consistent implementation of this plan, the Punjab Dyeing Unit aims to maintain a balance between industrial growth and environmental protection, achieving sustainable textile production while fostering community trust and long-term environmental stewardship.

## **4 PROJECT ALTERNATIVES**

The alternatives for the proposed project and their relative potential impacts on the environment were considered to evaluate the best project option. The following alternatives were assessed for the project.

### **Project Alternatives**

- No Project Option / Worst Scenario Option
- Site Alternative
- Technology Alternative

### **4.1 No Project Option / Worst Scenario Option**

#### **4.1.1 Analysis**

- **Strengths and Opportunities**

If the proposed Punjab Dyeing Unit at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhpura is not established, financial resources and time invested by the proponent could be redirected toward other low-impact ventures. The absence of construction and operation would prevent temporary nuisances such as dust generation, noise, and traffic disturbance. Additionally, potential environmental concerns related to wastewater discharge, chemical handling, and energy consumption would be avoided, allowing the existing environmental and social conditions of the area to remain undisturbed.

- **Weaknesses and Threats**

Not undertaking the project would lead to a loss of significant economic, industrial, and employment benefits for the region. The area would miss the chance to diversify its industrial base, create new jobs, and promote technology transfer within the textile sector. Potential contributions to the textile value chain and enhancements in export capacity would also remain unrealized. Additionally, local suppliers, transport companies, and service providers would lose potential business, and the region would forgo the accompanying industrial growth and infrastructure improvements associated with the project.

#### **4.1.2 Conclusion**

While the “No Project Option” eliminates environmental risks and avoids immediate disturbances, it also prevents socio-economic uplift, technological advancement, and regional industrial development. Therefore, this option is not considered favorable.

### **4.2 Site Alternatives**

The project site, measuring 33 Marla, has been carefully selected by the proponent. The land is owned by the company, eliminating the need for additional land acquisition and simplifying project implementation. The location has access to required utilities and infrastructure and offers logistical advantages for supply chain management and market access.

Key advantages of the selected site include:

- Located within a semi-industrialized area, minimizing potential land-use or community conflicts.
- Proximity to major transport routes, including the Lahore–Sheikhupura Road and motorway network, ensuring smooth movement of raw materials and finished goods
- Availability of basic infrastructure facilities, including power, gas, water supply, and an accessible internal road network.
- Access to a skilled and semi-skilled labor force from nearby industrial localities and settlements.
- Sufficient space to accommodate wastewater treatment systems, storage yards, and green buffer zones, ensuring environmental compliance.

The selected site is not only logistically convenient but also minimizes potential environmental and social disturbances, making it the most suitable option for the facility.

#### **4.3 Technology Alternative**

##### **4.3.1 Analysis**

In the textile dyeing and finishing sector, the selection of appropriate production technology plays a vital role in ensuring product quality, operational efficiency, worker safety, and environmental compliance. The choice of dyeing system, wastewater management setup, and energy-efficient machinery directly influences the plant's sustainability and compliance with the Punjab Environmental Quality Standards (PEQS). For the proposed Punjab Dyeing Unit at Mouza Thattha Khuda Yar, Kot Abdul Malik, Sheikhupura, different technological approaches were evaluated to identify the most suitable option based on efficiency, cost, and environmental performance.

##### **4.3.2 Conventional (Manual/Semi-Manual) Dyeing Systems**

- Lower initial setup cost and simple installation.
- High dependency on manual labor for dye mixing, loading, and monitoring.
- Greater variation in product quality due to inconsistent process control
- Increased occupational exposure to dyes, chemicals, and heat.
- Higher water and energy consumption and greater generation of untreated effluents.

##### **4.3.3 Fully Automated Systems**

- High precision, sterility, and consistency in reagent preparation and packaging.
- Reduced worker exposure to chemicals, improving occupational safety.
- Significant capital investment required, with higher operational costs.

- Greater reliance on imported technology and specialized expertise.

#### **4.3.4 Fully Automated Dyeing Systems**

- Precise control over dye concentration, temperature, and process timing.
- Significantly reduces chemical wastage, energy use, and water consumption.
- Ensures consistent color quality and minimizes reprocessing.
- High initial investment and reliance on imported machinery and technical expertise
- Requires specialized maintenance and trained operators.

#### **Proposed Semi-Automated Approach**

The selected technology for the proposed dyeing unit will adopt a semi-automated dyeing process, integrating advanced dyeing machines with computer-assisted control for temperature, mixing ratios, and process time. This hybrid setup combines automation with operator supervision, providing:

- Improved process consistency and color reproducibility while maintaining cost efficiency.
- Reduced direct worker exposure to dyes and chemicals, enhancing occupational safety.
- Lower resource consumption through controlled dosing and optimized cycle times.
- Flexibility to upgrade to fully automated systems as production expands.

#### **4.3.5 Conclusion**

The evaluation of technological alternatives shows that the semi-automated dyeing system is the most suitable option for the proposed textile dyeing and finishing unit. While conventional systems are inexpensive, they result in high water and energy use, inconsistent product quality, and greater worker exposure to chemicals. Fully automated systems offer high precision and environmental efficiency but require heavy capital investment, imported expertise, and complex maintenance. The semi-automated approach provides the best balance by improving process control, reducing chemical and water consumption, enhancing worker safety, and ensuring better compliance with environmental standards, while remaining cost-effective and scalable for future expansion

## **5 DESCRIPTION OF THE PROJECT**

This chapter presents all key aspects of the proposed project. It describes the nature and scope of the Textile Dyeing and Finishing Unit planned by M/s Punjab Dyeing, along with details of its location, design, and site layout. The chapter outlines all major activities involved during the construction and operational phases of the project, including the production process through which textile materials will be washed, dyed, dried, and finished. It also provides an overview of the process flow, machinery and equipment to be installed, as well as supporting requirements such as manpower, utilities, raw materials, chemicals, and environmental management systems. The aim of this chapter is to give a clear understanding of how the project will function, the technology to be employed, and the infrastructure needed to ensure efficient, safe, and environmentally compliant operations.

### **5.1 Type & Category of the Project**

The proposed project involves the establishment of a modern Textile Dyeing and Finishing Unit by M/s Punjab Dyeing, intended to create a fully equipped and environmentally compliant textile processing facility. The unit will include dedicated production sections for pre-treatment, bleaching, dyeing, washing, drying, and finishing of textile materials using advanced and energy-efficient machinery. Key equipment will include jet dyeing machines, soft-flow dyeing units, hydro-extractors, dryers, stenters, and finishing machines, supported by automated chemical dosing and color-mixing systems to ensure consistent product quality.

To support smooth industrial operations, the project includes purpose-built storage areas for dyes, chemicals, and raw materials, as well as designated sections for finished goods. A Packaged Wastewater Treatment Plant will be installed to manage and treat wastewater, ensuring compliance with Punjab Environmental Quality Standards (PEQS). Additional infrastructure such as water softening systems, ventilation and safety arrangements, and fire-fighting equipment will be integrated to meet industrial and environmental safety requirements.

The facility will be developed on a 6-kanal site using a combination of RCC and pre-engineered building (PEB) structures to ensure optimal workflow, worker safety, and long-term durability. The project represents a medium-scale textile processing initiative designed to enhance local dyeing capacity and reduce reliance on outsourced services. With an estimated cost of PKR 60 million, the project falls under an industrial category requiring environmental review. In accordance with the Punjab Environmental Protection Act, 2012 and the Review of IEE & EIA Regulations, 2022, the proposed textile processing facility is classified under Schedule II, thereby necessitating the preparation of a comprehensive Environmental Impact Assessment (EIA) report.

### **5.2 Objective of the Project**

The primary objective of the proposed project by M/s Punjab Dyeing, located on a 6-kanal site, is to establish a modern and efficient textile dyeing and finishing facility that meets national environmental regulations and industry best practices. The project aims to enhance local textile processing capacity by providing high-quality

dyeing, washing, bleaching, drying, and finishing services, thereby reducing dependence on outsourced processing and improving production timelines for textile and apparel manufacturers. By incorporating advanced dyeing technologies, automated chemical dosing systems, and an environmentally compliant Packaged Wastewater Treatment Plant, the facility will ensure consistent product quality while minimizing environmental impacts. In addition to supporting the regional textile value chain, the project will generate skilled and semi-skilled employment opportunities, promote industrial development in the area, and contribute to the overall growth and competitiveness of Pakistan's textile sector.

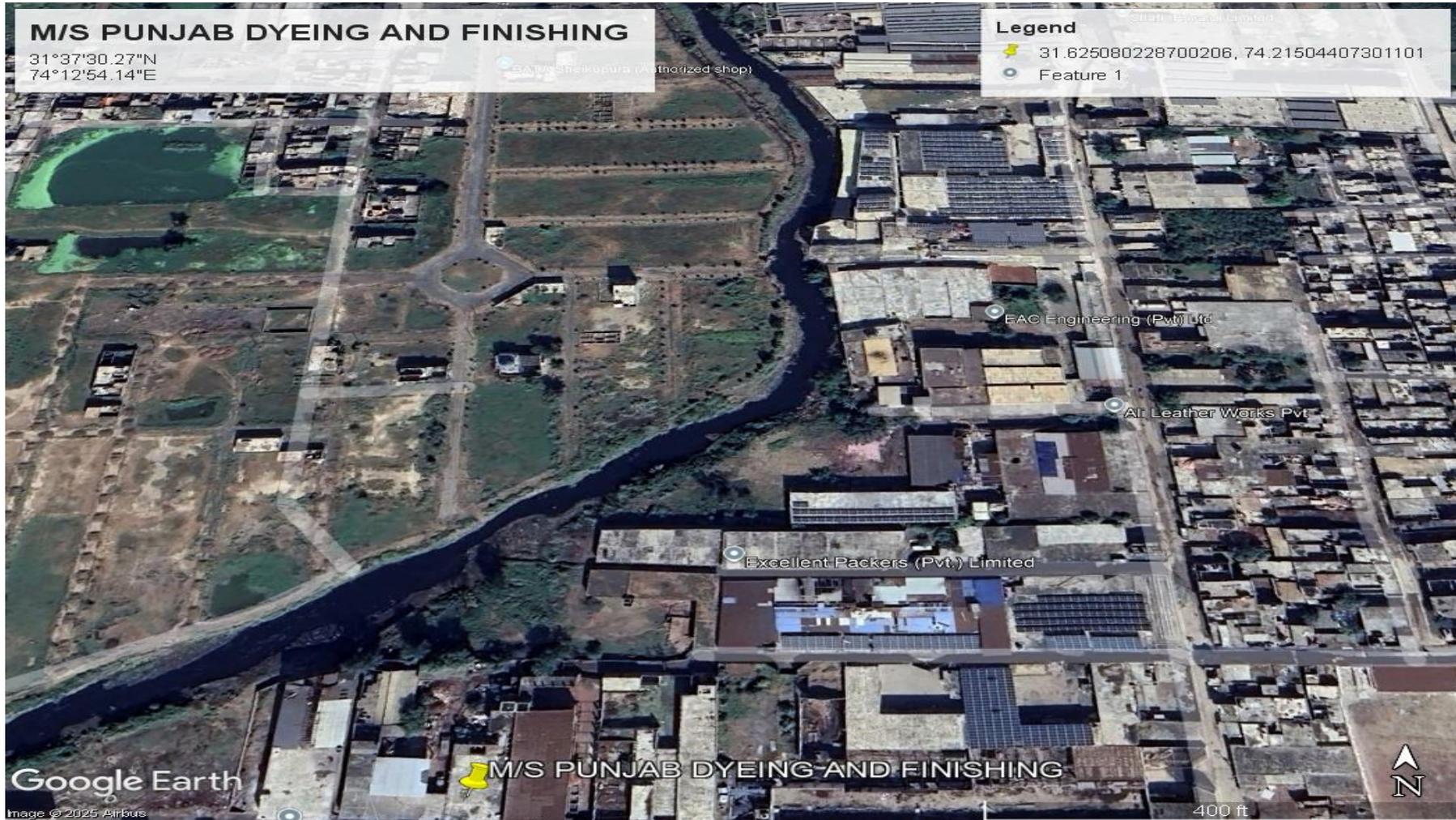
### **5.3 Location and Site Layout of the Project**

The Location of the proposed project is shown in the figure 5-1 below. The location of the proposed project is illustrated in Figure 5-1 below. The proposed Textile Dyeing and Finishing Unit is situated at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura. The geographic coordinates of the project site are as follows:

- **Latitude:** 31°42'22.00"N
- **Longitude:** 74°13'10.50"E

North	Open Land
South	Road
East	Open land
West	Fatima Dyeing and finishing

**Establishment of a Textile Dyeing Unit  
M/S Punjab Dyeing & Finishing  
Environmental Impact Assessment EIA**



**Figure 5-1: Location of the Project**

#### **5.4 Government Approvals**

Licensing and registration of the company, including the incorporation certificate (Form C) issued by the Securities and Exchange Commission of Pakistan (SECP), is attached as **Annexure A**. All other required government approvals and permits, including environmental clearance, trade licenses, and utility connections, will be obtained after the issuance of the No Objection Certificate (NOC) from the Punjab Environmental Protection Agency (EPA).

#### **5.5 Land Use on The Site**

The proposed site for the Textile Dyeing and Finishing Unit by M/s Punjab Dyeing is located at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura. The area has experienced steady industrial development in recent years and is primarily designated for industrial use, making it suitable for establishing a textile processing facility. The surrounding land use consists of other industrial units, warehouses, and commercial establishments, with residential areas located at a safe distance from the proposed site, minimizing potential environmental and social impacts.

#### **5.6 Road Access**

The proposed Textile Dyeing and Finishing Unit by M/s Punjab Dyeing is located at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura. The site benefits from excellent road connectivity, with direct access from the Ferozewala–Sheikhupura main road, which links the area to Lahore and other major industrial hubs. Internal access roads within the site are well-developed, allowing smooth movement of raw materials, chemicals, finished goods, and workforce. The proximity to major highways, including the Lahore–Sheikhupura route and nearby motorways, further enhances regional and national connectivity, facilitating efficient logistics for both inbound and outbound transport.

#### **5.7 Vegetation Features of the Site**

The proposed project site for the Textile Dyeing and Finishing Unit by M/s Punjab Dyeing is located at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhupura. The total project area is approximately 33 Marla, situated within an area designated for industrial development. As the land is intended for industrial use, it contains minimal natural vegetation. The site is largely barren, with only small patches of grasses and a few scattered shrubs observed. No agricultural activity is conducted within the premises. There are no ecologically significant plant species, natural habitats, or forested areas at the project site. The nearest vegetation consists of roadside plantations, ornamental trees along internal roads, and greenery in adjacent plots. Consequently, the construction and operation of the proposed facility are not expected to cause any significant adverse impacts on natural vegetation or biodiversity. Implementation of dust suppression measures during construction and landscaping within the facility will help maintain an environmentally responsible footprint.

## **5.8 Schedule of Implementation**

The proposed implementation schedule for the Textile Dyeing and Finishing Unit is designed to be followed smoothly, subject to the absence of significant delays or obstacles. The key stages of project execution are as follows:

### **1st Stage**

This stage comprises the following tasks:

- Conducting topographic surveys, soil testing, and geotechnical investigations.
- Finalization of the architectural design, site layout, and production floor plan.
- Obtaining approvals for building plans and necessary regulatory clearances, including EPA NOC.

### **2nd Stage**

This stage comprises the following tasks:

- Ground excavation and foundation laying.
- Civil construction of production halls, storage areas, administrative offices, and Packaged Wastewater Treatment Plant facilities.
- Installation of utility networks, including electricity, gas, and water supply.
- Construction of wastewater management, drainage, and effluent treatment systems.

### **3rd Stage**

This stage comprises the following tasks:

- Installation of dyeing, washing, finishing, and drying machinery.
- Installation of HVAC systems, ventilation, and safety controls in production areas.
- Establishment of chemical storage and water treatment systems.
- Completion of internal finishing, electrical, and mechanical works

### **4th Stage**

This stage comprises the following tasks:

- Commissioning of machinery, Packaged Wastewater Treatment Plant, and utility systems.
- Trial dyeing and finishing operations under supervision of technical experts.
- Training of operational staff on safety standards, chemical handling, and process control.
- Validation and quality checks of the production process to ensure compliance with environmental and industrial standards.

### **5th Stage**

The last stage will be:

- Commencement of full-scale commercial textile dyeing and finishing operations.
- Routine monitoring and compliance with Punjab Environmental Protection Agency (EPA) standards and other regulatory requirements.

### **5.9 Description of the Project**

The proposed project involves the establishment of a modern Textile Dyeing and Finishing Unit by M/s Punjab Dyeing at Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhpura, covering a total area of approximately 33 Marla. The project is aimed at creating a fully equipped and environmentally compliant facility for washing, bleaching, dyeing, drying, and finishing textile materials to meet both domestic and export market demands. The facility will comprise specialized production sections including jet dyeing machines, soft-flow dyeing units, hydro-extractors, dryers, stenters, and finishing machines, supported by automated chemical dosing and color-mixing systems. Dedicated storage areas will be provided for dyes, chemicals, raw materials, and finished goods to ensure smooth and uninterrupted operations.

An Effluent Treatment Plant Packaged Wastewater Treatment Plant will be installed to treat wastewater in compliance with Punjab Environmental Quality Standards (PEQS). Additional infrastructure will include water softening systems, safety and ventilation arrangements, and administrative offices to ensure operational efficiency and regulatory compliance. The facility will be constructed using a combination of Reinforced Cement Concrete (RCC) and Pre-Engineered Building (PEB) designs to ensure durability, workflow efficiency, and adherence to environmental and safety standards. With a total project investment of approximately PKR 60 million, the development qualifies as a medium-scale industrial project. Upon completion, the project will contribute significantly to the regional textile sector by enhancing local dyeing and finishing capacity, reducing reliance on outsourced services, generating skilled and semi-skilled employment, supporting the textile value chain, and promoting environmentally responsible industrial growth in the region.

### **5.10 Project components**

The proposed project by M/s Punjab Dyeing is focused on the washing, bleaching, dyeing, drying, and finishing of textile materials. The process involves the use of dyes, chemicals, surfactants, softeners, and other finishing agents to treat fabrics and improve their appearance, color, texture, and performance properties. The facility will comprise specialized production units for each stage of the process, supported by storage areas for raw materials, chemicals, and finished products, as well as a Packaged Wastewater Treatment Plant to manage wastewater in an environmentally compliant manner.

### 5.10.1 Raw Material Management

- Raw materials such as reactive dyes, disperse dyes, vat dyes, caustic soda, soda ash, hydrogen peroxide, wetting agents, softeners, and salts (sodium sulfate, sodium chloride) are procured from certified and approved suppliers.
- All materials are checked against supplier specifications and Certificates of Analysis (CoA) upon receipt.
- Materials are stored in segregated and controlled areas:
- **Hazardous chemicals** (e.g., caustic soda, hydrogen peroxide) → in chemical storage rooms with proper ventilation, spill control measures, and safety signage.
- **Dyes, salts, and auxiliaries** → in dry, cool, and well-organized storage areas to prevent contamination, degradation, or moisture absorption.

**Table 5-1: List of Raw Materials**

Category	Raw Material	Purpose / Function in Textile Dyeing & Finishing
<b>Dyes</b>	Reactive Dyes	Impart color to cotton and blended fabrics through covalent bonding.
	Disperse Dyes	Used for dyeing synthetic fibers such as polyester.
	Vat Dyes	Provide deep, fast colors on cotton fabrics; require reduction and oxidation steps.
<b>Alkalis / pH Regulators</b>	Caustic Soda (NaOH)	Used in scouring, bleaching, and dye fixation; adjusts pH during processing.
	Soda Ash (Na <sub>2</sub> CO <sub>3</sub> )	Enhances dye uptake and acts as a pH buffer in dye baths.
<b>Oxidizing / Bleaching Agents</b>	Hydrogen Peroxide (H <sub>2</sub> O <sub>2</sub> )	Used for bleaching to remove natural color and impurities from fabrics.
	Sodium Hypochlorite	Alternative bleaching agent for specific fabric types.
<b>Surfactants / Wetting Agents</b>	Nonionic / Anionic Surfactants	Improve wetting, penetration of chemicals, and uniform dyeing.
<b>Softeners / Finishing Agents</b>	Cationic Softeners	Impart softness, smoothness, and improved handle to finished fabrics.
<b>Inorganic Salts / Auxiliaries</b>	Sodium Sulfate	Helps in leveling and uniform dyeing; maintains ionic strength in dye baths.
	Sodium Chloride	Enhances dye penetration and uniformity.
<b>Stabilizers / Additives</b>	Polyethylene Glycol (PEG)	Acts as a leveling agent and stabilizer for certain dyes and finishing agents.
	Anti-foaming Agents	Prevent excessive foam formation during dyeing and washing processes.

**Table 5-2: Machinery Requirement for Textile Dyeing & Finishing Unit**

Sr. No.	Machinery / Equipment	Function / Purpose	Proposed Quantity
1		Soft Flow Dyeing Machine	04
2		Jet Dyeing Machine	02
3		Jigger Dyeing Machine	01
4		Winch Dyeing Machine	01
5		Hydro Extractor	02
6		Drying Machine (Tumble Dryer)	02
7		Stenter Machine	01
8		Relax Dryer	01
9		Compacting Machine	01
10		Calendaring Machine	01
11		Boller (Steam Generator)	01
12		Air Compressor	01
13		Color Kitchen (Dye & Chemical Mixing Unit)	01
14		Laboratory Dyeing Machine	01

### 5.10.2 Project Components

The facility will carry out textile processing operations including:

1. Material preparation and loading.
2. Pre-treatment: scouring and bleaching.
3. Dye bath preparation with automated chemical dosing.
4. Dyeing in jet and soft-flow dyeing machines.
5. Rinsing and washing cycles.

6. Neutralization and softening.
7. Hydro-extraction to remove excess water.
8. Drying using dryers and stenters.
9. Final inspection and packing.
10. Effluent collection and treatment via Packaged Wastewater Treatment Plant.

### **5.10.3 Dyeing Process Description**

The dyeing process at the proposed textile dyeing and finishing unit involves a series of controlled steps to ensure consistent color application, product quality, and environmental compliance. The key stages of the dyeing process are as follows:

#### **1. Material Preparation / Loading**

Textile material is received and inspected before loading into jet dyeing or soft-flow dyeing machines. The material is arranged to ensure smooth circulation during processing.

#### **2. Pre-Treatment (Scouring & Bleaching)**

The material undergoes scouring to remove oils, waxes, and impurities, followed by bleaching where required. This step improves fabric absorbency and prepares it for uniform dyeing.

#### **3. Dye Bath Preparation**

Dyes, chemicals, and auxiliaries are measured and mixed according to the required shade. The chemical dosing system ensures accurate and automated feeding of chemicals into the dyeing machine.

#### **4. Dyeing Operation**

The material circulates in the dye liquor at controlled temperature, pH, and pressure. The machine gradually raises temperature to achieve proper dye fixation. Automated controls ensure consistent shade and minimize chemical losses.

#### **5. Rinsing / Washing**

After dye fixation, the material is thoroughly washed to remove unfixed dye, residual chemicals, and impurities. Multiple washing cycles ensure colorfastness and meet quality standards.

#### **6. Neutralization**

A mild neutralizing agent is applied to remove excess alkalinity or acidity from the material, ensuring chemical balance and preventing fabric damage.

#### **7. Softening / Finishing Treatment**

If required, softeners or finishing agents are applied to improve the fabric's feel, drape, and performance qualities.

## 8. Hydro-Extraction

The dyed material is transferred to a hydro-extractor to remove excess water through high-speed spinning, reducing moisture content before drying.

## 9. Drying

The partially dried material is passed through drying machines or stenters where controlled heat removes residual moisture while maintaining dimensional stability.

## 10. Final Inspection and Packing

The processed material is inspected for shade, quality, and uniformity. Approved material is packed and moved to the finished goods storage area.

## 11. Effluent Collection and Treatment

Wastewater generated from dyeing, washing, and finishing processes is conveyed through a properly designed drainage network to the Packaged Wastewater Treatment Plant (PWTP). At the PWTP, wastewater first passes through **screening** to remove lint, fabric threads, and other large solids. It then enters the **equalization tank**, where flow and pollutant concentration are balanced to ensure steady treatment. The water subsequently undergoes **chemical treatment**, where coagulants and flocculants are added to remove color, suspended solids, and excess chemicals. Afterward, the effluent is treated in the **biological treatment unit**, where microorganisms break down biodegradable organic matter, reducing BOD and COD levels. Finally, the treated water passes through **settling and polishing processes** to ensure it meets the Punjab Environmental Quality Standards (PEQS) before being safely discharged or reused.

### 5.10.4 Quality Control (QC)

QC laboratories will conduct tests on each batch of processed fabrics to ensure quality and consistency.

- **Color Fastness Tests:** Evaluate resistance to washing, rubbing, light, and perspiration.
- **Physical Tests:** Check fabric strength, shrinkage, and dimensional stability.
- **Chemical Residue Tests:** Ensure residual dyes and chemicals are within safe limits.
- **Batch Validation:** Verify that processed fabrics meet customer specifications and industry standards.

### 5.10.5 Finishing & Packing

- Approved fabric batches are transferred to finishing sections for final processing such as softening, calendaring, or compacting.
- Fabrics are inspected, folded, and prepared for packing.
- Labels with batch numbers, production date, and washing/handling instructions are applied.

- Automatic packing machines or manual processes are used to package fabrics into rolls, bundles, or cartons for shipment.

#### 5.10.6 Storage & Distribution

- Finished fabrics are stored in covered warehouses, maintaining protection from moisture, dust, and direct sunlight.
- Fabrics are dispatched to textile mills, garment manufacturers, wholesalers, and export destinations.
- Inventory is managed to ensure FIFO (First In, First Out) distribution and maintain product quality.

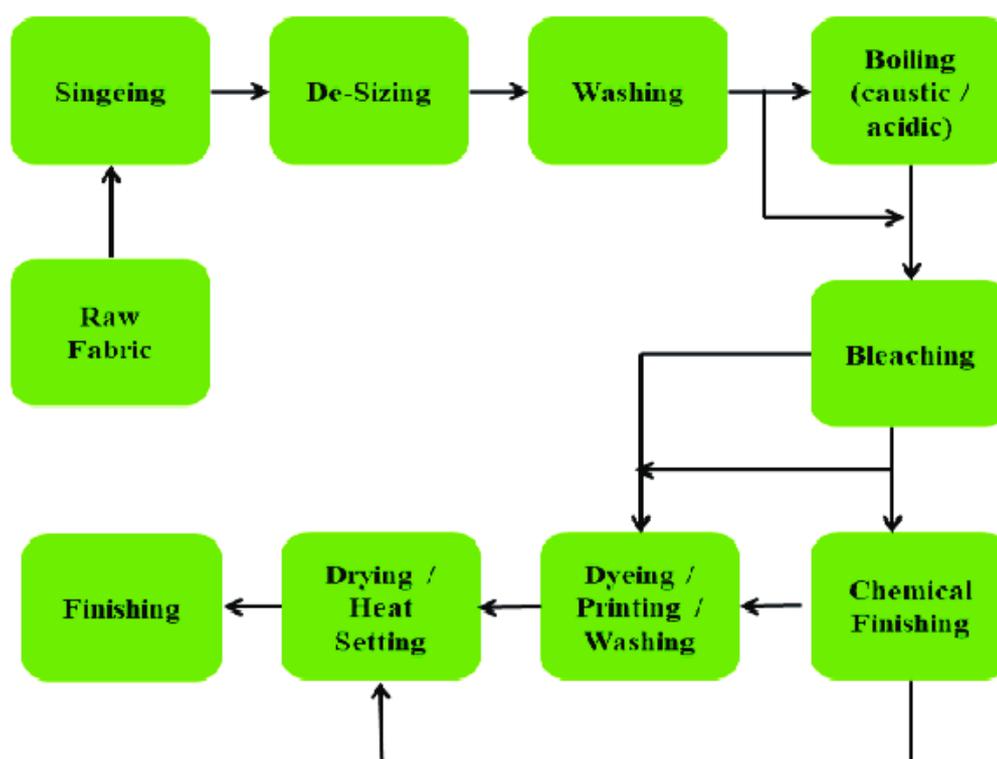


Figure 5-2: Process Flow Diagram

#### 5.11 Project Capacity

The proposed Textile Dyeing and Finishing Unit is designed to process approximately 1,500–2,500 meters of fabric per day under a single-shift operation. With two shifts, production capacity can reach up to 3,000–5,000 meters of fabric per day, depending on fabric type and processing requirements. This capacity ensures timely and efficient fulfillment of both domestic and export orders while maintaining high standards of color quality, fabric finish, and environmental compliance.

#### 5.12 Electricity

LESCO will be the primary source of electricity for the Textile Dyeing and Finishing Unit. In the event of power interruptions or load-shedding, a stand-by diesel

generator will provide uninterrupted electricity to ensure smooth operation of dyeing, finishing, and utility systems. The electrical supply will also support lighting, HVAC, water pumps, effluent treatment plant, and other auxiliary equipment necessary for production and safety.

### **5.13 Water supply**

The water supply for the proposed Textile Dyeing and Finishing Unit will primarily be provided through the local municipal water network and/or industrial water connections available in the area. In case of additional demand, supplementary water will be arranged through a dedicated tube well to ensure uninterrupted supply. The water will be used for various industrial purposes including washing, dyeing, bleaching, finishing, and for domestic use within the facility. Adequate storage tanks and a water distribution system will be installed to maintain a reliable and consistent supply throughout the production process.

### **5.14 Wastewater**

For the proposed Textile Dyeing and Finishing Unit, wastewater generation will be significant due to the washing, bleaching, and dyeing processes involved in fabric treatment. Proper management is planned to minimize environmental impact and ensure compliance with Punjab Environmental Quality Standards (PEQS).

### **5.15 Sources of Wastewater**

#### **5.15.1 Process Wastewater**

- Generated from fabric washing, scouring, bleaching, dyeing, rinsing, and finishing operations.
- Will contain dyes, salts, chemicals, and auxiliaries used in textile processing.

#### **5.15.2 Domestic Wastewater**

- Generated from toilets, handwashing, and canteen activities of staff.
- Comparable to normal municipal sewage.

#### **5.15.3 Utility Wastewater**

- From HVAC drain water, boiler blowdown, and cleaning of utility systems.

### **5.16 Estimated Wastewater Quantities**

- **Process wastewater:** ~30–50 m<sup>3</sup>/day (depending on fabric type and daily production).
- **Domestic wastewater:** ~25–30 liters per person per day × estimated staff (e.g., 50–60 staff → 1.5–2 m<sup>3</sup>/day).
- **Utility wastewater:** ~1–2 m<sup>3</sup>/day.
- **Total estimated wastewater:** ~32–55 m<sup>3</sup>/day.

### **5.17 Disposal & Management**

- All process wastewater will be treated in an on-site **Packaged Wastewater Treatment Plant** to meet PEQS before discharge.

- Domestic wastewater will be directed to the municipal sewer system or estate-provided sewerage network.
- Continuous monitoring and proper operation of the Packaged Wastewater Treatment Plant will ensure **zero discharge of untreated effluent**, protecting local water bodies and the environment.

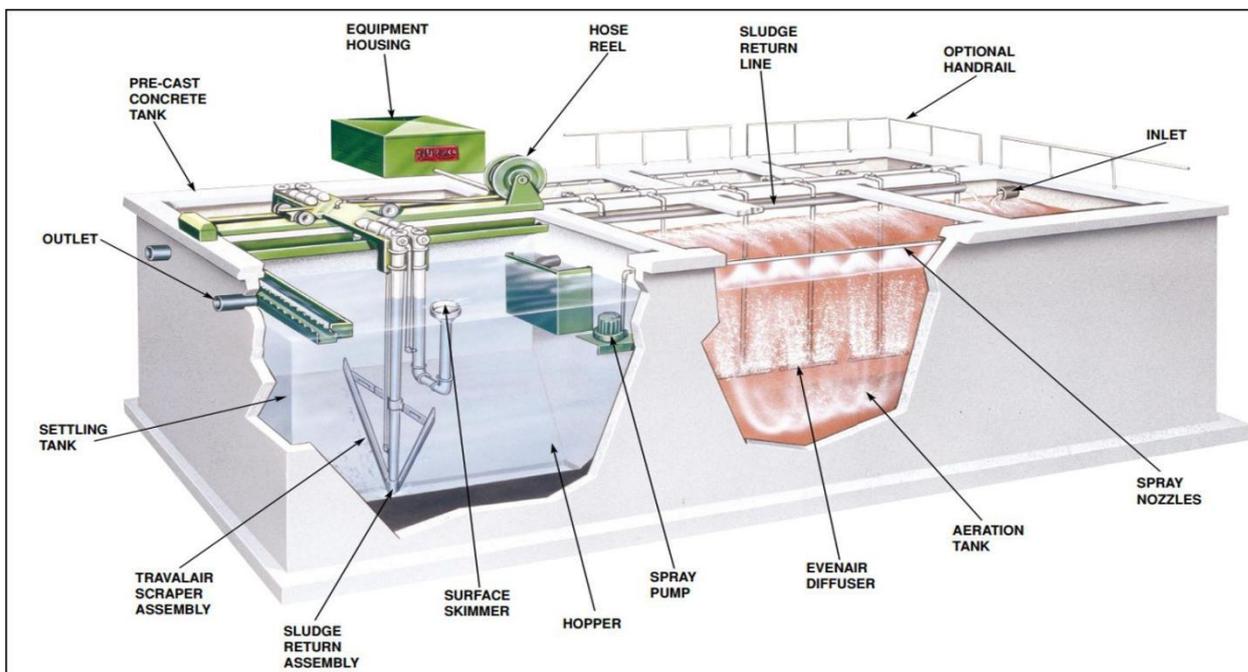


Figure 5-3: Process Flow diagram of packaged Wastewater Treatment Plant

### 5.18 Air Emissions

Air emissions from the proposed Textile Dyeing and Finishing Unit are expected to be localized and manageable. The primary sources include:

- **Boilers or steam generators** (if used in dyeing and finishing processes)
- **Standby diesel generators**
- **Exhaust from drying and finishing machines**
- **Fugitive emissions** such as dust from handling powdered chemicals or salts

Emissions may consist of CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub>, and particulate matter, depending on fuel use and machinery operation. Adequate stack heights, proper ventilation, and regular maintenance of generators and boilers will ensure compliance with Punjab Environmental Quality Standards (PEQS).

Fugitive dust and minor chemical vapors from dye handling will be controlled using local exhaust ventilation systems and enclosed storage areas. With these measures, no significant adverse impacts on ambient air quality or worker health are anticipated, and emissions will remain within permissible limits.

### **5.19 Noise**

Noise emissions from the proposed Textile Dyeing and Finishing Unit will primarily arise from:

- Dyeing, washing, and finishing machinery (jet dyeing machines, hydro-extractors, dryers, stenters)
- Standby diesel generators
- HVAC and ventilation systems
- Vehicular movement for raw material delivery and finished product transport

Noise levels inside production areas are expected to range between **65–80 dB(A)** depending on machinery operation, while noise at the site boundary will remain within the permissible limits set by Punjab Environmental Quality Standards (PEQS).

### **5.20 Solid waste**

The proposed Textile Dyeing and Finishing Unit will generate from multiple sources, including general office and domestic waste, recyclable packaging materials, non-hazardous production residues such as fabric off-cuts and lint, and small quantities of hazardous waste like used chemical containers and Packaged Wastewater Treatment Plant sludge. Waste will be segregated at source, with recyclables sent to licensed vendors, general waste collected by municipal or estate-approved contractors, and hazardous residues managed according to regulatory guidelines. Proper storage, handling, and disposal practices will ensure that solid waste is managed safely, minimizing environmental impacts and maintaining compliance with relevant regulations.

### **5.21 Area**

Total area of Unit is 33 Marla.

### **5.22 Cost of the project**

The total cost of the project is 60 Million.

## **6 DESCRIPTION OF THE ENVIRONMENT**

### **6.1 Introduction**

This chapter describes the baseline conditions, which cover the existing physical, ecological and socio-economic environment of the Study Area. Information on these aspects has been derived from the desk study of available data, field visits to the project area as well as information obtained through visits to the Government departments and other agencies namely Irrigation Department, Meteorological Department, Forest offices and prevailing environmental laws and environmental quality standards etc.

### **6.2 Desk Studies**

Building design data was collected from proponent. This data included the available documents, drawings, reports, etc related to the proposed project of commercial and related utilities. The experts conducted a detailed desk study of the above available data before the field visit. Salient features of the project were thoroughly reviewed to assess their environmental implications. The documents which were consulted and departments visited are project site, Irrigation Department, Meteorological Department, Forest offices and other related officials.

### **6.3 Physical Environment**

#### **6.3.1 Topography**

Sheikhupura, located in the Punjab province of Pakistan, boasts a diverse topography that reflects the region's rich natural landscape. Predominantly a flat and fertile plain, the area is interspersed with a network of canals and waterways stemming from the Ravi River, contributing to its agricultural prominence. The district is characterized by its vast stretches of cultivated fields, primarily producing wheat, rice, and sugarcane, which thrive due to the alluvial soil. In addition to the agricultural land, Sheikhupura features scattered pockets of woodland and small clusters of natural vegetation, providing a scenic contrast to the expansive fields. The city itself is relatively low-lying, with elevation levels generally ranging between 200 to 250 meters above sea level. This combination of fertile plains and well-irrigated fields underscores Sheikhupura's significance as an agricultural hub within Pakistan.

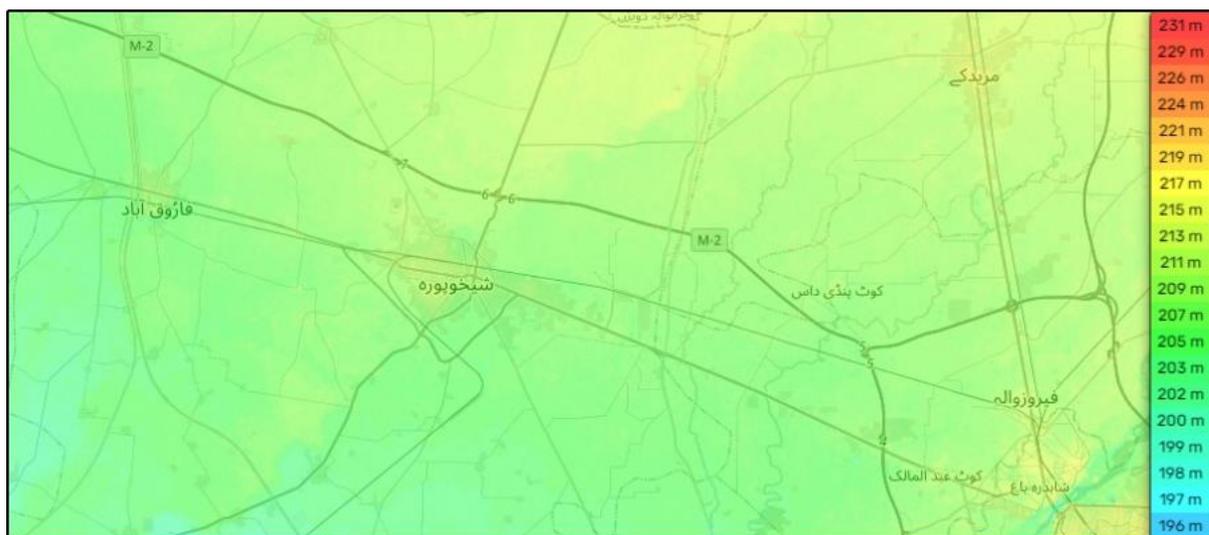


Figure 6-1: Topography of the Proposed Project

### 6.3.2 Geology

The project site is primarily characterized by its alluvial plains, formed by the sedimentary deposits of the Ravi and other rivers. This region lies within the Indo-Gangetic Plain, one of the world's largest alluvial plains, which is composed of unconsolidated sediments like sand, silt, and clay. These sediments are deposited by the extensive river system over millennia, creating highly fertile soil ideal for agriculture. The underlying geology is relatively young in geological terms, lacking significant mineral diversity or mountainous formations. Instead, the region's subsurface is dominated by deep layers of these alluvial deposits, which can extend hundreds of meters below the surface. Occasionally, minor limestone and sandstone formations can be found, remnants of older geological processes. The water table in Sheikhpura is relatively high, supported by the region's numerous canals and rivers, which also play a crucial role in maintaining the soil's fertility and agricultural viability.

### 6.3.3 Climate and Meteorology

The city typically sees high temperatures averaging around 42°C (104°F) during the summer months of June through August, accompanied by high humidity levels. Winter, spanning from December to February, brings relief with temperatures dropping to around 8°C (41°F) to 10°C (50°F). The region receives most of its rainfall during the monsoon season, which extends from July to September, contributing to the annual precipitation of approximately 540 millimeters. Due to its geographical location and climatic conditions, Sheikhpura faces challenges such as water scarcity during the dry months and occasional flooding during heavy monsoon rains, emphasizing the importance of sustainable water management and infrastructure development in the region.

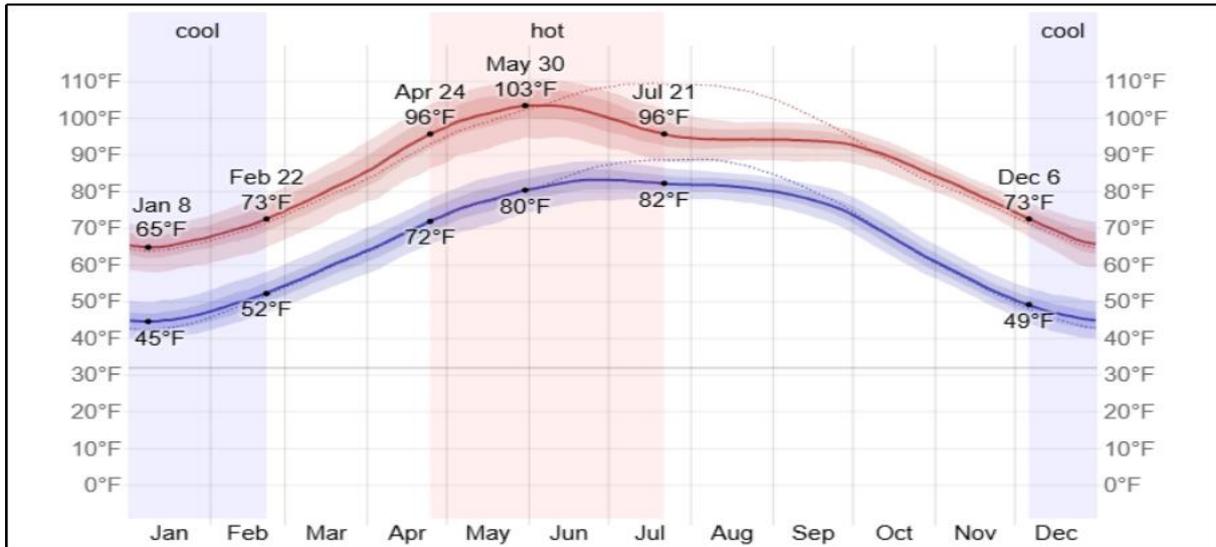


Figure 6-2: Average Temperature of the Sheikhupura

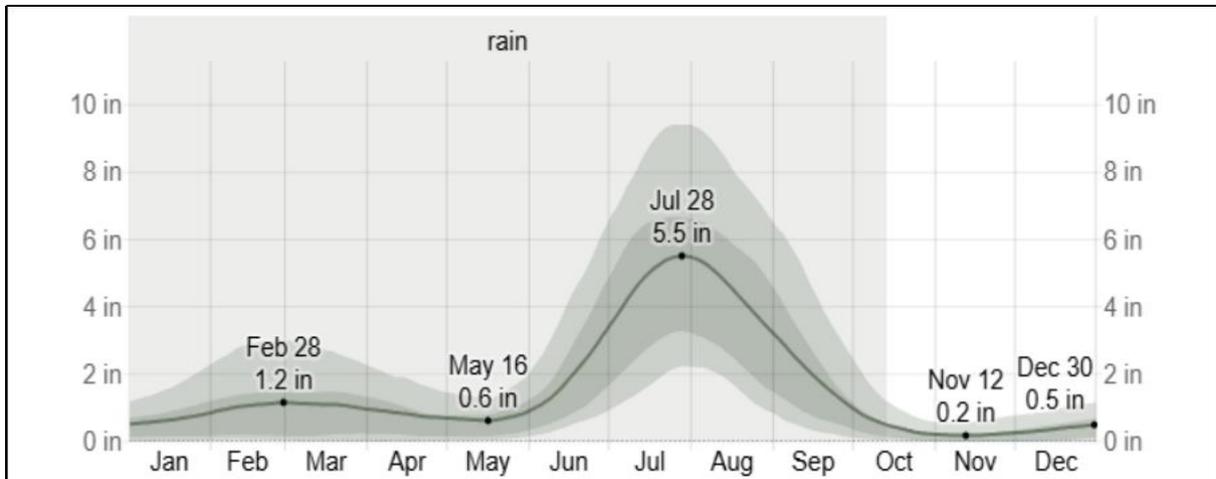


Figure 6-3: Average Rainfall of the Sheikhupura

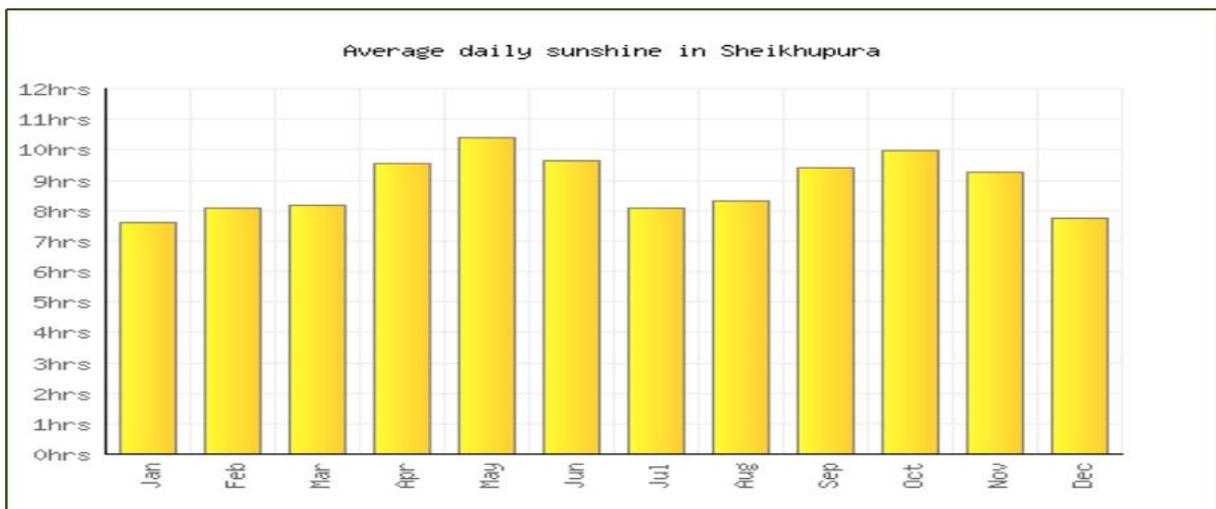


Figure 6-4: Average Sun Hours of Sheikhupura



Figure 6-5: Average Humidity of Sheikhupura

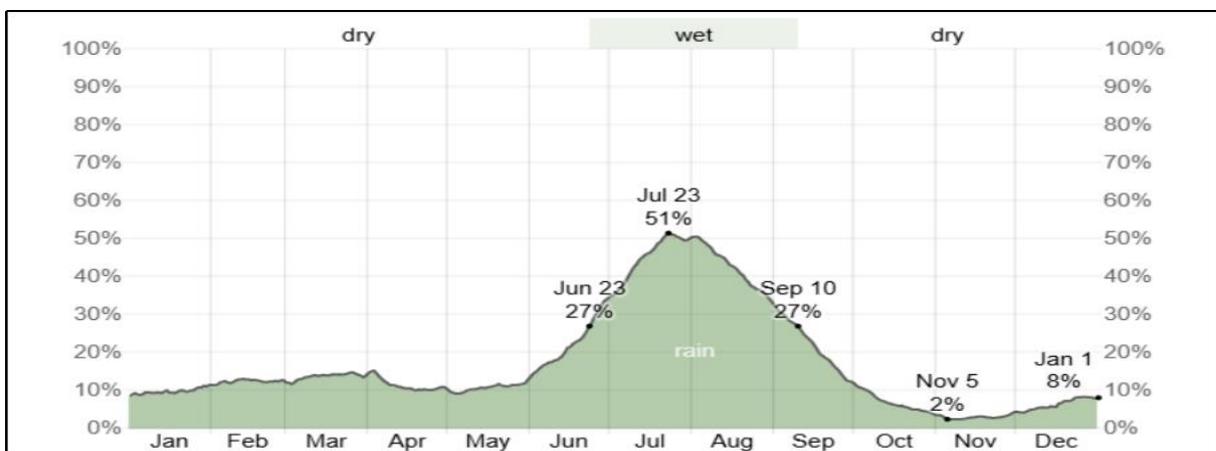


Figure 6-6: Average Precipitation of Sheikhupura

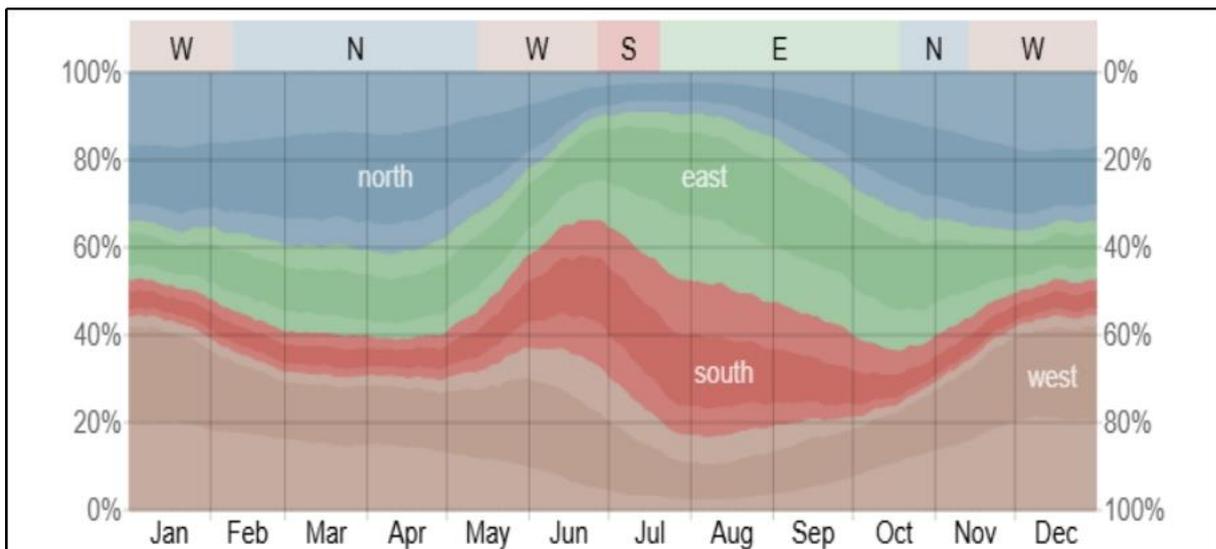


Figure 6-7: Wind Direction in Sheikhupura

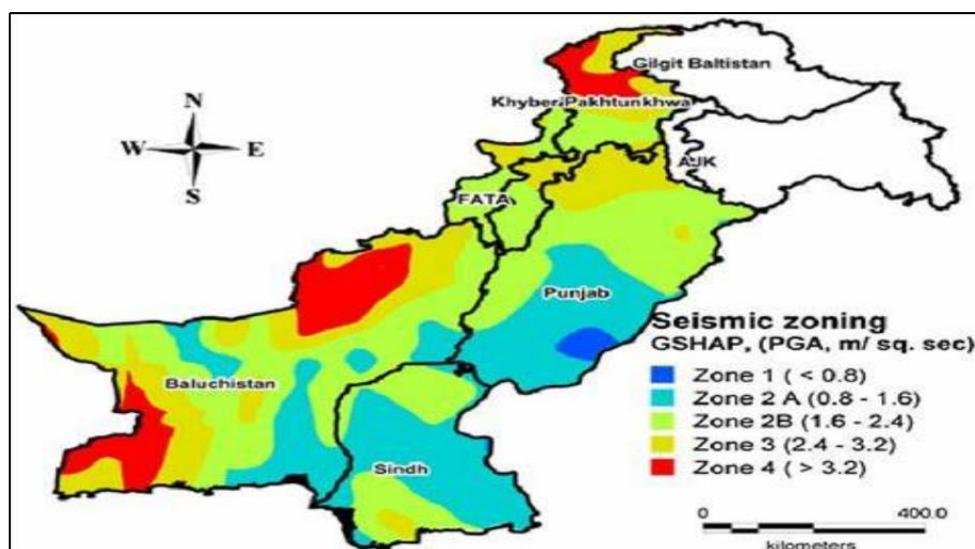
## 6.4 Surface and Ground Water

### 6.4.1 Surface Water resources

The project area benefits from various surface water resources that play a crucial role in sustaining agricultural activities, providing drinking water, and supporting industrial processes in the region. One of the primary surface water sources is the Lower Bari Doab Canal, which originates from the River Ravi and irrigates vast agricultural lands in and around Sheikhupura. Additionally, the city is situated near the Upper Chenab Canal, which further supplements irrigation water supply to the area. These canals are integral components of the Indus Basin Irrigation System, one of the largest contiguous irrigation systems globally, and they play a vital role in supporting the region's agricultural economy. Moreover, Sheikhupura benefits from several small reservoirs and ponds, primarily used for local irrigation and livestock watering purposes. While these surface water resources are essential for meeting the water needs of Sheikhupura and its surrounding areas, sustainable management practices and measures to address issues such as water pollution and sedimentation are necessary to ensure their long-term availability and usability.

### 6.4.2 Groundwater Resources

The project area heavily relies on groundwater as a primary source of water for agriculture, industry, and domestic purposes. The city's groundwater resources are mainly sourced from the aquifers in the region, primarily the Upper and Lower Indus Basin aquifers. These aquifers are replenished primarily by rainfall and surface water infiltration. However, due to increasing population, urbanization, and agricultural demands, there has been significant stress on these groundwater reserves, leading to declining water levels and deteriorating water quality in some areas. Over-extraction of groundwater for irrigation purposes, coupled with limited recharge rates, has resulted in issues such as land subsidence and saltwater intrusion in coastal areas. Sustainable management practices, including groundwater recharge initiatives, efficient irrigation techniques, and regulation of groundwater extraction, are essential to ensure the long-term viability of Sheikhupura's groundwater resources and to mitigate the risk of water scarcity in the region.



## 6.5 Seismology

The Sheikhpura's earthquake is a low-magnitude earthquake, but it occurs in a seismically active zone that warrants studies because of the location of some major population centers along this zone.

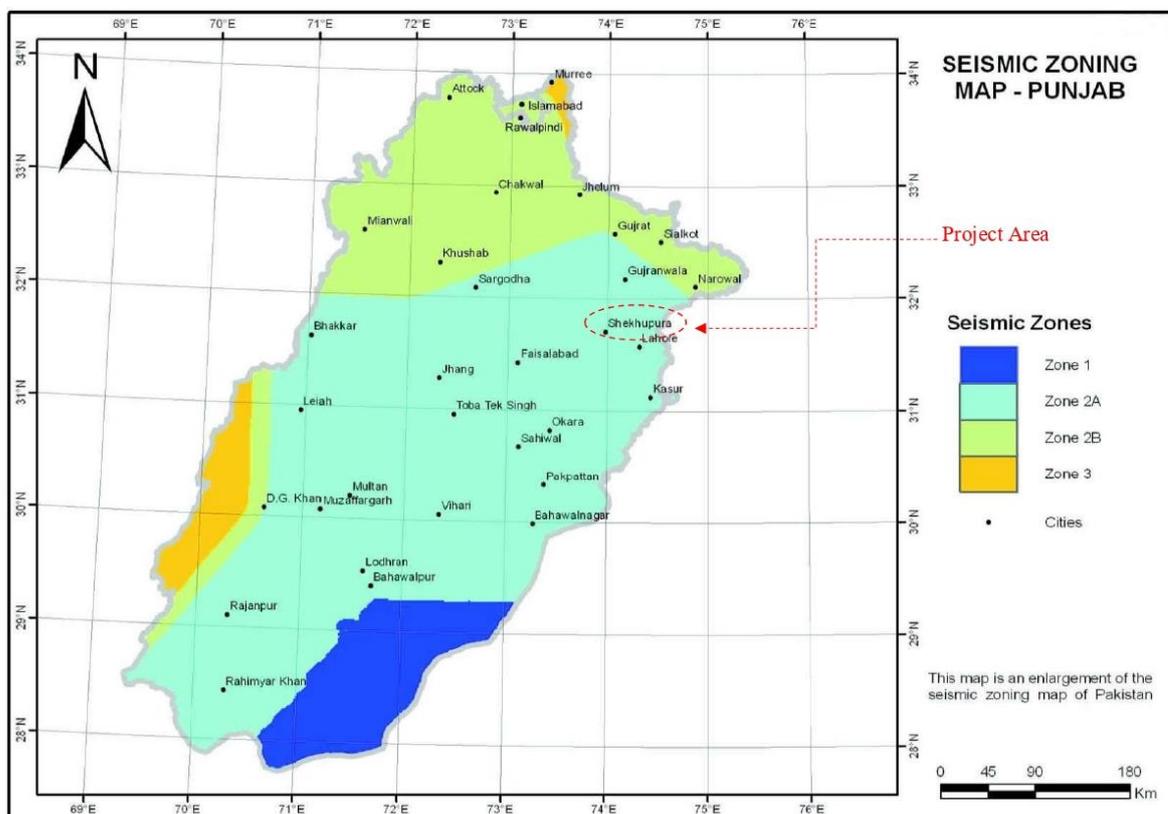


Figure 6-8: Seismic Map of Punjab

## 6.6 Flooding

No serious incidents of flooding have been reported in recent years. Despite the city's vulnerability to flooding due to its flat terrain and monsoon season.

## 6.7 Ecological Resources

### 6.7.1 Flora and Fauna

Some of the common trees found in Sheikhpura include:

**Shisham (*Dalbergia sissoo*):** A fast-growing, nitrogen-fixing tree with dark brown wood used for furniture and construction.

**Kikar (*Acacia nilotica*):** A drought-resistant tree with yellow flowers and long thorns, used as a source of gum arabic.

**Neem (*Azadirachta indica*):** A multipurpose tree with medicinal properties, used in traditional medicine and as a pesticide.

**Jamun (*Syzygium cumini*):** A large evergreen tree with purple fruit, used for jams, jellies, and wine.



**Figure 6-9: Flora of Project Area**

The fauna of Sheikhpura encompasses a diverse array of species adapted to the region's agricultural landscape and semi-arid climate. Common fauna in Sheikhpura include various bird species such as sparrows, doves, mynas, and parakeets, which thrive in both urban and rural habitats. The district's water bodies, including irrigation canals and ponds, support aquatic fauna like fish, frogs, and waterfowl.



Figure 6-10: Fauna of Project Site

## 6.8 Socio-Economic Environment

### 6.8.1 History

Sheikhupura, located in the Punjab province of Pakistan, has a rich and diverse history dating back thousands of years. The region has been inhabited since ancient times, with archaeological evidence suggesting human settlements dating back to the Indus Valley Civilization, around 2500 BCE. Over the centuries, Sheikhupura has been ruled by various empires and dynasties, including the Mauryans, Kushans, Ghaznavids, and Mughals.

During the Mughal era, Sheikhupura gained prominence as a center of trade and culture. It was founded by Emperor Jehangir in 1607 and named after his beloved son, Prince Sheikhupura. The city flourished under Mughal rule, with the construction of notable landmarks such as Hiran Minar, a monumental tower built in memory of Emperor Jehangir's pet deer. In the 18th and 19th centuries, Sheikhupura witnessed political upheavals and changing rulers, including periods of Sikh rule under Maharaja Ranjit Singh. After the British annexation of Punjab in the mid-19th century, Sheikhupura became a prominent administrative center in the British colonial administration.

Following the partition of India in 1947, Sheikhupura became part of Pakistan, and its demographics underwent significant changes due to migration and resettlement of

refugees. Today, Sheikhpura is a thriving city with a diverse population, known for its agricultural economy, industrial growth, and cultural heritage. Despite its modernization and urbanization, the city's historical legacy is preserved in its monuments, landmarks, and cultural traditions, providing a glimpse into its rich and vibrant past.

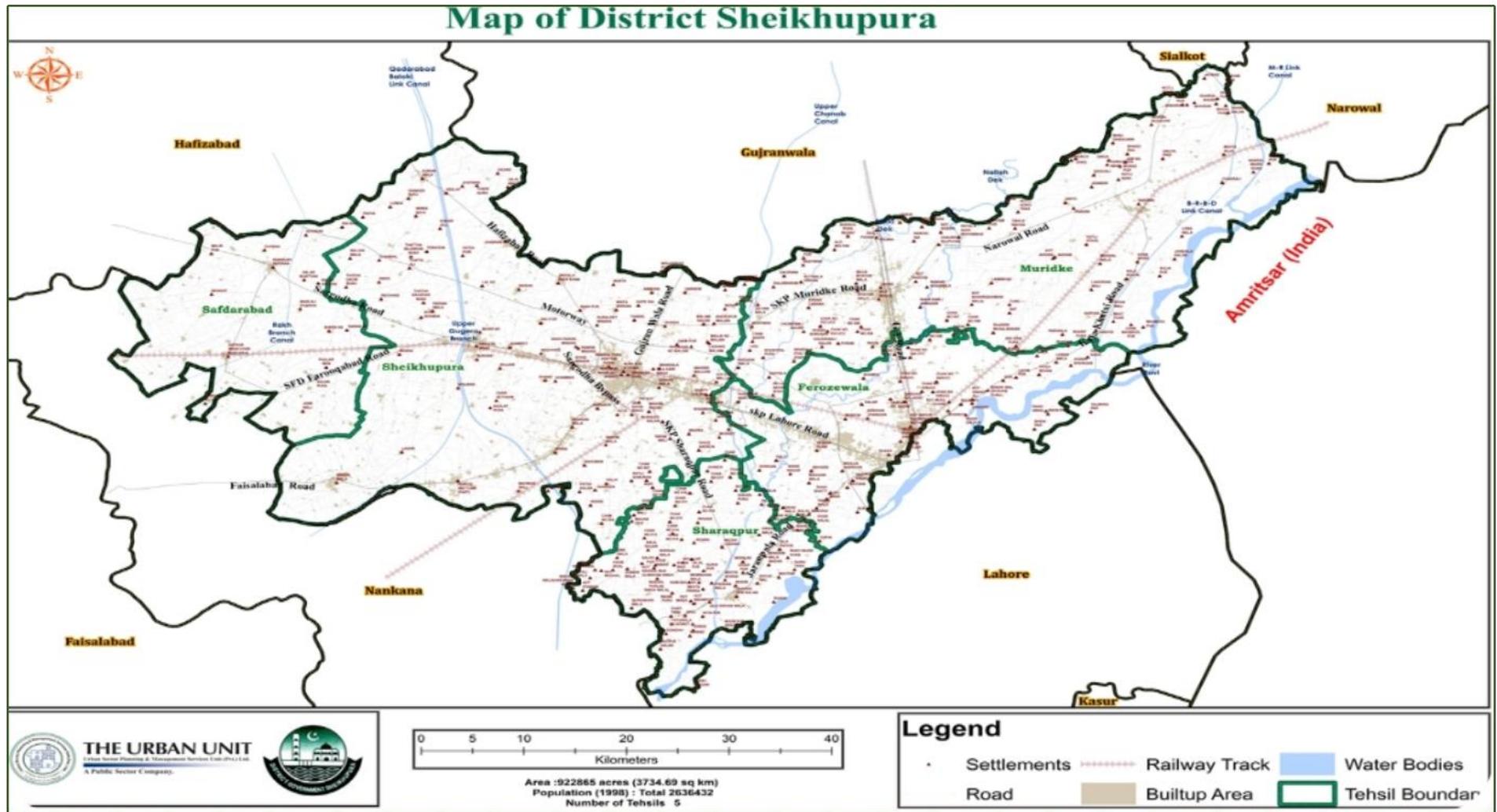


Figure 6-11: Map of Sheikhupura

## **6.9 Agricultural and Industrial Activities**

Agriculture is the backbone of Sheikhpura economy, with the region known for its fertile lands and diverse agricultural activities. The city's agricultural sector primarily revolves around the cultivation of crops such as wheat, rice, sugarcane, maize, and citrus fruits. These crops are not only crucial for local consumption but also contribute significantly to Pakistan's overall agricultural output. Wheat and rice are staple crops grown throughout the region, with Sheikhpura being one of the leading producers of these grains in Punjab. Sugarcane cultivation is also widespread, supporting the thriving sugar industry in the area. Maize is another important crop, often used for both human consumption and as fodder for livestock.

Citrus fruits, including oranges, kinnows, and lemons, thrive in Sheikhpura's favorable climate and are cultivated extensively in orchards across the region. These fruits are not only consumed domestically but also exported to various international markets, contributing to the city's economy. Aside from these major crops, Sheikhpura also engages in livestock farming, including dairy farming, poultry farming, and cattle rearing. Livestock and dairy products are essential components of the agricultural economy, providing additional income sources for farmers and supporting rural livelihoods.

## **6.10 Industrial Activities**

The project is located in an industrial zone of Sheikhpura. The city hosts a diverse range of industries, including textiles, ceramics, pharmaceuticals, food processing, and manufacturing. The industrial sector in Sheikhpura is characterized by both large-scale industrial complexes and small to medium-sized enterprises, collectively driving economic growth and employment generation in the region.

Textile manufacturing is one of the leading industries in Sheikhpura, with numerous textile mills producing a wide range of fabrics and garments for both domestic consumption and export markets. The textile sector plays a vital role in the city's economy, employing a large workforce and generating substantial export revenues.

The ceramics industry is another prominent sector in Sheikhpura, with numerous ceramic factories producing tiles, sanitary ware, and pottery items. These products are in high demand both domestically and internationally, contributing to the city's industrial output and export earnings.

Additionally, Sheikhpura is home to several pharmaceutical companies, producing a variety of pharmaceutical products, including medicines, vaccines, and healthcare products. The pharmaceutical industry in Sheikhpura not only caters to the local market but also exports its products to neighboring countries, further boosting the city's industrial profile.

Food processing is another thriving sector in Sheikhpura, with several food processing units engaged in the processing and packaging of agricultural products such as fruits, vegetables, and dairy products. These food processing units play a crucial role in adding value to agricultural produce, reducing post-harvest losses, and

meeting the demand for processed food products in both domestic and international markets.

## **6.11 Quality of Life Values**

### **6.11.1 Demographic Survey**

Between 2017 and 2023, Sheikhpura experienced a steady population growth rate of 2.7% annually, reaching an estimated population of 4,049,418 in 2023 according to citypopulation.de. This substantial increase reflects the city's status as a vibrant economic and industrial center in the Punjab province of Pakistan.

### **6.11.2 Cultural and social status**

Sheikhpura boasts a rich cultural heritage and a vibrant social fabric that reflects the diversity of its population and the traditions of Punjab, Pakistan. The city's cultural landscape is characterized by a blend of indigenous Punjabi customs, religious festivities, and artistic expressions. Traditional Punjabi folk music, dance, and poetry are integral parts of Sheikhpura's cultural identity, often showcased during festivals, weddings, and social gatherings.

Religiously, Sheikhpura is home to significant sites such as the Sheikhpura Fort and the Shrine of Baba Fariduddin Ganjshakar, which attract pilgrims and visitors from across the country. These religious landmarks contribute to the city's spiritual and cultural significance, fostering a sense of community and religious tolerance among its residents. In terms of social dynamics, Sheikhpura reflects a mix of urban and rural lifestyles, with close-knit communities and strong family ties playing a central role in social interactions. Hospitality is a hallmark of Sheikhpura's social fabric, with residents known for their warmth and generosity towards guests and neighbors.

Moreover, Sheikhpura's social landscape is evolving with modernization and urbanization, leading to changes in lifestyle, attitudes, and social norms. The city is witnessing the emergence of new social trends, increased access to education and healthcare, and growing participation in cultural and recreational activities.

### **6.11.3 Religion**

The predominant religion of the people in Sheikhpura, as in much of Pakistan, is Islam. The majority of the population adheres to the Sunni sect of Islam, which is the largest denomination within the country. Mosques are integral to the social and religious fabric of Sheikhpura, serving as centers for worship, community gatherings, and religious education. Additionally, there is also a significant Shia Muslim population in Sheikhpura, along with small minority communities of Christians and Hindus. These religious communities contribute to the city's cultural diversity, fostering interfaith harmony and mutual respect among its residents. Overall, Islam plays a central role in the daily lives and identity of the people of Sheikhpura, shaping their social customs, cultural practices, and religious observances.

#### **6.11.4 Languages**

The primary language spoken by the majority of people in Sheikhpura is Punjabi. Punjabi is not only the most widely spoken language in the city but also serves as a significant cultural and linguistic marker for its residents. Within the Punjabi language, various dialects are spoken, reflecting the diverse regional and cultural backgrounds of the population. Additionally, Urdu, the national language of Pakistan, is also widely understood and used, particularly in formal settings, education, and government institutions. Moreover, due to globalization and urbanization, many residents of Sheikhpura also have proficiency in English, especially among the younger generation and in educational and professional environments.

#### **6.11.5 Institutions**

Various institutes are located in the vicinity of the project area. Jamia-tur-Rasheed is located on Lahore-Sargodha Road.

- Government College University, Sheikhpura
- Government College for Women, Sheikhpura
- Punjab Group of Colleges
- Unique Group of Institutions
- The Educators
- Allied School Sheikhpura Campus

#### **6.11.6 Transportation**

A diverse range of transportation options that cater to the needs of its residents and visitors can be found in the project area. At the heart of the city's transportation network are its roadways, which are well-connected and bustling with various modes of transport. From colorful rickshaws zigzagging through narrow streets to modern taxis and buses traversing the main thoroughfares, commuters have ample choices for getting around.

#### **6.11.7 Health Facilities**

The project area has a number of health care facilities in its vicinity. Basic Health Unit (Mandiali) is located near the project area. Government-run hospitals such as District Headquarters Hospital Sheikhpura provide essential healthcare services to the community, including emergency care, outpatient services, and inpatient treatment.

#### **6.12 Site Suitability**

Based on the biological, physical, and social characteristics of the project area, it has been concluded that Mouza Thattha Khuda Yar, Kot Abdul Malik, Tehsil Ferozewala, District Sheikhpura is a highly suitable location for the establishment of the Textile Dyeing and Finishing Unit by M/s Punjab Dyeing. The assessment indicates that the site meets all necessary environmental, industrial, and safety criteria, with minimal impact on local ecosystems. The area benefits from well-developed physical infrastructure, including excellent road connectivity, proximity to raw material

suppliers, and access to key domestic and export markets, supporting efficient logistics and operations. Socially, the local community is favorable to industrial development, and the region's demographic and economic profile aligns well with the requirements for a successful medium-scale textile processing facility.

## **7 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**

### **7.1 General**

The importance of impact assessment in the EIA of the proposed Textile Dyeing and Finishing Unit by M/s Punjab Dyeing is critical for understanding and managing the potential environmental effects of the project. Through a systematic evaluation of anticipated impacts on air and water quality, soil, biodiversity, and the surrounding community, the assessment identifies both positive and negative consequences of the facility's operations, including wastewater discharge, solid waste generation, emissions, and noise. This process enables informed decision-making, guiding the implementation of effective mitigation measures such as Packaged Wastewater Treatment Plant operation, solid waste management, emission controls, and occupational safety practices. Additionally, impact assessment ensures transparency and accountability by facilitating public consultation and stakeholder engagement, allowing the concerns of affected communities to be addressed. Overall, the impact assessment provides a foundation for sustainable development, helping the project minimize environmental risks while supporting industrial growth, local employment, and the regional textile value chain.

### **7.2 Project Area of Influence**

Before commencing the environmental analysis of the proposed Textile Dyeing and Finishing Unit by M/s Punjab Dyeing, it is essential to define the Area of Influence (AoI). While the main production, finishing, and utility operations will be contained within the project's designated boundaries, certain project-related activities may extend beyond these limits, including:

- Temporary establishment of construction and storage areas for materials and chemicals.
- Transportation and handling of machinery, equipment, dyes, chemicals, and raw fabrics.
- Movement of labor and associated domestic activities.
- Minor infrastructure requirements such as internal access roads, drainage, and utility connections.

Environmental impacts have been assessed within a 500m radius of the proposed textile facility. The surrounding area has been considered to identify potential impacts such as construction-related noise and dust, wastewater discharge, air emissions, traffic movement, and socio-economic effects. Accordingly, the identification of environmental impacts and the recommendation of mitigation measures are limited to this defined Area of Influence to ensure focused and effective environmental management.

### 7.3 Methodology for impact assessment

The methodology for assessing the risk level associated with each potential impact is presented below. Risk has been assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring.

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

#### Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied.	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventive measures are not applied.	3
Unlikely	May occur once or twice during the activity if preventive measures are not applied.	2
Rare	Unlikely to occur during the project.	1

#### Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented impacts.	5
Major	The action will cause major adverse impacts.	3
Moderate	No or minimal impacts.	2
Minor	No or minimal impacts.	1

#### Risk Score Table

Likelihood	Consequence			
	Catastrophic	Major	Moderate	Minor
Certain	25	15	10	5
Likely	15	9	6	3
Unlikely	10	6	4	2
Rare	5	3	2	1

**Risk:**  
**Significant:** 15-25  
**Medium:** 6-10  
**Low:** 1-5

Any 'Medium' to 'Significant' risk requires an environmental management measure to manage the potential environmental risk. Judgment will be required concerning the application of an environmental management measure to mitigate low risk situations

#### 7.4 Impacts during design/pre-construction phase

**Table 7-1: Screening of Possible Impacts during Design/Pre-Construction Phase**

Potential Issue	Likelihood	Consequence	Risk Level	Residual Impact
Improper site layout or facility design not considering environmental and safety aspects	Possible	Major	High	Long Term
Incorrect siting near residential areas, schools, or other sensitive receptors	Rare	Major	Medium	Long Term
Use of substandard construction materials or non-compliance with building codes	Likely	Moderate	Medium	Long Term
Inadequate fire safety measures and emergency access provisions during design stage	Possible	Major	High	Long Term
Occupational health and safety risks to workers during site preparation, excavation, and construction	Likely	Moderate	Medium	Short Term
Dust generation, noise, and vibration from construction machinery causing community disturbance	Likely	Minor	Low	Short Term
Improper disposal of construction waste, debris, or excavated material	Possible	Moderate	Medium	Short Term
Contamination of soil or surface water due to accidental spillage of fuels, lubricants, or chemicals	Possible	Moderate	Medium	Short Term
Traffic congestion and road safety risks due to transport of construction materials and equipment	Likely	Minor	Low	Short Term

##### **1. Improper site layout or facility design not considering environmental and safety aspects**

Improper site layout or facility design that does not consider environmental and safety aspects can lead to inefficient operations, increased risk of accidents, chemical spills, fire hazards, and pollution of air, water, and soil. It may also cause congestion within the plant, improper handling of raw materials and waste, and exposure of workers to unsafe conditions, resulting in potential harm to both human health and the surrounding environment.

##### **Mitigation Measure**

Following mitigation measures will be implemented

- Design the facility layout following best industrial practices, ensuring proper zoning of production, storage, and waste treatment areas.
- Incorporate safety features such as fire exits, spill containment, and emergency response systems.
- Provide adequate buffer zones and ventilation to minimize exposure to hazardous chemicals.
- Ensure proper storage and handling of raw materials, chemicals, and waste to prevent environmental contamination.
- Conduct regular safety audits and employee training on occupational health and environmental compliance.

## **2. Inadequate operation or malfunctioning of the Packaged Wastewater Treatment Plant leading to water pollution**

**Impact:** Untreated or poorly treated wastewater can contaminate surface and groundwater, affecting aquatic ecosystems and posing risks to human health.

### **Mitigation Measures:**

- Design the Packaged Wastewater Treatment Plant according to wastewater characteristics and production load.
- Implement routine monitoring, maintenance, and operator training.
- Ensure compliance with **Punjab Environmental Quality Standards (PEQS)** before discharge.
- Install alarms or automatic shutdowns for malfunction detection.

## **3. Air emissions from boilers and machinery (SO<sub>2</sub>, NO<sub>x</sub>, CO, particulates)**

**Impact:** Release of pollutants can degrade ambient air quality, cause respiratory issues, and contribute to smog and acid rain.

### **Mitigation Measures:**

- Use low-emission fuel and maintain boilers and generators regularly.
- Install stack height as per regulatory guidelines and exhaust filtration systems.
- Monitor emissions continuously and ensure compliance with PEQS.

## **4. Odor nuisance from wastewater or chemical handling areas**

**Impact:** Offensive odors can affect workers and nearby communities, causing discomfort and potential complaints.

### **Mitigation Measures:**

- Treat wastewater and chemical residues promptly in enclosed systems.
- Cover storage tanks and handling areas.
- Use deodorizing or neutralizing agents where necessary.

#### **5. Improper storage, handling, or spillage of dyes and chemicals**

**Impact:** Can lead to soil and water contamination, chemical hazards, and accidents.

**Mitigation Measures:**

- Store chemicals in labeled, ventilated, and spill-controlled areas.
- Implement spill response plans and train staff in safe handling.
- Use secondary containment for hazardous chemicals.

#### **6. Solid waste generation (sludge, packaging, filter residues) and improper disposal**

**Impact:** Unmanaged waste can pollute land, water, and pose health hazards.

**Mitigation Measures:**

- Segregate solid waste into hazardous and non-hazardous streams.
- Recycle where possible and dispose of hazardous residues via licensed contractors.
- Maintain proper storage and record-keeping of waste disposal.

#### **7. Occupational health and safety risks to workers due to exposure to chemicals, heat, and noise**

**Impact:** Can cause injuries, burns, respiratory or skin problems, and long-term health effects.

**Mitigation Measures:**

- Provide PPE (gloves, masks, goggles, ear protection, etc.)
- Implement safety protocols, training, and emergency response drills.
- Ensure proper ventilation, temperature control, and first-aid facilities.

#### **8. Noise generation from operational equipment and ventilation systems**

**Impact:** High noise levels can affect worker health and disturb nearby communities.

**Mitigation Measures:**

- Install acoustic enclosures and silencers on noisy machinery.
- Maintain equipment to reduce noise.
- Provide ear protection for workers and monitor noise levels periodically.

#### **9. Excessive water and energy consumption affecting resource sustainability**

**Impact:** Overuse of water and energy resources can strain local supply and increase operational costs.

**Mitigation Measures:**

- Optimize production processes to reduce water and energy use.
- Install water recycling systems and energy-efficient machinery.
- Monitor consumption and implement conservation measures.

### 10. Accidental fire, explosion, or chemical reaction incidents

**Impact:** Can cause severe injury, property damage, and environmental contamination.

**Mitigation Measures:**

- Develop and implement a comprehensive fire and chemical safety plan.
- Install fire detection, alarm, and suppression systems.
- Train staff in emergency response and maintain safe distances between chemical storage and production areas.

### 11. Traffic congestion from transport of raw materials and finished products

**Impact:** Increased traffic can cause accidents, air pollution, and inconvenience to local communities.

**Mitigation Measures:**

- Schedule transport to avoid peak hours and optimize delivery routes.
- Use designated entry and exit points for trucks.
- Coordinate with local authorities to manage traffic and maintain road safety.

## 7.5 Impacts during Construction phase and Mitigation measures

**Table 7-2: Screening of Possible Impacts during Construction Phase**

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
Site clearing and excavation leading to soil disturbance and erosion	Likely	Moderate	Medium	Short Term
Dust emissions from excavation, material handling, and vehicular movement	Likely	Minor	Low	Short Term
Noise and vibration from construction machinery and vehicles	Likely	Minor	Low	Short Term
Temporary degradation of air quality due to emissions from construction equipment	Possible	Moderate	Medium	Short Term
Improper disposal of construction waste and debris contaminating soil or drains	Possible	Moderate	Medium	Short Term
Risk of water contamination from accidental spillage of fuels, oils, or chemicals	Possible	Moderate	Medium	Short Term
Occupational health and safety risks to workers (injuries, exposure, heat stress)	Likely	Moderate	Medium	Short Term
Traffic congestion and road	Likely	Minor	Low	Short

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
safety hazards due to transport of materials and heavy vehicles				Term
Nuisance to local community due to noise, dust, and restricted access	Likely	Minor	Low	Short Term
Disturbance or damage to existing utility services (water, sewerage, power lines)	Unlikely	Moderate	Low	Short Term

### 1. Site clearing and excavation leading to soil disturbance and erosion

**Impact:** Removal of vegetation and excavation can destabilize soil, causing erosion, sedimentation in drains, and loss of topsoil.

**Mitigation Measures:**

- Implement proper grading and slope stabilization.
- Cover exposed soil with tarpaulins or mulch where possible.
- Construct temporary drainage to prevent runoff and sedimentation.

### 2. Dust emissions from excavation, material handling, and vehicular movement

**Impact:** Dust can reduce local air quality, affect workers' health, and cause nuisance to nearby communities.

**Mitigation Measures:**

- Regularly sprinkle water on exposed surfaces and material stockpiles.
- Cover trucks transporting soil and construction materials.
- Provide dust masks to workers.

### 3. Noise and vibration from construction machinery and vehicles

**Impact:** Can disturb local residents and affect workers' hearing and comfort.

**Mitigation Measures:**

- Use well-maintained machinery and restrict working hours.
- Provide ear protection to workers.
- Install temporary noise barriers near sensitive areas.

**4. Temporary degradation of air quality due to emissions from construction equipment**

**Impact:** Exhaust from diesel engines can release CO, NO<sub>x</sub>, and particulates affecting local air quality.

**Mitigation Measures:**

- Use low-emission equipment and maintain engines regularly.
- Limit idling of vehicles and machinery.
- Schedule high-emission activities during daytime hours.

**5. Improper disposal of construction waste and debris contaminating soil or drains**

**Impact:** Unmanaged construction debris can block drainage, pollute soil, and create health hazards.

**Mitigation Measures:**

- Segregate and store construction waste at designated areas.
- Dispose of debris through licensed contractors.
- Reuse or recycle materials where feasible.

**6. Risk of water contamination from accidental spillage of fuels, oils, or chemicals**

**Impact:** Spills can contaminate surface and groundwater and harm aquatic life.

**Mitigation Measures:**

- Store fuels and chemicals in bunded areas.
- Provide spill kits and train workers in spill response.
- Avoid refueling near drains or water bodies.

**7. Occupational health and safety risks to workers (injuries, exposure, heat stress)**

**Impact:** Workers may face injuries, chemical exposure, or heat-related illnesses.

**Mitigation Measures:**

- Provide PPE including gloves, helmets, boots, and safety goggles.
- Implement safety protocols and conduct regular training.
- Ensure first-aid facilities and hydration points on-site.

**8. Traffic congestion and road safety hazards due to transport of materials and heavy vehicles**

**Impact:** Heavy vehicles can cause road accidents, congestion, and inconvenience to local communities.

**Mitigation Measures:**

- Schedule deliveries to avoid peak hours.
- Use designated entry and exit routes for construction vehicles.
- Coordinate with local authorities for traffic management.

#### 9. Nuisance to local community due to noise, dust, and restricted access

**Impact:** Construction activities can temporarily disrupt daily life and cause complaints from residents.

**Mitigation Measures:**

- Inform the local community about construction schedules.
- Use dust suppression and noise reduction measures.
- Maintain clear access routes for public use.

#### 10. Disturbance or damage to existing utility services (water, sewerage, power lines)

**Impact:** Excavation or construction activities can interrupt water, electricity, or sewer services.

**Mitigation Measures:**

- Conduct utility surveys before construction.
- Mark and protect existing lines and services.
- Coordinate with utility providers in case of unavoidable disruptions.

### 7.6 Impacts during operational Phase

**Table 7-3: Screening of Possible Impacts during Operational Phase**

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
Generation of wastewater containing dyes, chemicals, and suspended solids	Likely	Major	High	Long Term
Inadequate operation or malfunctioning of the Packaged wastewater treatment plant leading to water pollution	Possible	Major	High	Long Term
Air emissions from boilers and machinery (SO <sub>2</sub> , NO <sub>x</sub> , CO, particulates)	Likely	Moderate	Medium	Long Term
Odor nuisance from wastewater or chemical handling areas	Possible	Minor	Low	Short Term
Improper storage, handling, or spillage of dyes and chemicals	Possible	Major	High	Short Term
Solid waste generation (sludge, packaging, filter residues) and improper disposal	Likely	Moderate	Medium	Long Term
Occupational health and safety	Likely	Major	High	Long

Potential Impact	Likelihood	Consequence	Risk Level	Residual Impact
risks to workers due to exposure to chemicals, heat, and noise				Term
Noise generation from operational equipment and ventilation systems	Likely	Minor	Low	Long Term
Excessive water and energy consumption affecting resource sustainability	Possible	Moderate	Medium	Long Term
Accidental fire, explosion, or chemical reaction incidents	Unlikely	Major	Medium	Long Term
Traffic congestion from transport of raw materials and finished				

### 1. Generation of wastewater containing dyes, chemicals, and suspended solids

**Impact:** Untreated process wastewater can pollute local water bodies, harming aquatic life and affecting downstream users.

**Mitigation Measures:**

- Install and operate a properly designed Packaged Wastewater Treatment Plant.
- Regularly monitor water quality to ensure compliance with **Punjab Environmental Quality Standards (PEQS)**.
- Reuse treated water where possible for non-critical processes.

### 2. Inadequate operation or malfunctioning of the Packaged Wastewater Treatment Plant leading to water pollution

**Impact:** Malfunctioning Packaged Wastewater Treatment Plant may result in discharge of untreated or partially treated effluent, contaminating soil and water.

**Mitigation Measures:**

- Conduct routine maintenance and operator training.
- Install alarms or automated shutdowns for Packaged Wastewater Treatment Plant failures.
- Periodically audit effluent quality and plant performance.

### 3. Air emissions from boilers and machinery (SO<sub>2</sub>, NO<sub>x</sub>, CO, particulates)

**Impact:** Pollutant emissions can degrade ambient air quality, cause respiratory problems, and contribute to smog formation.

**Mitigation Measures:**

- Use low-sulfur fuels and maintain boilers/generators regularly.
- Provide adequate stack heights and exhaust filtration systems.

- Monitor emissions continuously to ensure compliance with PEQS.

#### **4. Odor nuisance from wastewater or chemical handling areas**

**Impact:** Foul odors may cause discomfort to workers and nearby communities.

**Mitigation Measures:**

- Cover storage tanks and wastewater handling areas.
- Treat odorous wastewater promptly in the Packaged Wastewater Treatment Plant.
- Use deodorizing or neutralizing agents where necessary.

#### **5. Improper storage, handling, or spillage of dyes and chemicals**

**Impact:** Can lead to soil and water contamination and pose fire or health hazards.

**Mitigation Measures:**

- Store chemicals in ventilated, labeled, and banded areas.
- Implement spill response procedures and train staff accordingly.
- Maintain secondary containment for hazardous chemicals.

#### **6. Solid waste generation (sludge, packaging, filter residues) and improper disposal**

**Impact:** Unmanaged waste can pollute land and water and pose health hazards.

**Mitigation Measures:**

- Segregate solid waste into hazardous and non-hazardous streams.
- Recycle or send appropriate waste to licensed disposal contractors.
- Maintain proper storage and disposal records.

#### **7. Occupational health and safety risks to workers due to exposure to chemicals, heat, and noise**

**Impact:** Workers may suffer from injuries, chemical exposure, heat stress, or hearing loss.

**Mitigation Measures:**

- Provide PPE such as gloves, masks, goggles, and ear protection.
- Conduct regular safety training and emergency drills.
- Ensure proper ventilation, temperature control, and first-aid facilities.

#### **8. Noise generation from operational equipment and ventilation systems**

**Impact:** Excessive noise can affect worker health and disturb surrounding communities.

**Mitigation Measures:**

- Install acoustic enclosures and silencers on noisy equipment.
- Maintain machinery to reduce noise levels.
- Provide ear protection for workers and monitor noise regularly.

**9. Excessive water and energy consumption affecting resource sustainability**

**Impact:** Overconsumption can strain local utilities and increase operational costs.

**Mitigation Measures:**

- Optimize processes for water and energy efficiency.
- Install energy-efficient machinery and water recycling systems.
- Monitor usage and implement conservation practices.

**10. Accidental fire, explosion, or chemical reaction incidents**

**Impact:** Can cause severe injuries, property damage, and environmental contamination.

**Mitigation Measures:**

- Implement fire detection, alarm, and suppression systems.
- Store chemicals safely with proper segregation.
- Train staff in emergency response and conduct regular drills.

**11. Traffic congestion from transport of raw materials and finished goods**

**Impact:** Increased traffic may lead to accidents, air pollution, and inconvenience for local communities.

**Mitigation Measures:**

- Schedule deliveries during off-peak hours and optimize transport routes.
- Designate specific entry/exit points for trucks.
- Coordinate with local authorities for traffic management

## **8 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN**

An Environmental Management and Monitoring Program (EMMP) is a structured framework developed to identify, mitigate, and monitor potential environmental impacts associated with the operations of M/s Punjab Dyeing Textile Dyeing and Finishing Unit. The primary objective of this program is to ensure compliance with national environmental regulations, Punjab Environmental Quality Standards (PEQS), and industry best practices, while safeguarding the health and safety of workers, nearby communities, and the surrounding ecosystem. The EIA has evaluated both positive and negative impacts of the project across design, construction, and operational phases, with particular attention to effluent discharge, solid and hazardous waste, air emissions, noise, energy and water consumption, and occupational safety. The EMMP provides site-specific mitigation measures aligned with regulatory requirements and international best practices, offering practical guidance for management, contractors, and stakeholders to minimize adverse environmental impacts and ensure sustainable operations. Furthermore, the EMMP will be integrated into contractual obligations and compliance documents to facilitate effective monitoring, reporting, and continuous improvement throughout the project lifecycle.

### **8.1 Environmental Management Plan (EMP)**

The EMP for the proposed Textile Dyeing and Finishing Unit by M/s Punjab Dyeing is designed to ensure the following:

- Delivery of prescribed environmental outcomes during design, construction, and operational phases of the project.
- Establishment of a system to ensure compliance with applicable environmental legislation, regulations, and project-specific commitments.
- Incorporation of environmentally sound design and sustainability principles to minimize potential impacts on the environment and surrounding community.
- Implementation of construction and operational work procedures that reduce pollution, prevent accidents, and safeguard community health.
- Development, implementation, and monitoring of measures that minimize emissions, effluent discharge, solid waste generation, and optimize the use of water and energy resources.

### **8.2 Objectives of EMMP**

The objectives of the EMMP for the proposed Textile Dyeing and Finishing Unit by M/s Punjab Dyeing are to promote sustainable and responsible industrial operations, safeguard environmental quality, and ensure full compliance with national and provincial regulatory requirements. The specific objectives include:

- Implement measures to minimize air emissions from boilers, generators, and dyeing machinery to comply with Punjab Environmental Quality Standards (PEQS).

- Ensure proper collection, treatment, and safe disposal of process and domestic wastewater to prevent contamination of soil and water bodies.
- Adopt best practices for segregation, storage, and disposal of solid, hazardous, and chemical waste (e.g., dye residues, sludge, packaging materials) in compliance with environmental regulations.
- Maintain safe operational protocols and engineering controls to prevent accidents, chemical spills, and occupational hazards.
- Minimize noise pollution from machinery and ventilation systems by using silencers, acoustic insulation, and scheduling maintenance.
- Protect workers from chemical exposure, heat, ergonomic risks, and other occupational hazards through proper PPE, safety training, and emergency preparedness plans.
- Promote energy efficiency and water conservation to reduce resource consumption and the facility's environmental footprint.
- Prevent adverse impacts on nearby communities related to air, water, noise, and traffic, and establish an effective grievance redress mechanism.
- Ensure compliance with national environmental regulations, PEQS, and industry best practices throughout the lifecycle of the textile dyeing and finishing facility.

### **8.3 Schedule for Implementation of Environmental Management Plan**

M/s Punjab Dyeing will oversee the implementation of the EMMP for the textile dyeing and finishing unit. An in-house Environmental Officer will monitor air emissions, wastewater, solid/hazardous waste, occupational safety, and resource use, with findings reported to management. Periodic third-party audits and annual validation by accredited bodies will ensure compliance with PEQS and environmental regulations, while the Punjab EPA will provide regulatory oversight. This multi-tiered system ensures effective EMMP implementation, accountability, and sustainable operations.

- Internal Monitoring by company-appointed Environmental Officer/Consultant.
- Periodic Audits by independent Environmental Specialists.
- Annual Third-Party Validation by accredited institutions or agencies.
- Regulatory Oversight by EPA at the provincial/district level.

This integrated approach ensures effective implementation of the EMMP, strengthens accountability, and promotes environmental sustainability across all stages of pharmaceutical manufacturing and operations.

**Table 8-1: Schedule for Implementation of Environmental Management Plan (EMP)**

<b>Phase</b>	<b>Key Activities</b>	<b>Responsibility</b>
<b>Pre-Construction</b>	- Conduct baseline environmental surveys (air, water, soil, noise) - Finalize EMP with EPA approval - Secure land ownership & layout	Proponent, Environmental Consultant

Phase	Key Activities	Responsibility
	approval	
<b>Construction</b>	- Implement dust and noise suppression measures - Safe storage of construction materials and dyes/chemicals - Set up waste collection and disposal systems - Occupational health & safety training for workers	Contractor, EHS Officer
<b>Commissioning</b>	- Install pollution control Systems (Packaged Wastewater Treatment Plant, air filters, scrubbers) - Inspect fire safety and chemical handling systems - Calibrate monitoring equipment	Contractor, EHS Officer
<b>Trial Run</b>	- Test dyeing, washing, and finishing lines under controlled conditions - Monitor effluent quality, air emissions, and noise levels - Train workers on chemical handling, SOPs, and safety	Proponent, EHS Officer
<b>Operational</b>	- Enforce SOPs for wastewater discharge, air emissions, and chemical use - Segregation, storage, and disposal of hazardous and solid waste (dye sludge, chemical containers, packaging) - Conduct regular fire, chemical spill, and emergency drills	Facility Operator, EHS Team
<b>Monitoring &amp; Reporting</b>	- Routine monitoring of air, water, and noise - Solid and hazardous waste audits - Periodic compliance reporting to EPA - Update EMP as required	EHS Officer, Third-Party Laboratory
<b>Decommissioning (if required)</b>	- Safe dismantling of machinery and equipment - Final hazardous waste disposal - Remediation and cleanup of the site	Contractor, EHS Officer
<b>Post-Construction / Closure</b>	- Landscaping and green buffer development - Review and evaluation of EMP effectiveness - Submission of closure/environmental compliance report	Proponent, Consultant
<b>External Validation</b>	- Independent environmental audit - Verification of EPA compliance - Address audit recommendations	Independent Auditor, Proponent
<b>Continuous Improvement</b>	- Apply lessons learned for future expansion - Update SOPs and EMP based on new standards - Conduct refresher training for staff	Proponent, EHS Officer

This schedule for EMP implementation is adaptable and subject to adjustments based on monitoring findings, changes in project scope, or regulatory requirements. It emphasizes a proactive and adaptive approach, ensuring that environmental management measures are not only implemented effectively but also continually refined to achieve the project's environmental objectives.

## 8.4 Scope of Environmental Management Plan

The EMP provides mitigation and management measures for the following phases of the project:

### 8.4.1 Pre-Construction Phase

During the pre-construction phase, the EMP focuses on integrating environmental and social safeguards into the project planning and design before any physical activities begin. This includes obtaining necessary approvals and NOCs from the Provincial Environmental Protection Agency (EPA), ensuring compliance with Punjab Environmental Quality Standards (PEQS), and incorporating environmental considerations into technical and site layouts. The EMP also covers site verification to avoid sensitive areas, planning for safe storage and handling of dyes, chemicals, and raw materials, and developing mitigation strategies for anticipated impacts. Furthermore, this phase emphasizes stakeholder engagement, public disclosure of project information, and establishment of grievance redress mechanisms. These actions ensure early identification of potential risks, regulatory compliance, and a strong foundation for environmental management during the construction and operational phases.

### 8.4.2 Construction Phase

The EMP for the construction phase specifies environmental management measures, procedures, and responsibilities to minimize impacts from site clearing, civil works, equipment installation, and material handling. These include dust and noise suppression, proper storage of construction materials and chemicals, waste collection and disposal, and occupational health and safety measures. All specifications form part of the construction contract, and the contractor is required to comply with these measures to the satisfaction of the Project Manager and Environmental Control Officer (ECO). This ensures that environmental safeguards are effectively implemented during construction and that the project adheres to both regulatory requirements and industry best practices.

**Table 8-2: Key Environmental Management Actions**

Activity	Potential Impact	Mitigation Measures	Responsible Party
<b>Site Preparation &amp; Construction</b>	Soil erosion, minor habitat disturbance, dust generation	Limit clearing to designated areas; use silt fences; water sprinkling to suppress dust; replant vegetation where feasible	Contractor, EHS Officer
<b>Material Storage (Dyes, Chemicals, Auxiliary Materials)</b>	Soil & water contamination, fire hazard	Store on impervious surfaces with bunds; proper labeling & MSDS; fireproof storage for flammable chemicals; regular inspection	Contractor, EHS Officer
<b>Wastewater</b>	Water pollution	Ensure proper Packaged	Facility

Activity	Potential Impact	Mitigation Measures	Responsible Party
<b>Handling &amp; Packaged Wastewater Treatment Plant Operation</b>	from dye and chemical effluents	Wastewater Treatment Plant operation; monitor effluent quality; neutralize and treat wastewater before discharge	Operator, EHS Officer
<b>Air Emissions (Fumes, Boiler Exhaust, VOCs)</b>	Air pollution, worker health risks	Install scrubbers and ventilation systems; enclose dust and fume-generating processes; periodic air quality monitoring	Contractor, Facility Operator
<b>Noise from Machinery &amp; Generators</b>	Disturbance to workers and nearby communities	Use low-noise machinery; provide ear protection to workers; restrict high-noise operations to daytime	Contractor, EHS Officer
<b>Chemical &amp; Dye Spillages</b>	Soil and groundwater contamination, fire/explosion risk	Secondary containment; spill response kits; staff training on spill control and emergency response	Contractor, EHS Officer
<b>Worker Safety &amp; Health</b>	Accidents, injuries, chemical exposure	Provide PPE (gloves, masks, goggles); conduct safety trainings; regular medical checkups; enforce OHS and safe handling procedures	Facility Operator, EHS Officer
<b>Energy &amp; Utility Use (Generators, Boilers, HVAC)</b>	GHG emissions, resource depletion	Use energy-efficient systems; regular maintenance of generators and boilers; explore renewable energy options	Facility Operator, EHS Team
<b>Solid &amp; Packaging Waste</b>	Litter, environmental pollution	Segregate recyclable materials (plastics, cartons); safe disposal of sludge, packaging, and chemical residues through licensed contractors	Facility Operator, Contractor

## 8.5 Operation and Mitigation Phase

This section of EMP provides management principles for the operation and maintenance phase of the project. Environmental actions, procedure and responsibilities are required from proponent within the operation and maintenance phase are satisfied environmental Plan for Construction and Operation Phase.

**Table 8-3: Environmental Management Plan for Pre-Construction Phase, Construction and Operational Phase**

Sr No.	Project Component / Impact	Mitigation / Preventive Action	Implementation Phase	Responsibility
<b>Design/Pre-Construction Phase</b>				
1.	Improper facility design leading to non-compliance with textile environmental standards	Engage qualified consultants; ensure compliance with local environmental, safety, and textile industry standards; design proper effluent and wastewater treatment layouts	Pre-Construction	Proponent, Contractor
2.	Incorrect siting near residential / sensitive receptors	Conduct site suitability & EIA; maintain buffer distance from residences and schools; comply with PEQS and local siting rules	Pre-Construction	Proponent, Contractor
3.	Use of substandard machinery or dyeing technology	Specify validated energy-efficient and water-efficient dyeing and finishing machinery; third-party quality assurance during procurement	Pre-Construction	Proponent, Contractor
4.	Risk of cross-contamination in wastewater or dye effluents	Design separate process streams; install proper Packaged Wastewater Treatment Plant; adopt zoning in production layout	Pre-Construction	Proponent, Contractor
5.	Improper waste disposal design (sludge, dyes, chemicals)	Provide dedicated storage with bunds; specify approved disposal contractors and methods	Pre-Construction	Proponent, Contractor
6.	Occupational health risks (chemical exposure, dust)	Provide PPE (gloves, masks, goggles); develop handling SOPs; conduct safety training	Pre-Construction	Proponent, Contractor
7.	Flooding / fire risk affecting plant operations	Avoid siting in flood-prone areas; install stormwater drainage; provide fire-fighting systems	Pre-Construction	Proponent, Contractor
<b>8. Construction Phase</b>				
9.	Degradation of air quality due to construction works	Water sprinkling; cover dusty materials; maintain construction equipment; provide PPE; monitor air quality	Construction	Contractor, EHS Officer
10.	Soil erosion from excavation or leveling	Phase excavation; provide drainage channels; reuse soil for backfilling; erect silt fences	Construction	Contractor, EHS Officer
11.	Traffic management issues	Develop traffic plan; schedule vehicle movement	Construction	Contractor, EHS Officer

Sr No.	Project Component / Impact	Mitigation / Preventive Action	Implementation Phase	Responsibility
		during off-peak hours; signage and flagmen; maintain emergency access		
12.	Community health and safety risks	Fencing and access control; community awareness; health checks; first aid on site	Construction	Contractor, EHS Officer
13.	Occupational health & safety hazards	Induction training; PPE; hazard signage; first aid; regular safety drills; emergency plans	Construction	Contractor, EHS Officer
14.	High noise levels from machinery	Limit construction to daytime hours; maintain equipment; provide ear protection; install noise barriers; monitor ambient noise	Construction	Contractor, EHS Officer
15.	Improper handling/disposal of hazardous and non-hazardous waste	Segregate waste; use authorized disposal contractors; paved and covered storage; staff training; maintain records	Construction	Contractor, EHS Officer
16.	Untreated effluent from construction activities	Septic tanks or portable treatment; prevent discharge into drains; regular inspection and testing	Construction	Contractor, EHS Officer
17.	Soil contamination due to accidental spills	Store chemicals on impervious surfaces; secondary containment; spill kits; immediate cleanup; regular inspection	Construction	Contractor, EHS Officer
18.	Employment-related conflicts	Prioritize local hiring; clear and transparent recruitment; grievance redress mechanism; community communication	Construction	Proponent, Contractor
19.	Gender issues including GBV	Code of conduct; gender sensitivity training; separate sanitation facilities; confidential reporting; local women employment	Construction	Proponent, Contractor
20.	Vegetation and wildlife loss	Limit clearing; preserve existing vegetation; replant native species; mark boundaries; raise awareness	Construction	Contractor, EHS Officer
21.	Social tensions from labor influx	Source labor locally; brief workers on local customs; provide on-site accommodation; grievance mechanisms; appoint liaison officer	Construction	Contractor, Proponent

Sr No.	Project Component / Impact	Mitigation / Preventive Action	Implementation Phase	Responsibility
22.	Use of child labor	Age verification; contractually prohibit child labor; inspections and audits; staff training on labor laws	Construction	Contractor, Proponent
23.	Loss of access to facilities or roads	Keep access routes open; provide alternative routes; phase construction; signage and coordination	Construction	Contractor, Proponent
24.	Site restoration post-construction	Remove temporary structures; restore damaged surfaces; implement restoration plan; replant native vegetation; post-inspection	Post-Construction	Contractor, Proponent
<b>25. Operational phase</b>				
26.	Wastewater generation (dyes, chemicals, suspended solids)	Operate Packaged Wastewater Treatment Plant efficiently; monitor influent and effluent quality; neutralize pH; reuse treated water where feasible	Continuous monitoring of Packaged Wastewater Treatment Plant; regular sampling & testing	Facility Operator, EHS Officer
27.	Air emissions (steam, VOCs, particulate matter)	Install scrubbers, filters, and proper ventilation; maintain boilers and generators; comply with PEQS	Stack monitoring, emission testing; record-keeping	Facility Operator, EHS Officer
28.	Solid and hazardous waste (sludge, chemical containers, packaging)	Segregate at source; store safely; hand over to licensed disposal contractors; recycling where possible	Daily waste audits; periodic reporting	Facility Operator, EHS Officer
29.	Energy consumption (electricity, fuel)	Use energy-efficient machinery; maintain equipment; explore renewable energy options	Track energy use; periodic maintenance	Facility Operator, EHS Officer
30.	Water consumption	Optimize water use in dyeing and finishing; recycle/reuse process water; prevent leaks	Monitor water meters;	Facility Operator, EHS Officer

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Sr No.	Project Component / Impact	Mitigation / Preventive Action	Implementation Phase	Responsibility
			maintenance of piping	
31.	Noise from dyeing machinery, boilers, generators	Install acoustic insulation; schedule noisy operations during daytime; provide hearing protection	Periodic noise monitoring; maintain equipment	Facility Operator, EHS Officer
32.	Occupational health and safety	Provide PPE (gloves, masks, goggles, ear protection); conduct regular training on chemical handling, ergonomics, and emergency procedures	Safety audits; medical checkups; incident reporting	Facility Operator, EHS Officer
33.	Chemical storage and handling	Store chemicals on impervious surfaces with bunds; proper labeling; follow MSDS; spill kits available	Weekly inspections; inventory control	Facility Operator, EHS Officer
34.	Odor nuisance from chemicals and wastewater	Ensure proper ventilation; maintain Packaged Wastewater Treatment Plant; periodic cleaning; odor control measures	Regular inspection and maintenance	Facility Operator, EHS Officer
35.	Accidental spills, fire, or chemical reactions	Firefighting equipment installed; spill response plan; emergency drills; proper storage of flammables	Periodic drills; equipment inspection	Facility Operator, EHS Officer
36.	Community and environmental impacts (effluent, emissions, noise)	Ensure compliance with PEQS, EPA regulations; maintain buffer zones; regular reporting	Monthly compliance reports; audits	Facility Operator, EHS Officer
37.	Record keeping and regulatory compliance	Maintain logs for effluent, emissions, waste, and energy use; submit periodic reports to EPA and local authorities	Continuous record review; annual audits	Facility Operator, EHS Officer

## **8.6 Environmental Management Team along with their Roles and Responsibilities**

The project proponent bears the responsibility for overseeing all the project activities. To cater to the varying requirements during operational phase, the proponent will hire personnel specifically dedicated to environmental management at the project site. This step is crucial to ensure the effective implementation and operations of the EMP.

Assigning the responsibilities to designated individuals is paramount to uphold accountability in the event of any oversight or mishap. Each appointed person will have specific duties outlined within the EMP. These responsibilities will be tailored to their roles, ensuring they are accountable for the successful execution of environmental protocols and procedures.

By delineating and assigning these responsibilities to individuals, the project proponent establishes a framework where each person understands their role and obligation within the broader context of environmental management. This structuring allows for a more efficient response to any environmental issue. This approach aims to create a clear chain of accountability, ensuring that the implementation of EMP is conducted diligently and that there are identifiable points of contact for any concerns or queries related to environmental management during the project's operational phase.

## **8.7 Environmental Monitoring Program**

An Environmental Monitoring Program (EMP) is a structured system designed to continuously observe, assess, and record the environmental conditions and impacts associated with the construction and operation of the textile dyeing and finishing unit. It involves systematic monitoring of air quality (particulate matter, VOCs, SO<sub>2</sub>, NO<sub>x</sub>), wastewater characteristics (pH, BOD, COD, color, TSS), soil quality, noise levels, and solid/hazardous waste management. The collected data is analyzed to detect deviations from prescribed environmental standards, including Punjab Environmental Quality Standards (PEQS).

The EMP also includes periodic reporting to regulatory authorities, adaptive management to address non-compliance, and evaluation of mitigation measures such as effluent treatment, emissions control, and safe chemical handling. The ultimate aim is to ensure sustainable environmental practices, minimize adverse impacts on the surrounding community and ecosystem, and maintain regulatory compliance, thereby promoting safe and efficient operations.

## **8.8 Objectives of the Environmental Monitoring Plan (EMP)**

- Detect environmental changes arising from textile dyeing and finishing activities (e.g., dye wastewater, chemical spills, or air emissions) to prevent and minimize potential negative impacts.
- Ensure compliance with environmental laws, permits, and regulations by conducting regular monitoring and reporting of textile-related parameters such as COD, BOD, TSS, pH, color, heavy metals, and air pollutants (SO<sub>2</sub>, NO<sub>x</sub>, VOCs), helping to meet legal requirements and avoid penalties.

- Assess and manage risks associated with textile operations, including handling of dyes, chemicals, solvents, and effluents, by evaluating impacts and implementing mitigation measures.
- Monitor and manage natural resources (water, energy, and air) to ensure efficient use, conservation, and sustainable operation, while maintaining ecological balance in and around the plant.
- Assess the impact of textile manufacturing processes on the environment to understand consequences of wastewater quality, air emissions, solid and hazardous waste, and guide operational improvements.
- Improve environmental performance by using monitoring data to refine effluent treatment, enhance air emission control, optimize solid/hazardous waste management, and adopt best available technologies.
- Establish emergency response protocols for unforeseen incidents such as chemical spills, dye leakage, fire hazards, or accidental releases, ensuring quick and effective mitigation to minimize environmental damage.

**Table 8-4: Environmental Monitoring Plan for M/S Punjab Dyeing**

<b>Sr. No</b>	<b>Monitoring Parameters</b>	<b>Monitoring Location</b>	<b>Monitoring Mechanism</b>	<b>Remarks</b>
<b>Construction Phase</b>				
1	Noise	Construction vehicles, machinery, generators	Noise meter	Regular monitoring by contractor to ensure compliance with NEQS.
2	Air Emissions (Dust, Smoke)	Construction vehicles, equipment, site activities	Ambient monitoring (PM <sub>10</sub> , PM <sub>2.5</sub> ), visual inspection	Regular checks to control dust and smoke emissions.
3	Wastewater	Worker camps, site runoff points	Visual inspection; basic tests (pH, turbidity)	Prevent contamination of soil and drains during construction.
4	Solid Waste	Construction zone, worker camps	Inspection, segregation	Waste collected and disposed of at approved municipal sites.
<b>Operational Phase</b>				
1	Air Emissions (PM, VOCs, SO <sub>2</sub> , NO <sub>x</sub> )	Boiler stacks, chimneys, exhaust vents	Stack testing & ambient air monitoring	Quarterly monitoring as per PEQS and textile industry standards.
2	Wastewater Quality	Effluent discharge point, PWTP outlet	Lab tests: pH, COD, BOD, TSS, TDS, Color, Temperature, Heavy Metals	Monthly/quarterly monitoring; ensure compliance with NEQS for Textile Effluents.
3	Hazardous Waste	Chemical storage, sludge collection, disposal areas	Inventory checks, visual inspections	Monthly monitoring; disposal through licensed hazardous waste vendors.
4	Dye & Chemical Handling	Dye kitchen, dosing area, chemical storage	Inspection of MSDS compliance, PPE usage, spill checks	Weekly monitoring; ensure proper labeling and safe handling.

Sr. No	Monitoring Parameters	Monitoring Location	Monitoring Mechanism	Remarks
5	Solid Waste (Packaging, Process Waste)	Production floor, storage area, sludge pits	Visual inspection and segregation	Recyclable waste separated; sludge disposed safely.
6	Occupational Health & Safety	Dyeing, finishing, boiler room, chemical storage	Monitoring for noise, heat, chemical exposure	Periodic monitoring; enforce PPE and safety protocols.
7	Noise Levels	Boiler section, compressors, production hall	Noise meter	Quarterly monitoring; maintain silencers/insulation.
8	Water Consumption	Dyeing machines, washing units, utilities	Meter readings & consumption logs	Monthly monitoring to improve efficiency and reduce wastage.
9	Energy Consumption	Boilers, motors, production machinery	Metering and performance logs	Monthly monitoring to optimize energy use.
10	Soil & Groundwater Quality	Near PWTP, chemical storage area	Testing for dyes, chromium, sulfates, heavy metals	Semi-annual monitoring to detect leakage or contamination.
11	Fire Safety & Emergency Response	Entire facility	Inspection of alarms, extinguishers, hydrants, emergency exits	Monthly inspections; drill records maintained.

### 8.9 Environmental Budget

An environmental budget is a critical component of the textile dyeing and finishing project, ensuring that sufficient funds are allocated for environmental protection, regulatory compliance, and sustainable operations. It includes provisions for wastewater treatment through the Packaged Wastewater Treatment Plant, management and safe disposal of solid and hazardous wastes (sludge, chemical residues, packaging), air emission control (dust, VOCs, SO<sub>2</sub>, NO<sub>x</sub>), and energy and water efficiency measures. The budget also covers environmental monitoring, staff training on occupational health, safety, and chemical handling, as well as periodic audits to ensure adherence to Punjab Environmental Quality Standards (PEQS) and industry best practices. Proper allocation of these resources ensures that the facility operates responsibly, minimizes ecological impact, and supports long-term environmental sustainability.

**Table 8-5: Environmental Budget**

Sr. No.	Environmental Management / Monitoring Item	Revised Cost (PKR)
1	Air Quality & Noise Monitoring (annual)	130,000
2	Water Quality Testing (process + drinking)	120,000
3	Effluent / Wastewater Testing	90,000
4	Solid & Hazardous Waste Management (bins, disposal contracts)	170,000
5	PPE & Safety Equipment for Workers	140,000

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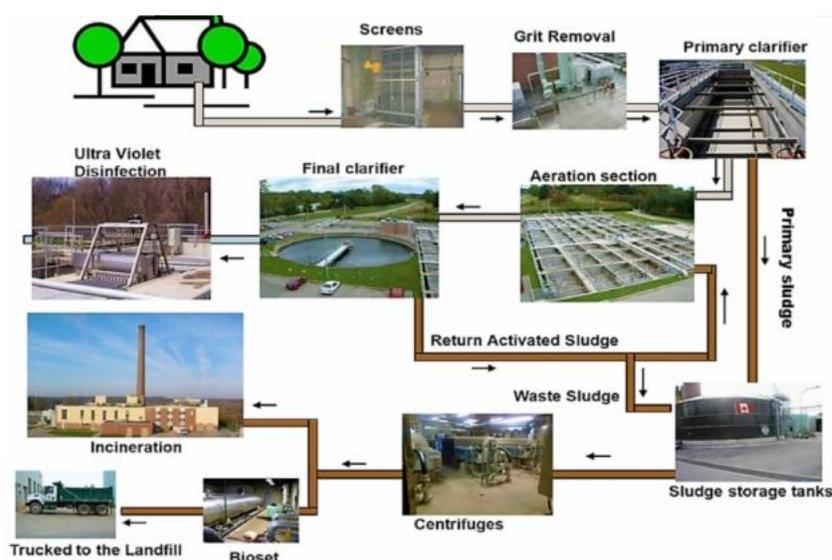
<b>Sr. No.</b>	<b>Environmental Management / Monitoring Item</b>	<b>Revised Cost (PKR)</b>
6	Training & Awareness Programs (environmental & safety)	80,000
7	Emergency Preparedness (spill kits, firefighting, first aid)	80,000
8	Environmental Reporting & Compliance (EPA fees, audits)	90,000
<b>Total</b>	—	<b>900,000</b>

## 9 WASTEWATER TREATMENT PLANT

### 9.1 Traditional activated sludge treatment plant

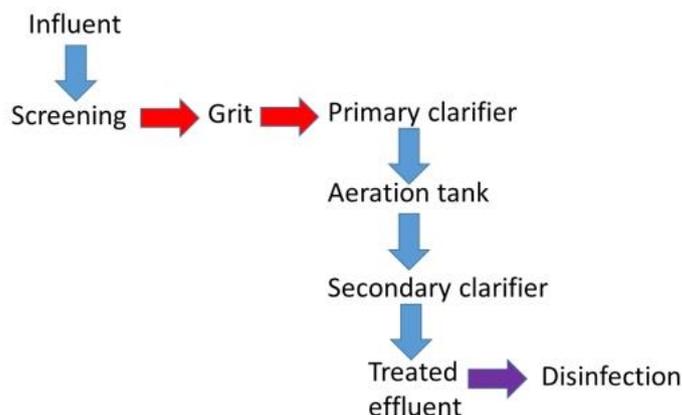
In an activated sludge plant, wastewater is combined with air and microorganisms as part of a secondary (biological) wastewater treatment process. These microbes produce cleaner water and biomass (sludge) by consuming organic matter (BOD/COD).

The initial step in building an active sludge treatment plant is to build a number of reinforced concrete tanks, primarily the secondary clarifier where sludge settles and the aeration tank where air is given to nourish microorganisms. All plumbing, channels, and waterproofing are finished, the site is dug, and tanks are cast in reinforced cement concrete. Electrical panels and controls are added after the civil work, followed by mechanical equipment like blowers, diffusers, pumps, pipes, valves, and clarifier mechanisms. After everything is linked, the plant is water-tested, the equipment is put into service, and biological seeding is carried out to allow microorganisms to proliferate and begin treating sewage. To put it simply, construction includes building the tanks, setting up pumping and aeration equipment, joining pipes, and initiating the biological process to produce steady wastewater treatment.



**Figure 9-1: Activated Sludge Treatment Plant**

After going through basic processes like screening and grit removal, sewage enters a primary clarifier, where solids settle. An aeration tank receives the partially cleaned water, where the pollutants are broken down by microorganisms and air. After that, it travels to a secondary clarifier, where the sludge settles once more to provide purified water for disinfection. While extra sludge is transferred for thickening, digestion, dewatering, and ultimate disposal or reuse, some of the settled sludge is returned to sustain the biological process. In short, the procedure settles sludge, eliminates solids, biologically processes the wastewater, and handles the residual sediments.



**Figure 9-2: Process Flow Diagram of Activated Sludge Treatment**

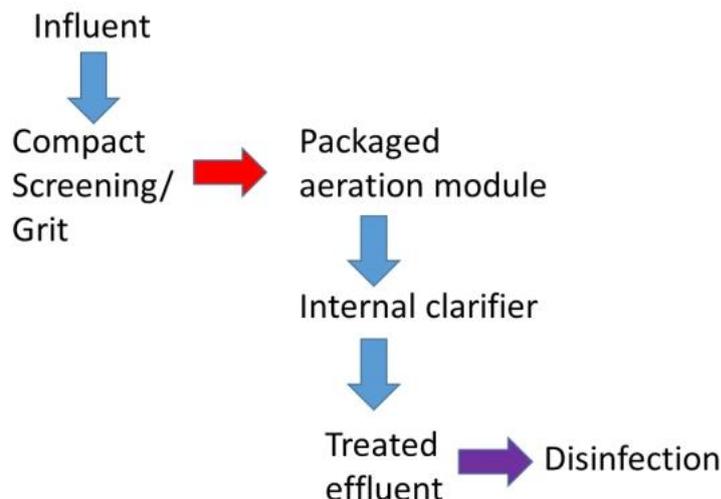
## 9.2 Packaged wastewater treatment plant

In 2024, the packaged wastewater treatment market was valued at USD 21.8 billion worldwide. Wastewater treatment systems that are constructed and designed in a factory and then carried to the installation site for assembly and operation are referred to as packaged wastewater treatment (PWWT). They are the perfect option for decentralized wastewater treatment applications, such as small towns, isolated locations, and industrial operations, because they are tiny, modular, and simple to carry and install.



**Figure 9-3: Packaged treatment plant**

First, a small screening/grit equipment is used to filter out sand and debris from sewage. After that, it enters a packed aeration module, where internal baffles are used to equalize, aerate, and mix the wastewater. Microorganisms clean the water here during an extended period of retention. The water next enters an internal clarifier, where the sludge settles and the clean, treated water proceeds to be disinfected. While the excess sludge (WAS) is directed to a small sludge tank that is periodically emptied by a tanker, some sludge (RAS) is returned to maintain the biological process active. In short, the plant settles the sludge, disinfects the water, screens the sewage, treats it biologically in a small unit, and stores extra sludge for later removal.



**Figure 9-4: Process Flow Diagram of Packaged Wastewater Treatment Plant**

### 9.2.1 Comparison between Two Systems

A packaged treatment plant is a compact, ready-made wastewater treatment facility that is primarily pre-built from a manufacturer, requires very little land, installs rapidly, and is perfect for small communities, hotels, or housing societies. On the other hand, an activated sludge plant is a huge, conventional system that is constructed on-site with big concrete tanks; it requires more space, takes longer to build, and is used to treat large amounts of municipal sewage. Activated sludge facilities are larger and more complicated; whereas packaged wastewater treatment systems are smaller and faster.

**Table 9-1: Comparison of Engineering Details**

	<b>Activated sludge plant</b>	<b>Packaged treatment plant</b>
<b>Plant size</b>	Medium to large	Small to medium
<b>Construction</b>	RCC civil tanks	Steel, FRP
<b>Installation time</b>	1-3 years	2-12 weeks
<b>Footprint</b>	Large	Small
<b>Aeration system</b>	Diffusers/ surface aerators	Diffusers/ blowers integrated
<b>Operator skill</b>	High	Low-medium
<b>Automation</b>	Moderate	High (PLC/SCADA)
<b>Sludge generation</b>	Moderate	Low
<b>Treatment performance</b>	Good with heavy load	Good with small load
<b>Expandability</b>	Difficult	Easy (modules can be added)
<b>Application</b>	Municipalities, cities, large utilities	Schools, hotels, apartments, townships

An **Activated Sludge Plant (ASP)** and a **Packaged Treatment Plant (PTP)** both clean wastewater using bacteria, but in slightly different ways. **MLSS** (Mixed Liquor Suspended Solids) is the concentration of bacteria in the water—PTPs usually have more bacteria packed in a smaller tank to treat water efficiently. **SRT** (Sludge

Retention Time) is how long the bacteria are kept in the system; PTPs keep them longer to improve treatment in a compact space. **HRT** (Hydraulic Retention Time) is the time water stays in the tank—longer in PTPs to allow small tanks to clean water fully. **F/M ratio** is the amount of “food” for the bacteria; lower in PTPs, meaning bacteria work slowly but efficiently. **Dissolved Oxygen (DO)** is the oxygen bacteria need to survive; PTPs often need slightly more because tanks are smaller. **Sludge age** is how old the bacterial population is; PTPs maintain very old sludge to save space. **Power consumption** is higher per cubic meter in PTPs because aeration is intensive but absolute energy may be lower due to low flow. Finally, clarifier settle out sludge: ASPs use large tanks, while PTPs use compact tube or hopper settlers, and PTPs recycle most sludge internally, producing very little waste.

**Table 9-2: Comparison of design**

	<b>Active sludge plant</b>	<b>Packaged treatment plant</b>
<b>Design basis</b>	Municipal sewage	Institutional / small community
<b>MLSS</b>	2,000–4,000 mg/L	3,00–6,000 mg/L
<b>SRT (Sludge Retention Time)</b>	6–12 days	20–30 days (extended aeration)
<b>HRT (Bioreactor)</b>	4–8 hours	12–24 hours
<b>F/M Ratio</b>	0.15–0.5	0.05–0.15
<b>Dissolved Oxygen (DO)</b>	1.5–3 mg/L	2–4 mg/L
<b>Sludge Age</b>	Medium	Very high 0.3–0.5 kWh/m <sup>3</sup>
<b>Power Consumption</b>	0.25–0.35 kWh/m <sup>3</sup>	(absolute energy may be lower due to smaller flows)
<b>Clarifier Type</b>	Large, radial, rectangular	Tube settler / hopper bottom
<b>RAS Rate</b>	20–60% of flow	Internal recycle 50–100% of influent
<b>WAS Rate</b>	Controlled via SRT	Minimal (low sludge generation)

An activated sludge plant is more expensive to build because it involves huge concrete structures and full sludge-handling facilities, while a packaged treatment plant is cheaper since it is factory-built and requires less civil work. Operating expenses for activated sludge systems are costly at small scale but become reasonable for big municipal flows. Packaged plants often have greater energy costs, but they save on labor and maintenance. Packaged plants create less sludge that can be occasionally kept and removed, whereas activated sludge plants produce more sludge that needs to be treated and transported, making sludge management costlier. In general, packaged plants offer lower lifetime costs for small communities, while activated sludge facilities are better suited for major cities with more population and flow.

Table 9-3: Cost comparison

	Activated sludge plant	Packaged treatment plant
<b>Capital Cost (CAPEX)</b>	High – large	Lower – 20–60%
<b>O&amp;M Cost</b>	High for small scale, lower for large scale.	High due to energy, minimizes labour and civil work
<b>Sludge Handling Cost</b>	Higher – full digestion, dewatering, transport	Lower – extended aeration produces minimal sludge; small storage tank; periodic tanker removal
<b>Lifecycle Cost</b>	Lower for large municipal systems	Lower for small systems

### Hypothetical Design

- Wastewater generation at home: 150 liters per person per day
- The standard population equivalent value, which is frequently used worldwide, is 60 g BOD/person/day.
- Peak factor (daily):
  - 2.0 for communities with fewer than 5,000 residents
  - 1.8 for areas with more than 5000 residents

### Assumed Sizing Calculations

#### **1,000 People**

- Average flow =  $1,000 \times 150 = 150 \text{ m}^3/\text{day}$
- Peak flow (PF 2.0) = **300 m<sup>3</sup>/day**
- BOD load =  $1,000 \times 60 \text{ g} = 60 \text{ kg BOD/day}$

#### **5,000 People**

- Average flow = **750 m<sup>3</sup>/day**
- Peak flow = **1,500 m<sup>3</sup>/day**
- BOD load = **300 kg BOD/day**

#### **20,000 People**

- Average flow = **3,000 m<sup>3</sup>/day**
- Peak flow (PF 1.8) = **5,400 m<sup>3</sup>/day**
- BOD load = **1,200 kg BOD/day**

### Assumed Packaged STP Process (MBBR-Based)

For a packaged treatment plant, selecting a Moving Bed Bioreactor (MBBR) is advantageous because it effectively treats wastewater in a little, compact system. In order to treat heavy organic loads without the need for huge tanks, MBBR uses

plastic medium that offer a vast surface area for bacteria to flourish. Unlike activated sludge systems, it is easy to use, stable even when flow or load fluctuates, and doesn't require sludge recycling. MBBR fits readily into prefabricated containerized or modular systems, produces less sludge, and requires little operator attention. Overall, it is used for packaged wastewater treatment plants because it provides high efficiency, a small footprint, little maintenance, and stable performance.

### **Treatment workflow**

#### **1. Inlet Works**

- Coarse screen (20–50 mm)
- Flow equalisation tank (with mixing)
- Grit removal (where required)

#### **2. Primary Settling**

- Omitted in many packaged systems unless influent total suspended solid and oil or grease is high.

#### **3. Biological Treatment (MBBR)**

- Aeration tank with 40–60% media fill
- High shock-load tolerance
- Compact footprint

#### **4. Secondary Clarifier**

#### **5. Disinfection**

- UV preferred (no residual)

#### **6. Sludge Management**

- Thickening → holding → dewatering (filter press or drying beds)

#### **7. Odor Control**

- Biofilter or activated carbon at headworks

### **Assumption with Population Sizing (5,000 People / 750 m<sup>3</sup>/day)**

#### **Equalisation Tank**

- Average flow =  $750 \div 24 = 31.25 \text{ m}^3/\text{hour}$
- EQ storage for 8 hours = **250 m<sup>3</sup>**

#### **MBBR Aeration Tank**

- Typical HRT = 4–6 hours (use 5 hours)
- Required volume =  $31.25 \times 5 = \approx 156 \text{ m}^3$
- Media fill = **50–60%** of tank volume
- Provide adequate freeboard and aeration capacity

### **Secondary Clarifier**

Surface Overflow Rate (SOR): **20–35 m<sup>3</sup>/m<sup>2</sup>-day**

Using 30 m<sup>3</sup>/m<sup>2</sup>-day:

- Average flow:  $750 \div 30 = 25 \text{ m}^2$  clarifier area
- Peak flow:  $1,500 \div 30 = 50 \text{ m}^2$  clarifier area

### **Disinfection**

- UV system sized for peak flow **1,500 m<sup>3</sup>/day**

### **Utilities & Workforce**

#### **Utilities**

- Aeration blowers
- Influent/effluent pumps
- Standby generator
- Chemical storage (if chlorination is used but UV is preferred)

#### **Workforce**

- Small plant: 1 operator + periodic vendor visits
- Medium plant: 2–4 operators + maintenance technician
- Large plant: full O&M team + laboratory support

### **Instrumentation & Controls**

- Influent & effluent flow meters
- DO probes in aeration tanks
- pH & turbidity monitoring
- PLC with SCADA and alarm notifications
- Oil/grease and solids monitoring as required

### **Operation & Maintenance Summary**

#### **Daily**

- Flow checks
- DO levels
- Screen cleaning

#### **Weekly**

- Sludge wasting
- Pump checks

#### **Monthly**

- Media inspection
- Sensor calibration

- UV or chlorine system inspection

**1–3 Months**

- EQ tank desludging
- Clarifier desludging

**Annual**

- Blower overhauls
- Pump and electrical maintenance

## **10 FIRE SAFETY PLAN**

A fire safety plan is a structured and comprehensive document that details procedures, protocols, and strategies aimed at preventing, preparing for, and responding to fire emergencies at the project site. This essential plan outlines preventive measures, emergency procedures, evacuation protocols, fire detection and suppression systems, training requirements and communication strategies. It assigns specific roles and responsibilities to individuals and provides clear instructions for evacuations, ensuring occupants, or employees understand what to do in case of a fire. Regular reviews and updates to the plan maintain its relevance, ensuring compliance with fire safety regulations and fostering a safe and prepared environment in the event of a fire emergency.

### **10.1 Objectives of a Fire Safety Plan**

Following objectives collectively aim to create a safe and prepared environment in the face of a fire emergency, ensuring the protection of lives, property, and assets.

- The primary goal is to prevent fires from occurring by implementing measures that reduce fire hazards, ensuring that all the safety systems, equipment, and protocols are up to standard, and that fire risks are minimized.
- Protecting the lives and well-being of occupants and employees by ensuring a quick and safe evacuation during a fire emergency. This involves establishing and regularly practicing efficient evacuation routes and procedures.
- Minimizing damage to property and assets by having effective fire detection and suppression systems in place. This includes regular maintenance of fire safety equipment such as fire alarms, sprinkler systems, and fire extinguishers.
- Outlining procedures to respond effectively and efficiently in the event of a fire. This involves establishing clear roles and responsibilities for personnel during a fire emergency.
- Ensuring compliance with local fire safety regulations and standards.
- Conducting regular training sessions, and fire drills to educate occupants and employees about fire safety procedures, evacuation routes, and the use of fire equipment.
- Regularly reviewing and updating the fire safety plan to incorporate any necessary changes in equipment, procedures, or regulations. This ensures the plan remains current and effective.

### **10.2 Fire Safety Symbols**

In Dyeing and finishing industries, hazard identification symbols play a crucial role in communicating potential hazards identification symbols play a crucial role in communicating potential dangers to employees, emergency responders, and the public. These symbols, often standardized, convey various hazard associated with the storage and handling of materials. Some common symbols and their meanings in such a facility include:

### 10.2.1 Flammable Symbol

It warns about the potential for fire explosion.



**Figure 10-1: Symbol for Flammable Material**

### 10.2.2 Gas Cylinder Symbol

It highlights the presence of compressed gas cylinder, signifying the potential pressure and hazards associated with gas containment.



**Figure 10-2: Symbol for Gas Cylinder**

### 10.2.3 Toxic Symbol

It warns about the toxicity of certain chemicals or gases, emphasizing the need for caution and proper handling to avoid health and hazard.



**Figure 10-3: Symbol for Toxic Material**

### 10.2.4 Explosive Symbol

It indicates the potential for an explosion due to certain conditions or elements present in the industry.



**Figure 10-4: Symbol for Explosive Material**

### 10.2.5 Electrical Hazard Symbol

It warns about electrical hazards present in the facility, highlighting the risk of electrical shock or short circuits.



**Figure 10-5: Symbol for Electrical Hazard**

### 10.2.6 PPE (Personal Protective Equipment) Symbol

It emphasizes the necessity of wearing appropriate personal protective equipment while working in the facility.



**Figure 10-6: Symbols of PPEs**

### 10.2.7 Environmental Hazard Symbol

It signifies potential hazards to the environment, like contamination or pollution risks from leaks.



**Figure 10-7: Environmental Hazard Symbol**

These symbols are commonly used in combination with written warnings, color codes, and other safety measures to ensure a comprehensive and easily understandable identification system for the hazards present in pharmaceutical unit. It's crucial for all personnel to be familiar with these symbols and their meanings to ensure a safe working environment.

## 10.3 Fire Safety Measures

Fire safety measures prevent fires and explosions, safeguard personnel, protect property and equipment, ensure compliance with regulations, maintain emergency

preparedness, and mitigate environmental risks associated with potential fire incidents. Following safety measures are proposed at project site.

### 10.3.1 Fire Extinguishers

Fire extinguishers are necessary in storage areas of the facility. They provide a means to quickly suppress small fires, prevent their escalation, comply with safety regulations, and protect lives, and the environment. These extinguishers ensure emergency preparedness and the rapid containment of fires, offering immediate response and safety for individuals working in or around storage areas.

### 10.3.2 Dry Chemical Powder Fire Extinguishers

**Dry Chemical Powder (DCP) fire extinguishers** are an essential safety measure in pharmaceutical facilities due to their ability to combat different classes of fires, including those involving chemicals, solvents, and electrical equipment. In pharmaceutical operations, where flammable substances and sensitive machinery are present, DCP extinguishers are highly effective as they interrupt the chemical reaction of the fire, quickly suppress flames, and minimize the risk of escalation. They are particularly useful for Class B fires (flammable liquids such as alcohols and solvents) and Class C fires (electrical equipment), which are common risks in laboratories, production areas, and storage facilities. Their reliability, fast action, and versatility make DCP fire extinguishers a critical component of pharmaceutical safety protocols, ensuring protection of personnel, equipment, and valuable research asset



**Figure 10-8: DCP Fire Extinguisher**

### 10.3.3 Fire Extinguishers Foam Type

Fire extinguishers of the foam type play a critical role in ensuring the safety of pharmaceutical facilities. Pharmaceutical operations often involve the use of flammable liquids such as alcohols, solvents, and chemicals, which can pose significant fire hazards if not properly managed. Foam-type extinguishers are specifically designed to combat flammable liquid fires, making them indispensable in laboratories, production areas, and chemical storage units. The foam creates a blanket over the liquid surface, suppressing the release of flammable vapors and effectively preventing the spread of fire. This targeted mechanism allows for swift and

effective control of fire outbreaks, reducing the risk of damage to sensitive equipment, stored medicines, and valuable research materials.

The use of foam extinguishers in pharmaceutical facilities highlights a proactive safety measure, ensuring reliable first response in the event of fire emergencies and safeguarding personnel, assets, and the surrounding environment. Regular maintenance, periodic training on proper usage, and adherence to strict safety protocols further enhance the effectiveness of foam-type fire extinguishers in protecting pharmaceutical operations.



**Figure 10-9: Fire Extinguisher Foam Type**

#### **10.3.4 Fire Hydrants**

Fire Hydrants provide immediate access to water for firefighting in emergencies, supporting fire suppression efforts, ensuring site safety by cooling structures, and complying with safety regulations. Although water might not directly extinguish fires, hydrants serve as a crucial resource for firefighting equipment and overall emergency preparedness.



**Figure 10-10: Fire Hydrant**

### **10.3.5 Fire Alarm**

Fire alarms are crucial for early fire detection, timely warnings, evacuation, facilitation, prevention of fire escalation, and compliance with safety regulations. They play a vital role in ensuring the safety of personnel and protecting the facility and its surroundings. Fire alarm is supposed to be installed at the storage plant.



**Figure 10-11: Fire Alarm**

### **10.3.6 Sand Buckets**

Sand buckets hold significant importance in the safety measures. In the event of a small fire or a minor leak that may lead to a fire, sand buckets provide a crucial first line of defense. Sand is a non-combustible material, and when swiftly applied to a small flame, it can smother the fire by cutting off its oxygen supply. Moreover, in cases where liquid chemicals are involved, sand can be used to absorb and neutralize spills. The use of sand buckets is particularly essential in situations where traditional firefighting equipment, like water or foam, may not be suitable due to the flammable nature of certain components. These buckets are strategically placed throughout the facility, easily accessible for immediate use, and serve as an additional safety measure to contain and control potential fire hazards effectively. Regular training and awareness regarding the proper use of sand buckets will further enhance their role in maintaining a secure environment. Fire Sand Bucket will be placed to cater any minor fire accident.



**Figure 10-12: Sand Bucket**

### 10.3.7 Fire Pump

A fire pump holds paramount importance in the safety infrastructure of a pharmaceutical facility. The presence of flammable chemicals, solvents, and alcohol-based solutions used in production and laboratory processes necessitates rapid and effective fire response mechanisms. A fire pump is a critical component of the facility's firefighting system, as it ensures a pressurized and reliable water supply during emergencies. In the event of a fire outbreak, the pump activates to deliver water at high pressure to firefighting hoses and nozzles, enabling responders to swiftly extinguish or control the fire and prevent its escalation. The installation of fire pumps in pharmaceutical plants addresses challenges related to water distribution, especially in large production areas or multi-story buildings where consistent water pressure is vital. Their presence significantly enhances firefighting capacity, ensuring protection of sensitive equipment, stored medicines, raw materials, and personnel. Regular inspection, maintenance, and performance testing of fire pumps are essential to guarantee their operational readiness and reliability in safeguarding pharmaceutical operations against fire emergencies.



**Figure 10-13: Fire Pump**

### 10.3.8 Jockey Pump

The jockey pump plays a crucial role in maintaining the operational efficiency and safety of fire protection system. This small but vital pump ensures that the fire suppression system's main piping remains pressurized within an optimal range. By doing so, the jockey pump helps prevent unnecessary cycling of the main fire pump and ensures that it only activates when there's an actual fire emergency. This not only conserves energy but also extends the lifespan of the main pump, reducing wear and tear. The jockey pump contributes to the plant's readiness to respond swiftly and effectively to fire incidents by maintaining the required pressure in the fire protection system, guaranteeing that water or fire suppression agents can be delivered promptly when needed. Regular monitoring and maintenance of the jockey pump will essential to ensure its reliability, making it an integral component of the overall fire safety strategy at the pharmaceutical facility.



**Figure 10-14: Jockey Pump**

### **10.3.9 Standby Pump**

The standby pump is a critical component in ensuring the reliability and continuous functionality of the fire protection system at English Pharmaceutical industry. In the event that the primary fire pump faces mechanical failure or requires maintenance, the standby pump serves as a backup, ready to seamlessly take over the crucial task of maintaining water pressure for fire suppression. This redundancy is vital for preventing any downtime in the plant's ability to respond promptly to fire emergencies. The standby pump ensures that there is no compromise in the fire protection system's effectiveness, providing a constant and reliable water supply even during unexpected failures. This redundancy not only enhances the overall safety of the industry but also contributes to the resilience of the plant's fire safety infrastructure, ensuring uninterrupted protection against potential fire hazards. Regular testing and maintenance of the standby pump will be imperative to guarantee its operational readiness when called upon.

## **11 OCCUPATIONAL HEALTH AND SAFETY PLAN**

The Occupational Health and Safety (OHS) plan holds paramount importance within the framework of an EIA. This plan is a comprehensive document that outlines strategies and protocols to safeguard the well-being of workers involved in the project. Beyond the ethical imperative of ensuring a safe working environment, the OHS plan is integral to regulatory compliance and risk management. It identifies potential occupational hazards associated with the project, establishes preventive measures, and details emergency response procedures. By incorporating an OHS plan into the EIA, not only is the health and safety of the workforce prioritized, but it also contributes to the overall success and sustainability of the project. A well-executed OHS plan minimizes the likelihood of accidents, injuries, and occupational health issues, fostering a workplace culture that values the welfare of its personnel. In essence, the OHS plan, as part of the EIA process, aligns with responsible and ethical project management, ensuring that occupational health and safety considerations are seamlessly integrated into the project's design, implementation, and ongoing operations.

### **11.1 Objectives of Occupational Health and Safety**

The objectives of Health and Safety plan at English pharmaceutical industry are given below;

- Protect the health and safety of employees, contractors, visitors, and nearby communities by preventing workplace injuries, occupational illnesses, chemical exposures, and fire hazards.
- Minimize risks associated with pharmaceutical operations, including the handling of flammable chemicals, solvents, and biological materials, ensuring safe storage, processing, and disposal practices.
- Ensure compliance with all applicable health, safety, and environmental regulations, Good Manufacturing Practices (GMP), and international standards relevant to pharmaceutical operations.
- Promote a safe working culture by providing training, personal protective equipment (PPE), and emergency preparedness measures for fire, chemical spills, or accidental releases.
- Safeguard the environment by preventing contamination of air, water, and soil from pharmaceutical waste, emissions, and hazardous materials.
- Support continuous improvement in health and safety performance through regular monitoring, audits, and corrective actions.

### **11.2 Scope of Occupational Health and Safety Plan**

The Occupational Health and Safety (OHS) framework at English Pharmaceutical Industry will cover the following areas:

- Workplace Safety – Implementation of safe work practices to prevent accidents, injuries, and occupational illnesses across production, laboratories, warehouses, and administrative areas.

- Chemical Safety – Safe handling, storage, labeling, and disposal of active pharmaceutical ingredients (APIs), solvents, and other hazardous substances.
- Biological Safety – Control measures for handling biological agents and materials to protect employees and the surrounding community.
- Fire and Explosion Safety – Installation and maintenance of firefighting equipment, alarms, and emergency response systems to address risks from flammable chemicals and processes.
- Personal Protective Equipment (PPE) – Provision, use, and monitoring of PPE such as gloves, masks, goggles, and lab coats to reduce exposure risks.
- Health Surveillance & Medical Services – Regular health check-ups, occupational health screenings, and first-aid facilities for employees.
- Training and Awareness – Continuous education and training programs for employees and contractors on safe practices, emergency response, and hazard identification.
- Emergency Preparedness & Response – Development of evacuation plans, spill management procedures, and fire drills to ensure rapid and effective responses to emergencies.
- Regulatory Compliance – Strict adherence to OSHA, WHO, GMP, ISO, and national occupational health and safety standards applicable to the pharmaceutical sector.
- Continuous Improvement – Regular monitoring, auditing, and reviewing of OHS performance for ongoing enhancement of workplace safety.

### **11.3 Personal Protective Equipment**

The use of Personal Protective Equipment in a paper manufacturing plant is vital for safeguarding workers, ensuring regulatory compliance, mitigating risks, and promoting a culture of safety that is conducive to both employee well-being and operational excellence. The importance of Personal Protective Equipment (PPE) at a paper manufacturing plant cannot be overstated. Here are several key reasons highlighting the significance of PPE in this industrial setting:

- PPE provides a crucial line of defense against various occupational hazards prevalent in a paper manufacturing environment. It includes items such as safety helmets, gloves, safety glasses, and respiratory protection, which shield workers from potential injuries, chemical exposures, and airborne particles.
- Utilizing PPE is often a legal requirement and is mandated by occupational health and safety regulations. Adhering to these regulations not only ensures the safety of workers but also prevents regulatory penalties and legal issues for the manufacturing unit.
- Paper manufacturing involves machinery, chemicals, and processes that pose inherent risks. PPE serves as a risk mitigation strategy by minimizing the likelihood and severity of injuries or illnesses, contributing to a safer working environment.

- In the paper manufacturing process, workers may come into contact with various chemicals used in pulping, bleaching, and other stages. PPE, such as chemical-resistant gloves and protective clothing, safeguards workers from direct skin contact and potential harm.
- Dust and other airborne particles are common in paper mills. Respiratory protection, such as masks or respirators, is vital in preventing inhalation of harmful substances, promoting respiratory health, and minimizing the risk of respiratory-related illnesses.
- PPE not only prioritizes safety but also contributes to the overall comfort of workers. Comfortable and well-fitted PPE encourages adherence to safety protocols, fostering a positive work culture and enhancing overall productivity.
- In the event of unexpected incidents or emergencies, PPE can be crucial for protecting workers and mitigating the impact of accidents. Items like hard hats and steel-toed boots provide added protection during emergencies.
- Providing PPE demonstrates the employer's commitment to the health and safety of its workforce, instilling confidence and trust among employees. This, in turn, contributes to a positive work environment and employee morale.

#### **11.4 PPE Required for Construction Phase**

During the construction of a project, including a paper manufacturing unit, a comprehensive set of Personal Protective Equipment (PPE) is necessary to safeguard the health and safety of workers involved in various tasks. The specific PPE requirements may vary based on the nature of construction activities, potential hazards, and regulatory standards. Here is a general list of PPE commonly required during construction:

**Head Protection:** Hard hats to protect against falling objects, impact, or head injuries.

**Eye and Face Protection:** Safety glasses or goggles to shield the eyes from dust, debris, or other airborne particles. Face shields for additional protection during tasks with a higher risk of facial exposure.

**Hearing Protection:** Earplugs or earmuffs to reduce exposure to loud noises, especially in areas with heavy machinery or construction equipment.

**Respiratory Protection:** Dust masks or respirators to protect against inhalation of dust, particulates, or hazardous substances.

**Hand Protection:** Safety gloves appropriate for the specific tasks, such as cut-resistant gloves, leather gloves, or chemical-resistant gloves.

**Body Protection:** High-visibility vests or clothing to enhance visibility, especially in areas with moving equipment. Reflective clothing for night time or low-visibility construction activities. Protective clothing, such as coveralls, for tasks involving exposure to hazardous substances.

**Foot Protection:** Steel-toed safety boots or shoes to protect against crushing injuries, falling objects, or punctures.

**Fall Protection:** Safety harnesses, lanyards, and other fall protection systems for workers operating at heights or in elevated areas.

**Hand and Arm Protection:** Elbow and knee pads for tasks that involve kneeling or crawling. Wrist support or braces for tasks with repetitive motions.

**Weather Protection:** Weather-appropriate clothing, such as rain gear, insulated clothing, or sunscreen, depending on the climate and weather conditions.

**First Aid Kit:** Access to a well-equipped first aid kit to provide immediate care for minor injuries.



**Figure 11-1: PPEs for Construction Phase**

It is essential for the construction project management to conduct a thorough hazard assessment to identify the specific risks associated with each construction activity and determine the appropriate PPE for the workers involved. Regular training, monitoring, and enforcement of PPE usage contribute to a safer construction environment.

### 11.5 Safety Signs during Construction Phase

Safety signs serve as critical elements in maintaining a secure and hazard-free environment at construction sites. Their importance lies in their ability to effectively communicate potential risks and hazards to workers, visitors, and contractors. By providing clear information about safety procedures, required personal protective equipment, and safe work practices, these signs play a pivotal role in preventing

accidents and injuries. Moreover, safety signs contribute to regulatory compliance, ensuring adherence to local regulations and occupational health and safety standards. They also serve as essential tools for emergency response by indicating the location of emergency exits, first aid stations, fire extinguishers, and other emergency equipment. In addition to their role in risk reduction, safety signs assist in site navigation, guiding individuals to specific areas and enhancing overall organization. Beyond practical benefits, safety signs contribute to fostering a culture of safety awareness among the workforce. They communicate important safety policies, promote compliance with site-specific regulations, and reduce the project's liability by showcasing a commitment to responsible construction practices. Ultimately, safety signs are integral components in creating a safe, compliant, and organized construction site conducive to the well-being of all involved parties.



**Figure 11-2: Safety signs for Constructional Phase**

### 11.6 Personal Protective Equipment during Operational Phase

Personal Protective Equipment (PPE) is an essential component of the health and safety system at English Pharmaceutical Industry. It is designed to safeguard employees from occupational hazards that may arise during pharmaceutical manufacturing, handling, and storage. PPE provides protection against:

- Chemical Hazards – Exposure to active pharmaceutical ingredients (APIs), solvents, cleaning agents, and other hazardous chemicals that may cause skin irritation, respiratory issues, or chemical burns.
- Biological Hazards – Contact with biological materials, microorganisms, or contaminated samples that can pose infection risks.
- Particulate and Dust Exposure – Protection from inhalation of pharmaceutical powders and fine particles during formulation and packaging.

- Thermal and Mechanical Hazards – Prevention of burns, cuts, or injuries from equipment, heating devices, and moving machinery.
- General Workplace Hazards – Minimization of risks from slips, trips, falls, and accidental spills.

#### **11.7 PPE Required for M/S Punjab Dyeing**

The use of appropriate PPE is mandatory in pharmaceutical operations to ensure a safe working environment. The following PPE is required for workers at English Pharmaceutical Industry:

- Laboratory Coats / Coveralls – To prevent contamination and protect against chemical splashes and spills.
- Gloves (Nitrile / Latex / Chemical-Resistant) – For handling chemicals, APIs, and biological materials.
- Safety Goggles / Face Shields – To protect eyes from chemical splashes, powders, or glass breakage.
- Respiratory Protection (Masks / Respirators) – For safeguarding against dust, vapors, and airborne contaminants.
- Safety Shoes / Non-Slip Footwear – To prevent injuries from slips, trips, and falling objects.
- Hearing Protection (Ear Plugs / Muffs) – Where noise levels exceed occupational safety limits.
- Head Protection (Caps / Helmets as required) – For specific operations involving overhead equipment or materials.

Regular **training, inspection, and replacement** of PPE will be ensured to maintain safety standards and regulatory compliance.



**Figure 11-3: PPE Required for the Operational Phase of M/S Punjab Dyeing and Finishing**

## **12 STAKEHOLDER CONSULTATION**

Stakeholder consultation is of paramount importance in the EIA process as it facilitates inclusive decision-making, fosters transparency, and enhances the overall quality of the assessment. Involving stakeholders, including local communities, governmental bodies, non-governmental organizations, and affected parties, ensures that diverse perspectives, concerns, and local knowledge are taken into account. This inclusive approach contributes to the identification of potential environmental and social impacts that might not be evident from a solely technical or regulatory standpoint. Stakeholder consultation is a way to involve both the primary and secondary stakeholders in making decisions about the project. Stakeholder engagement builds trust, allows for the exchange of valuable information, and empowers communities by giving them a voice in the decision-making process. Moreover, it helps to align the project with the needs and expectations of the local population, minimizing conflicts and fostering a sense of shared responsibility for environmental stewardship. In essence, stakeholder consultation transforms the EIA into a more robust and credible tool, enhancing the sustainability and social acceptance of proposed projects.

### **12.1 Objectives of Stakeholder Consultation**

In 1992, the United Nations Conference on the Environment and Development (UNCED) supported the idea of involving the public in decision-making, and this was outlined in one of the key documents of the conference called Agenda 21.

Agenda 21 is a comprehensive plan for global actions focused on sustainable development and deals with how people interact with the environment. It highlights the importance of including the public in making decisions about the environment to achieve sustainable development.

The objectives of stakeholder consultation in the context of EIA are multi-faceted, aiming to foster meaningful engagement, inclusivity, and informed decision-making. Some key objectives include:

- ✓ Ensure the inclusion of diverse stakeholder perspectives in the decision-making process, promoting a more comprehensive understanding of potential environmental and social impacts.
- ✓ Provide a platform for stakeholders to express their concerns, values, and local knowledge related to the project, contributing to a more nuanced understanding of potential impacts and benefits.
- ✓ Gather valuable insights and feedback that can be integrated into the project design, helping to address and mitigate potential adverse impacts and enhance positive contributions.
- ✓ Establish trust among stakeholders by being transparent, responsive, and open to dialogue. Building trust is essential for the successful implementation of the project and its long-term acceptance by the community.

- ✓ Fulfill regulatory requirements by actively engaging with stakeholders, demonstrating a commitment to compliance with environmental and social standards, and addressing concerns raised during the consultation process.
- ✓ Facilitate an open and inclusive dialogue to build understanding and acceptance of the project within the affected communities, minimizing potential conflicts and fostering a sense of shared responsibility.
- ✓ Integrate local knowledge and community input to enhance the overall sustainability of the project, aligning it with the needs and aspirations of the affected stakeholders.
- ✓ Disseminate accurate and accessible information about the project, its potential impacts, and proposed mitigation measures to ensure that stakeholders are well-informed and can actively participate in the decision-making process.
- ✓ Consider the needs and interests of all affected parties, including vulnerable or marginalized groups, to ensure that the benefits and burdens of the project are distributed equitably.
- ✓ Create a platform for addressing conflicts and disputes, allowing for the resolution of issues through open communication and negotiation.



**Figure 12-1: Stakeholder Management**

By achieving these objectives, stakeholder consultation contributes to the overall success and sustainability of the project, enhancing its social, environmental, and economic outcomes while fostering positive relationships with the communities it impacts.

## 12.2 Proponent Environment Management Team

A comprehensive discussion on all conceivable impacts and corresponding mitigation measures related to the project was conducted with both the proponent and project management. In this collaborative dialogue, a thorough examination of potential environmental, social, and economic implications of the project took place. The proponent and management, demonstrating a proactive commitment to responsible practices, assured the incorporation of all suggested mitigation measures to effectively control and address any discrepancies that may arise during the project's implementation. Their pledge to embrace these measures underscores a dedication to environmental stewardship and sustainable practices. By actively engaging in this discourse, the proponent and management not only exhibit a commitment to regulatory compliance but also demonstrate a broader responsibility to the well-being of the community and the preservation of the surrounding environment. This collaborative approach ensures that the project aligns with best practices, fostering a positive impact on the environment and minimizing any potential adverse effects.

## 12.3 The Responsible Authority

The Proponent assumes the crucial role of the responsible authority, pledging to undertake all necessary measures both prior to the commencement of the project and throughout its operational phases. This commitment encompasses a comprehensive approach to project management, ensuring that all regulatory requirements, environmental standards, and best practices are diligently adhered to. Before project initiation, the Proponent commits to conducting thorough assessments and implementing necessary preparatory measures to mitigate potential impacts. This includes adopting robust environmental management strategies, obtaining required permits, and addressing any concerns raised during stakeholder consultations. Throughout the operational phase, the Proponent maintains an ongoing commitment to environmental sustainability and regulatory compliance. This involves continuous monitoring, prompt response to emerging issues, and the implementation of adaptive management practices. By assuming the mantle of responsibility, the Proponent not only safeguards the project's integrity but also prioritizes the well-being of the environment, local communities, and all stakeholders involved. This proactive stance ensures that the project operates within the parameters of environmental and ethical standards, reflecting a dedication to responsible and sustainable project execution.

**Table 12-1: Stakeholders and Their Roles and Responsibilities**

Stakeholders	Roles
Proponent/Responsible Authority	The discussion with the proponent proposed the mitigation measures and alternatives to control any disparity in the project.
Environmental Expert	The consultants from the Integrated Environment Consultants survey the project site to gather relevant information and to record the local community stance and behaviors regarding the project. And also the

Stakeholders	Roles
	evaluation of socio-economic impacts of the project has been done.
Government Departments	The consulted government department includes Environmental protection agency, wildlife, planning, and development. The departments overviewed the proposed projects and its socio-economic impacts.
Local affected communities	The surveys determined the extent of community that could be affected and their verdict about the proposed project.

### **12.3.1 Other Departments and Agencies**

A comprehensive impact analysis was conducted in collaboration with key stakeholders, including project management, the local community, educational institutes, health institutions, hospitals, and non-governmental organizations (NGOs). This inclusive approach sought to gather diverse perspectives and insights related to the implementation of the project. The engagement process involved scoping sessions, focused group discussions, and wayside consultations, providing a multifaceted platform for dialogue and information exchange. Through these forums, all pertinent issues associated with the project were thoroughly examined, including potential environmental, social, and economic impacts. The proactive involvement of stakeholders, representing various sectors of the community, ensured that a holistic understanding of the project's implications was achieved. This collaborative effort not only fostered transparency but also allowed for the incorporation of valuable local knowledge and concerns into the impact analysis. By actively engaging with stakeholders through diverse communication channels, the project management demonstrated a commitment to responsible and inclusive decision-making, setting the stage for a well-informed and socially accepted project implementation process.

### **12.4 Environmental Practitioners and Experts**

Our dedicated team undertook a comprehensive site visit, engaging in extensive discussions with a broad spectrum of project stakeholders. This inclusive approach involved reaching out to residents from nearby villages and beyond, ensuring a diverse representation of perspectives to assess the socio-economic impacts of the project. The community demographic was richly diverse, encompassing individuals from various professions, such as those employed in different fields, business owners, doctors, expatriates, military personnel, and educators. In a conscious effort to ensure gender inclusivity, consultations with women were prioritized to gather their unique perspectives on how the project could contribute to the improvement of the area. While some women openly shared their thoughts, it was evident that social norms in the area made many feel hesitant, creating discomfort with speaking or being photographed. This nuanced understanding allowed our team to respect and navigate the cultural sensitivities of the community. The local community, nonetheless, proved to be a wellspring of information, offering valuable insights into

the project and expressing predominantly positive views regarding its potential for development. This holistic approach to stakeholder engagement not only highlights the diverse fabric of the community but also underscores the importance of cultural sensitivity in ensuring meaningful and respectful interactions during the assessment of socio-economic impacts.

### **12.5 Discussed Points**

The points that have been kept in view while consulting stakeholders are as follows:

- ❖ Activities of the project and their consequences.
- ❖ Requirements of the people likely to be affected.
- ❖ Mitigation measures or compensation strategies.
- ❖ Role of the affected people in the implementation and development of the project.

### **12.6 Affected and Wider Community**

In the vicinity of the proposed project, there is no identified affected community; however, the proactive engagement of the proponent with inhabitants from various villages has been instrumental in understanding and addressing local perspectives. The absence of a distinct affected community does not diminish the importance of comprehensive consultations. The proponent has undertaken conscientious efforts to reach out to residents across different villages, fostering a dialogue to assess the community's sentiments towards the project. Remarkably, the feedback from these consultations has been overwhelmingly positive, with residents expressing favorable views regarding the proposed endeavor. This positive reception is indicative of the proactive communication and collaborative approach adopted by the proponent, establishing a foundation of mutual understanding and support within the broader community. While the absence of an affected community streamlines certain aspects of the engagement process, the commitment to inclusive consultations with diverse stakeholders remains integral to building a harmonious relationship with the local population.

## **13 GRIEVANCE REDRESS MECHANISM**

A Grievance Redress Mechanism is a structured system established to address and resolve complaints, concerns, or issues raised by individuals or entities regarding their experiences or interactions. This mechanism typically involves clear channels for lodging complaints, whether through written communication, online platforms, or dedicated grievance officers. Once a grievance is registered, the mechanism ensures a systematic and fair investigation of the matter, taking into account all relevant information and perspectives. Timely resolution and effective communication with the aggrieved party are essential components, helping to restore trust and rectify any perceived injustices. An efficient Grievance Redress Mechanism not only safeguards the rights and interests of individuals but also contributes to organizational transparency, accountability, and continuous improvement in service delivery.

### **13.1 Objectives of Grievance Redress Mechanism**

The objectives of a GRM are designed to provide an effective and transparent process for addressing and resolving complaints or grievances raised by individuals or entities affected by a project or organization. The key objectives of a Grievance Redress Mechanism include:

- Ensure that the grievance redress process is easily accessible to all stakeholders, providing a straightforward means for individuals or communities to voice their concerns.
- Promote a fair and impartial mechanism that treats all grievances with equal consideration, regardless of the stakeholder's background, status, or affiliation.
- Establish a system that addresses grievances in a timely manner, minimizing delays and providing prompt resolution to concerns to prevent prolonged dissatisfaction.
- Foster transparency in the grievance redress process, ensuring that stakeholders are informed about the status of their complaints and the steps taken to address them.
- Hold the organization or project accountable for addressing and resolving grievances in accordance with established policies and procedures.
- Utilize the grievance redress process as an opportunity for organizational learning, collecting feedback to identify areas for improvement in project implementation or organizational practices.
- Empower affected individuals or communities by giving them a voice in the decision-making process and acknowledging the importance of their concerns.
- Serve as a mechanism for resolving conflicts and disputes in a constructive manner, minimizing the potential for escalation and promoting harmonious relationships.
- Use insights gained from the grievance redress process to enhance project design, implementation strategies, and overall organizational practices for continuous improvement.

- Ensure that the grievance redress mechanism aligns with legal requirements, industry standards, and the principles of social responsibility.
- Strengthen community engagement by demonstrating a commitment to addressing concerns and maintaining open communication channels.

By achieving these objectives, a Grievance Redress Mechanism contributes to building trust, fostering positive relationships with stakeholders, and enhancing the overall social and environmental sustainability of a project or organization.

### **13.2 Components of GRM**

GRM typically involves several basic steps to address and resolve complaints or grievances effectively. While specific procedures may vary depending on the organization or context, the following are common steps in a basic GRM:

- Individuals submit their grievances through designated channels, which may include online platforms, written communication, or direct contact with a grievance officer.
- The received grievance is formally registered in the system, assigning a unique identifier. This step ensures proper tracking and documentation of each complaint.
- A preliminary assessment is conducted to determine the nature and severity of the grievance. This step helps in categorizing grievances and prioritizing them based on urgency.
- A thorough investigation is carried out to gather relevant information and facts related to the grievance. This may involve interviews, document reviews, or other means of inquiry.
- Clear and timely communication is maintained with the aggrieved party throughout the process. Regular updates and feedback are provided to keep them informed about the progress of the investigation.
- Once the investigation is complete, appropriate measures are taken to address the grievance. This may involve corrective actions, policy changes, compensation, or other forms of redress, depending on the nature of the complaint.
- The resolution is communicated to the aggrieved party, and feedback is sought to ensure their satisfaction. Follow-up may be conducted to confirm that the resolution has been implemented and to monitor any lingering concerns.
- The entire process, from grievance registration to resolution, is documented for record-keeping and reporting purposes. This documentation aids in analyzing trends, identifying systemic issues, and improving the overall grievance-handling process.

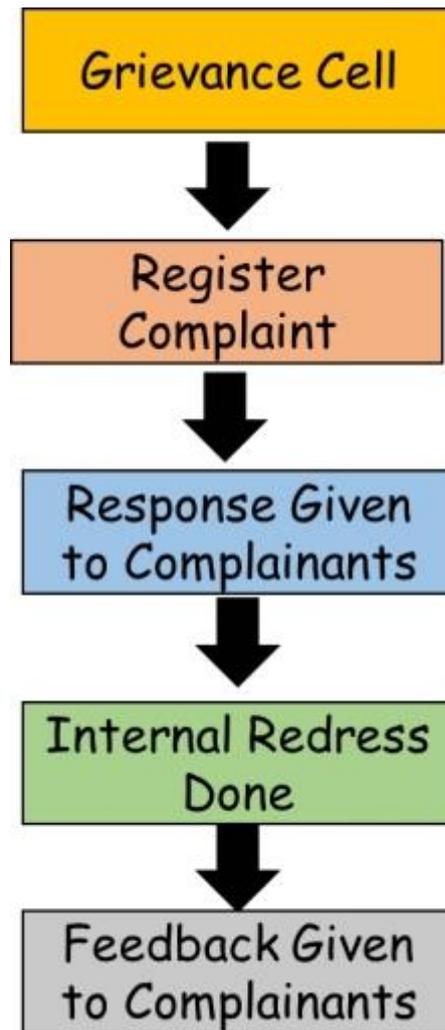


Figure 13-1: Grievance Redress Mechanism

## 14 CONCLUSION AND RECOMMENDATION

Based on the study conducted for EIA of the project, the following recommendations are made:

- ☞ Plantation as far as permissible and within the scope of the project to be carried out.
- ☞ Sustainable development approach through conservation of natural environment is followed.
- ☞ Environmental aspects of the project should be well taken care through implementation of the Environmental Management Plan as recommended in this report.
- ☞ The project management may adopt “cleaner and greener environment” as its motto and this will make the project more environment friendly.

On the basis of the findings of the EIA, it is concluded that the project will not pose any adverse impact on the local population and the environment. Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the construction and operation of this project.

## 15 REFERENCES

Listed below are some of the documents, reports and other references consulted during the preparation of this report:

1. Information and data provided by project proponents;
2. Project Pre-Feasibility Study Report;
3. Technical Design Data related to the project.
4. Information gathered through discussions with the project related persons of the project proponent;
5. Information collected from the Technical documents of various suppliers of machinery/equipment.
6. Punjab Environment Quality Standards for Ambient Air August 2016;
7. Punjab Environment Quality Standards Noise Levels August 2016;
8. Punjab Environment Quality Standards for Drinking Water August 2016;
9. Pakistan Environmental Protection Act, 1997;
10. The Punjab Environmental Protection (Amendment) Act 2012 covers aspects related to:
  - The protection, conservation, rehabilitation and improvement of the environment and the prevention, control of pollution and promotion of sustainable development;
  - Establishing complete regulatory and monitoring bodies, policies, rules, regulations and national environmental quality standards; and
  - To ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC) and responsible bodies i.e. Punjab Environmental Protection Agency (Punjab EPA) at Provincial level.
- i. Environment related Laws in Pakistan and the Province of Punjab;
- ii. Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review and Approval of Environmental Assessment, 2022;
- iii. Google earth, maps.
- iv. Guidelines for Public Consultations - These guidelines cover:
  - Consultation, involvement and participation of Stakeholders
  - Techniques for public consultation (principles, levels of involvements, tools, building trust)
  - Effective public consultation (planning, stages of EIA
  - where consultation is appropriate)
  - Consensus building and dispute resolution.
1. workplace safety and health act 2011

2. Land Acquisition Act (LAA) of 1894
3. The forest Act 1927
4. Pakistan Penal Code, 1860
5. Provincial Wildlife Act, 1974
6. Drugs Act 1976

## **16 TERM OF REFERENCES**

The Consultant is required to carry out an Environment Assessment Study of the Project as required under section 12 of Pakistan Environmental Protection Act 1997/ Punjab Environmental Protection Act 2012.

The Study should be comprehensive and should cover all aspects which are envisaged under the relevant national and provincial's laws & regulations including but not limited to:

- Identification and recommendation for suitable solution/treatment/mitigation measures of emissions and effluents such as waste water and sludge etc. in accordance with Punjab Environmental Quality Standards (PEQS).
- Identification and recommendation for suitable solution/treatment/mitigation measures of solvents, oils (tar), hazardous waste, organic compounds, steam, flue gases, particulate matter and chemical compounds harmful for the environment and other substances leading to air, noise, water and soil pollution in accordance with PEQS.

The Study should be acceptable to the relevant national and/or provincial authorities (relevant authorities) in Punjab