

# HUI HUANG SANITARY SOLUTIONS (PRIVATE) LIMITED

(Manufacturing Unit for Ceramic Sanitary Ware & Bathroom Tiles)

Plot No. 45 & 46-B, Allama Iqbal Industrial City,  
Faisalabad Industrial Estate Development & Management Company (FIEDMC),  
Faisalabad, Punjab - Pakistan

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## ENVIRONMENTAL IMPACT ASSESSMENT

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(EIA)

**Project Proponent:**

**Mr. Xu Bin,  
Mr. Yan Qihui**



**Zoom Consultancy & Services  
77 UG Eden Height, Gulberg, Lahore**

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## ABBREVIATIONS

| Abbreviation | Description                                                   |
|--------------|---------------------------------------------------------------|
| AIIC         | Allama Iqbal Industrial City                                  |
| AoI          | Area of Influence                                             |
| CEO          | Chief Executive Officer                                       |
| EIA          | Environmental Impact Assessment                               |
| EMMP         | Environmental Management and Monitoring Plan                  |
| EMP          | Environmental Management Plan                                 |
| EPA          | Environmental Protection Agency                               |
| FBR          | Federal Board of Revenue                                      |
| FIEDMC       | Faisalabad Industrial Estate Development & Management Company |
| FGD          | Focus Group Discussion                                        |
| FSD          | Faisalabad                                                    |
| GRM          | Grievance Redress Mechanism                                   |
| HSE          | Health, Safety and Environment                                |
| IEE          | Initial Environmental Examination                             |
| NEQS         | National Environmental Quality Standards                      |
| NOC          | No Objection Certificate                                      |
| PEQS         | Punjab Environmental Quality Standards                        |
| PEPA         | Pakistan Environmental Protection Act                         |
| PPE          | Personal Protective Equipment                                 |
| PVC/UPVC     | Polyvinyl Chloride / Unplasticized Polyvinyl Chloride         |
| SECP         | Securities and Exchange Commission of Pakistan                |
| SEZ          | Special Economic Zone                                         |
| TSS/TDS      | Total Suspended/Dissolved Solids                              |
| WASA         | Water and Sanitation Agency                                   |

## EXECUTIVE SUMMARY

### Background

Pakistan's ceramic sanitary ware and tile manufacturing sectors have grown steadily over the last decade, supported by expanding housing schemes, commercial development, and infrastructure projects across major cities. Products including ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories are widely used in residential, commercial, and industrial buildings for sanitation, drainage, and interior finishing applications. Faisalabad, as one of Punjab's major industrial centres, has attracted a growing number of such manufacturing units, many of which are being established in dedicated industrial estates, including the Allama Iqbal Industrial City (AIIC), developed and managed by the Faisalabad Industrial Estate Development & Management Company (FIEDMC).

M/s Hui Huang Sanitary Solutions (Private) Limited proposes to establish a manufacturing unit at Plot No. 45 & 46-B, Allama Iqbal Industrial City (AIIC), FIEDMC, Faisalabad. The proposed facility will manufacture ceramic sanitary ware and bathroom tiles comprising 12 specialized product types: ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories. The project is proposed in accordance with the Zone Enterprise purpose approved by FIEDMC.

This Environmental Impact Assessment (EIA) has been prepared to identify, assess, and evaluate the potential environmental and social impacts of the proposed project during construction and operational phases. It also recommends suitable mitigation measures and an Environmental Management Plan (EMP) to ensure compliance with the Pakistan Environmental Protection Act, 1997, and the Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022.

### Title and Location of the Project

The proposed project is titled “Hui Huang Sanitary Solutions (Private) Limited” and is located at Plot No. 45 & 46-B, Allama Iqbal Industrial City (AIIC), FIEDMC, Faisalabad, Punjab, Pakistan. The combined project site measures approximately 1,080,436 sq.ft (about 24.8 acres), comprising Plot 45 (756,512 sq.ft) and Plot 46-B (323,924 sq.ft/8.998 acres), both allotted by FIEDMC for setting up an industrial unit for the manufacturing of sanitary products and allied items.

## **Project Proponent**

The project proponent is Hui Huang Sanitary Solutions (Private) Limited, a company incorporated in Pakistan under the Companies Act, 2017 (Corporate Universal Identification Number 0247883, dated 28 December 2023). The company is represented by Mr. Xu Bin, Chief Executive Officer, and Mr. Yan Qihui, Director, with its registered office at Plot 66, M4 Industrial City, Sahianwala Interchange, Faisalabad.

## **Project Consultant**

This EIA has been prepared by Zoom Consultancy & Services, Lahore, engaged by the project proponent to carry out the environmental assessment and to prepare the regulatory documentation required for submission to the Environmental Protection Agency, Punjab (EPA Punjab).

## **Brief Outline of the Report**

Section 1 of the report introduces the project along with the approach and methodology adopted for the study. Section 2 outlines the national and provincial policy, legal and administrative framework applicable to the project. Section 3 describes the project in detail, including its location, layout, manufacturing process, machinery, raw materials and infrastructure. Section 4 presents the environmental baseline of the project area covering the physical, ecological and social environment. Section 5 identifies the potential environmental impacts and risks associated with the construction and operational phases of the project along with the proposed mitigation measures. Section 6 sets out the Environmental Management and Monitoring Plan (EMMP), while Section 7 records the stakeholder consultations carried out during the study. Section 8 presents the conclusions and recommendations of the assessment.

## **Potential Impacts/Risks of the Project**

The proposed manufacturing facility is a plastic-processing and light-metal-fabrication unit rather than a heavy or hazardous industry, and the potential environmental impacts and risks associated with its construction and operation are assessed as minor to moderate and manageable through standard mitigation measures. During construction, the anticipated impacts are largely limited to dust generation, minor noise from equipment, and typical construction-related solid waste, all of which are temporary and localized. During operation, the principal environmental considerations relate to the extrusion and injection-moulding processes used for fittings, the electroplating and finishing operations associated with faucet manufacturing, energy consumption, and the generation of domestic and process-related solid waste and wastewater. With the mitigation measures proposed in the Environmental Management and Monitoring Plan, including dust suppression, exhaust and fume extraction with scrubbing where required, proper wastewater treatment prior to discharge, and controlled handling and disposal of plastic offcuts and metal scrap, the residual impacts of the project are expected to remain within acceptable limits and in conformity with the National Environmental Quality Standards (NEQS) and Punjab Environmental Quality Standards (PEQS).

The project is not located within or adjacent to any environmentally sensitive area, national park, wildlife sanctuary, or protected forest. The site lies within a designated and developed industrial estate where land use has already been zoned for industrial purposes, and the surrounding land use is predominantly industrial in character. The project is also expected to generate direct and indirect employment opportunities for the local population of Faisalabad, contributing positively to the socio-economic environment of the area.

## **Conclusions and Recommendations**

This EIA study concludes that the proposed Hui Huang Sanitary Solutions manufacturing facility can be implemented and operated in an environmentally sound manner, provided the mitigation measures and monitoring commitments detailed in Section 6 of this report are implemented in full and in a timely manner. It is recommended that the project proponent obtain environmental approval from EPA Punjab prior to the commencement of construction and commercial production, implement the Environmental Management and Monitoring Plan throughout the project life cycle, and submit periodic compliance monitoring reports to EPA Punjab as required under the applicable regulations.

# 1. INTRODUCTION

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## 1.1 Background

Pakistan's construction-materials, sanitary ware, and building-finishing sectors have experienced sustained growth in response to urban expansion, housing schemes, commercial construction, industrial development, and public infrastructure investment. Sanitation systems and interior finishing are essential components of all building projects; consequently, there is continuing demand for durable bathroom fixtures, sanitary ware, and high-quality wall/floor surface materials.

Products proposed under the project comprise ceramic sanitary ware and bathroom tiles consisting of 12 specialized product types: ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories. These materials are widely used in residential, commercial, institutional, and industrial developments for sanitary services, surface finishing, and interior construction.

Faisalabad is one of Punjab's major industrial centres, with established road connectivity, access to labour, supply-chain linkages, and dedicated industrial infrastructure. The Allama Iqbal Industrial City (AIIC), developed and managed by Faisalabad Industrial Estate Development and Management Company (FIEDMC), provides a planned industrial setting for manufacturing enterprises. The proposed facility is to be located at Plot No. 45 & 46-B, AIIC, FIEDMC, Faisalabad, in accordance with the Zone Enterprise purpose approved by FIEDMC.

M/s Hui Huang Sanitary Solutions (Private) Limited proposes to establish a manufacturing unit for sanitary, bathroom, plumbing, , tile, and associated construction-material products at the proposed site. The project will include production areas, raw-material and finished-product storage, utility systems, administrative facilities, staff amenities, internal roads, loading/unloading areas, and other supporting infrastructure.

The project may generate environmental aspects requiring systematic assessment and management during both construction and operations. These include dust emissions, vehicular movement, construction waste, noise, energy consumption, water use, wastewater, solid waste, plastic and packaging scrap, rejected products, possible chemical storage, occupational-health concerns, and emergency risks such as fire. This Environmental Impact Assessment (EIA) has therefore been prepared to identify potential environmental and social impacts, assess their significance, and specify mitigation, monitoring, and management measures before project implementation.

The EIA is prepared in accordance with the Punjab Environmental Protection Act, 1997, as amended, and the Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022. Section 12 requires a project proponent to file the applicable environmental assessment and obtain approval from the Provincial Agency before commencing construction or operation. The 2022 Regulations provide the provincial framework for categorizing projects and for submission, review, approval, and environmental assessment procedures.

## **1.2 Scope of the Study**

The scope of this EIA encompasses the proposed construction and operation of the manufacturing facility of M/s Hui Huang Sanitary Solutions (Private) Limited at Plot No. 45 & 46-B, AIIC, FIEDMC, Faisalabad. The assessment considers direct, indirect, short-term, long-term, reversible, and potentially cumulative environmental and social effects that may arise within the project site and its area of influence.

The study covers the following principal components:

- Review of the project concept, location, approved industrial-use purpose, site layout, construction activities, manufacturing operations, utilities, machinery, workforce, raw materials, products, and waste streams.
- Assessment of the existing physical environment, including climate, topography, geology, soil characteristics, drainage patterns, groundwater conditions, ambient air quality, noise environment, traffic conditions, and surrounding land use.
- Assessment of the biological environment, including existing vegetation, habitat conditions, ecological sensitivity, and the likely presence or absence of environmentally important flora and fauna within the project area and its immediate surroundings.
- Assessment of the socio-economic environment, including nearby settlements, industrial activities, employment opportunities, local infrastructure, community resources, traffic, health and safety considerations, and stakeholder concerns.
- Identification of environmental aspects during the construction phase, including land preparation, construction-material handling, excavation, vehicle movement, dust emissions, noise, construction waste, labour safety, sanitation, and traffic management.
- Identification of environmental aspects during the operational phase, including use of raw materials, energy and water consumption, process emissions, wastewater generation, solid and hazardous waste management, plastic and ceramic scrap, rejected products, packaging waste, occupational safety, fire protection, emergency response, and transportation of raw materials and finished products.
- Development of practical mitigation measures, monitoring indicators, institutional responsibilities, implementation schedules, and reporting arrangements through an Environmental Management and Monitoring Plan (EMMP).
- Review of legal, regulatory, and institutional requirements applicable to the proposed development, including requirements of EPA Punjab, FIEDMC, and other relevant government agencies.
- Consultation with relevant stakeholders, including FIEDMC representatives, neighbouring industrial units, site personnel, and accessible nearby communities, to understand concerns and incorporate relevant feedback into project planning and environmental management.

The EIA does not replace detailed engineering design, factory licensing, building approvals, fire-safety approvals, occupational-health compliance, or other statutory permissions. Rather, it provides the environmental basis for decision-making and establishes management commitments that shall be integrated into detailed design, construction contracts, operational procedures, and regulatory compliance arrangements.

### **1.3 Objectives of the EIA Study**

The primary objective of this EIA is to ensure that environmental, health, safety, and social considerations are incorporated into the planning, design, construction, operation, and management of the proposed manufacturing facility.

The specific objectives of the study are as follows:

- To describe the proposed project in terms of its location, land area, production capacity, project components, construction activities, manufacturing processes, machinery, utilities, raw materials, products, workforce, infrastructure, and transportation arrangements.
- To identify the nature and quantities of key inputs, including PVC, UPVC, PPR, additives, pigments, packaging materials, ceramic/tile raw materials where applicable, metal components, water, electricity, fuel, and ancillary materials.
- To establish baseline environmental conditions within the project site and surrounding area, covering physical, ecological, social, and economic parameters relevant to the project.
- To identify the likely environmental and social impacts associated with site development, construction works, operation of production lines, storage activities, vehicle movement, waste generation, and utility operations.
- To assess the significance of identified impacts by considering their magnitude, duration, geographic extent, likelihood, reversibility, sensitivity of receptors, and the effectiveness of proposed control measures.
- To evaluate potential risks related to air emissions, dust, noise, wastewater, solid waste, plastic and ceramic scrap, chemical handling, traffic, fire, occupational accidents, and emergency incidents.

- To recommend technically feasible, cost-effective, and site-specific mitigation measures to avoid, minimize, control, or compensate for adverse impacts.
- To promote efficient use of water, electricity, raw materials, and other resources through good housekeeping, material recovery, recycling, leak prevention, energy-efficient equipment, and responsible production practices.
- To prepare an Environmental Management and Monitoring Plan that defines mitigation measures, monitoring parameters, implementation frequency, responsible personnel, reporting requirements, and corrective-action procedures.
- To document stakeholder engagement and address relevant concerns relating to employment, traffic, emissions, noise, water use, waste handling, worker safety, and general environmental performance.
- To provide EPA Punjab with sufficient, accurate, and structured environmental information to support review of the project and determination of environmental approval under the applicable legislation.

## 1.4 Identification of the Project and Project Proponent

### 1.4.1 Identification of the Project

| Item                      | Description                                                                                                                                                                                                                                                               |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Title</b>      | M/s Hui Huang Sanitary Solutions (Private) Limited — Manufacturing Unit for Ceramic Sanitary Ware & Bathroom Tiles                                                                                                                                                        |
| <b>Project Location</b>   | Plot No. 45 & 46-B, Allama Iqbal Industrial City (AIIC), FIEDMC, Faisalabad, Punjab, Pakistan                                                                                                                                                                             |
| <b>Project Proponent</b>  | The company is represented by Mr. Xu Bin, Chief Executive, and Mr. Yan Qihui, Director                                                                                                                                                                                    |
| <b>Nature of Project</b>  | Manufacturing and processing of ceramic sanitary ware and bathroom tiles                                                                                                                                                                                                  |
| <b>Principal Products</b> | <p>Ceramic sanitary ware and bathroom tiles comprising 12 specialized product types:</p> <ol style="list-style-type: none"> <li>1. Ceramic wall tiles</li> <li>2. Porcelain floor tiles</li> <li>3. Vitrified floor tiles</li> <li>4. Anti-slip bathroom tiles</li> </ol> |

|                                 |                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | 5. Decorative mosaic tiles<br><br>6. Wash basins<br><br>7. Water closets<br><br>8. Wall-hung toilets<br><br>9. Urinals<br><br>10. Bidets<br><br>11. Ceramic shower trays<br><br>12. Ceramic bathroom accessories |
| <b>Tile &amp; Ceramic Range</b> | High-grade glazed ceramic, vitrified, porcelain, anti-slip, textured, and decorative ceramic surface products                                                                                                    |
| <b>Project Setting</b>          | Planned industrial estate developed and managed by FIEDMC                                                                                                                                                        |
| <b>Project Cost</b>             | 500 Million                                                                                                                                                                                                      |
| <b>Land-use Compatibility</b>   | Proposed in line with the Zone Enterprise purpose approved by FIEDMC                                                                                                                                             |
| <b>Project Phases</b>           | Pre-construction, construction, installation and commissioning, operation, maintenance, and eventual decommissioning if applicable                                                                               |

The project involves the establishment of an integrated manufacturing and processing facility intended to serve the ceramic sanitary ware and bathroom tile market. The facility will produce 12 specialized product types, including ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip bathroom tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories. Depending on the final production configuration, operational activities will include raw material receipt and storage (clays, feldspar, quartz, and glazes); batching, ball milling, slip preparation, spray drying, pressing, slip casting, glazing, high-temperature kiln firing, sorting, quality control, packing, warehousing, and dispatch.

The facility will be designed to provide dedicated areas for manufacturing, storage, administration, staff welfare, loading and unloading, utility operations, internal circulation, parking, waste collection, and fire/emergency arrangements. Detailed machinery specifications, capacities, and process-flow diagrams shall be included in the Project Description chapter and updated as final engineering information becomes available.

### **1.4.2 Project Proponent**

The project proponent is M/s Hui Huang Sanitary Solutions (Private) Limited, a private limited company incorporated under the Companies Act, 2017 with the Securities and Exchange Commission of Pakistan (SECP), Company Registration Office, Faisalabad. The company holds Corporate Universal Identification Number (CUIN) 0247883, issued on 28 December 2023.

The company is registered with the Federal Board of Revenue under NTN 0247883 and holds Corporate Class Membership of the Faisalabad Chamber of Commerce and Industry. The company's directors are Mr. Xu Bin, Chief Executive Officer, and Mr. Yan Qihui, Director, both nationals of the People's Republic of China. The registered office of the company is located at Plot No. 66, M-4 Industrial City, Sahianwala Interchange, Faisalabad.

As project proponent, M/s Hui Huang Sanitary Solutions (Private) Limited will be responsible for ensuring that the proposed facility is designed, constructed, commissioned, and operated in accordance with applicable environmental, occupational health and safety, industrial-estate, labour, building-control, and fire-safety requirements. The proponent will also be responsible for implementing the mitigation measures and monitoring commitments contained in this EIA and the subsequent environmental approval conditions issued by EPA Punjab.

### **1.5 Details of Consultants**

This EIA study has been undertaken by Zoom Consultancy & Services, Lahore, engaged by the project proponent to conduct the environmental assessment, compile statutory documentation, develop environmental management measures, and facilitate submission of the EIA to EPA Punjab.

The consultant's role includes review of available project information; site reconnaissance; baseline data collection and review; identification and assessment of potential environmental and social

impacts; preparation of mitigation and monitoring measures; stakeholder consultation; and preparation of the EIA report in accordance with applicable regulatory requirements.

The study team comprises personnel with relevant experience in industrial environmental assessment, environmental compliance, air-quality and noise assessment, water and wastewater considerations, waste-management planning, occupational health and safety, environmental monitoring, stakeholder consultation, and preparation of environmental management plans. Where required, the assessment relies on laboratory testing, technical data, relevant government information, published literature, and project-specific engineering inputs.

The consultant has prepared this report based on project information available at the time of the study. The project proponent shall ensure that any material alteration in project location, land area, production capacity, process technology, fuel type, machinery, utilities, raw materials, product range, wastewater-disposal arrangement, or waste-management system is communicated to the relevant environmental authority and addressed as required under the applicable regulatory framework.

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

The proposed project involves the establishment of a manufacturing facility for ceramic sanitary ware and bathroom tiles. The facility will process, manufacture, glaze, fire, package, store, and dispatch 12 specialized product types: ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip bathroom tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories.

Such ceramic and tile products are intended for use in washrooms, kitchens, residential buildings, commercial buildings, offices, retail facilities, educational institutions, healthcare facilities, industrial establishments, and infrastructure projects.

The facility is proposed on Plot No. 45 & 46-B, AIIC, FIEDMC, Faisalabad, over a combined plot area of approximately 1,080,436 square feet, equivalent to approximately 24.8 acres. The proposed development is expected to include the following main components:

- Production halls for sanitary ware, bathroom products, tiles, and associated components, subject to final process configuration.
- Raw-material stores for polymers, compounds, additives, pigments, packaging materials, metal components, ceramic/tile inputs, and other production materials.
- Finished-goods warehouse for safe storage, inventory management, loading, and dispatch of market-ready products.
- Administration block, meeting rooms, quality-control facilities, staff rooms, washrooms, security posts, and other welfare facilities.
- Utility areas for electrical distribution, transformers, generators where required, air compressors, water-storage systems, maintenance workshops, and other ancillary equipment.
- Internal roads, vehicle parking, loading and unloading areas, drainage infrastructure, landscaping, designated waste-storage areas, fire-water provisions, and emergency assembly points.

The primary environmental considerations during construction will include site preparation, soil disturbance, dust emissions, material transport, construction noise, construction waste, stormwater management, labour welfare, and site safety. During operation, the key considerations will include electricity and water consumption, process emissions where applicable, indoor air quality, noise, wastewater and sanitary effluent, solid waste, rejected products, plastic/ceramic/metal scrap, packaging waste, vehicle emissions, worker safety, chemical handling, fire risk, and emergency preparedness.

The final EIA classification and approval route shall be determined and confirmed by EPA Punjab under the Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022, based on the project's final capacity, manufacturing processes, raw materials, utilities, fuel use, emissions

profile, and potential environmental impacts. The regulations establish the provincial process for categorization and review of projects requiring environmental assessment.

## **1.7 Regulatory Requirements of Environmental Impact Assessment**

The proposed project is subject to the requirements of the Punjab Environmental Protection Act, 1997, as amended, and the rules, regulations, standards, notifications, and directions issued under the Act. The principal legal requirement for environmental assessment is contained in Section 12 of the Act.

Section 12 requires that a project proponent shall not commence construction or operation of a project unless the applicable Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) has been filed with the Provincial Agency and environmental approval has been obtained. Where a project is likely to cause an adverse environmental effect, an EIA is required.

The Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022 provide the procedural framework for environmental assessment in Punjab. They identify project categories through schedules, describe submission and review requirements, and establish processes relating to environmental approval, public participation, conditions of approval, and environmental management.

In addition to EIA approval, the project proponent shall comply with all applicable environmental obligations throughout the project life cycle. These include, but are not limited to:

- Compliance with environmental approval conditions issued by EPA Punjab.
- Compliance with applicable National Environmental Quality Standards and Punjab Environmental Quality Standards for emissions, effluent, noise, and waste-related matters, as applicable.
- Provision of appropriate wastewater, sewage, drainage, and stormwater-management arrangements.
- Implementation of measures to control dust, smoke, process emissions, odour, noise, vibrations, and fugitive emissions.
- Segregation, storage, recovery, recycling, treatment, and lawful disposal of solid waste, plastic scrap, metal scrap, ceramic scrap, packaging materials, used oil, chemical containers, and other waste streams.
- Maintenance of records for environmental monitoring, waste generation and disposal, complaints, incidents, training, emergency drills, and compliance reporting.
- Compliance with FIEDMC conditions, building-control requirements, fire-safety requirements, labour laws, occupational health and safety provisions, and any other approvals required from competent authorities.

Environmental approval does not exempt the project proponent from obtaining other legal permissions, licences, registrations, no-objection certificates, utility connections, or safety approvals that may be applicable to the project.

## **1.8 Approach and Methodology**

The EIA has been prepared using a systematic and multidisciplinary approach. The study combines review of project information, site observations, primary environmental monitoring where undertaken, secondary-data review, stakeholder consultations, impact assessment, and development of mitigation and monitoring measures.

Potential impacts are identified by linking project activities with environmental receptors. For example, earthworks may affect soil, drainage, air quality, and nearby receptors; production processes may affect air quality, workplace conditions, resource consumption, waste generation, and occupational safety; while vehicle movement may affect traffic, noise, road safety, and dust levels.

The significance of each potential impact is assessed considering the nature of the activity, magnitude of change, duration, extent, likelihood, sensitivity of affected receptors, legal standards, and the proposed mitigation measures. Impacts are evaluated for both pre-mitigation and post-mitigation conditions so that residual impacts can be identified and appropriately managed.

### **1.8.1 Review of Project Documents**

The study team reviewed available project documents to understand the nature and scale of the proposed development. These documents include company incorporation and registration information, FIEDMC provisional allotment or plot documents, site plan, available building layout, project concept information, proposed product range, and other relevant technical details provided by the project proponent.

The review focused on identifying the project boundary, land area, existing site condition, proposed buildings, production areas, utility requirements, storage areas, traffic access, workforce requirements, raw materials, process inputs, products, expected waste streams, water demand, energy demand, and safety arrangements.

The information obtained through document review forms the basis for preparation of the project description, impact assessment, and Environmental Management and Monitoring Plan. Any project information that is finalized after completion of the EIA should be checked against the environmental commitments contained in this report to ensure continued compliance.

### **1.8.2 Delineation of the Study Area**

The study area was delineated to include the project site, its immediate surroundings within AIIC, access routes, neighbouring industrial plots, and the broader area of influence likely to experience effects from project-related activities. The area of influence includes locations potentially affected by construction traffic, vehicle emissions, noise, dust, wastewater management, stormwater discharge, waste movement, and transport of raw materials and finished goods.

The primary study area includes the project plots and immediately adjoining industrial land. The secondary study area extends beyond the plot boundary to consider nearby industrial facilities, roads, drainage features, utility infrastructure, sensitive land uses if any, and the nearest residential or commercial settlements outside the industrial estate.

The study-area boundary may vary by environmental parameter. For example, the immediate project site is most relevant for soil, workplace safety, and waste-storage considerations, while air-quality, traffic, and noise considerations may extend along access roads and towards nearby sensitive receptors.

### **1.8.3 Reconnaissance Survey of the Project Area**

A reconnaissance survey of the project site and its surroundings was undertaken to obtain a first-hand understanding of the environmental setting and prevailing site conditions. The survey included visual observation of land use, access roads, industrial infrastructure, existing development, drainage conditions, vegetation, nearby activities, and potentially sensitive environmental or social receptors.

The survey also helped identify practical issues relevant to construction and operation, such as site access, traffic circulation, location of neighbouring plots, potential dust pathways, stormwater flow directions, waste-storage locations, and placement of utility and emergency-response facilities.

Observations from the reconnaissance survey were used to validate available project documents, guide baseline data collection, identify monitoring locations, refine the impact assessment, and develop site-specific mitigation measures.

#### **1.8.4 Field Survey and Data Collection**

Primary environmental information was collected, where applicable, through field observation and monitoring at representative locations within or around the project area. The assessment includes consideration of ambient air quality, environmental noise, groundwater or water quality, drainage conditions, land use, vegetation, and visible sources of pollution.

Ambient air-quality assessment is intended to establish existing concentrations of relevant parameters and to provide a baseline against which future operational performance may be assessed. Noise monitoring is undertaken to understand existing sound levels and identify the need for noise-control measures around machinery, generators, compressors, loading areas, and transport routes.

Water-quality assessment, where conducted, considers relevant physical, chemical, and bacteriological parameters according to the intended water source and use. The study also examines the anticipated quantity and characteristics of domestic sewage, process wastewater where applicable, wash water, cooling water, stormwater, and any other liquid effluent generated by the facility.

Secondary data are compiled from credible government departments, industrial-estate authorities, published studies, meteorological information, and other available sources. These data support the description of regional climate, rainfall, temperature, wind direction, geology, hydrology, groundwater, population, land use, and local infrastructure.

### **1.8.5 Stakeholder and Public Consultations**

Stakeholder consultation is an important component of the EIA process because it helps identify local concerns, improves project transparency, and supports environmentally responsible project planning. Consultations were undertaken with relevant stakeholders, including FIEDMC representatives, project management personnel, neighbouring industrial establishments, workers where available, and accessible representatives of nearby communities.

Key consultation topics included land-use compatibility, construction-related disturbance, dust, noise, traffic, local employment, wastewater management, waste disposal, occupational health and safety, fire and emergency risks, and expectations regarding compliance with environmental requirements.

Stakeholder comments and concerns are documented in the consultation chapter of the EIA. Relevant and practical concerns are incorporated into the proposed mitigation measures, traffic-management arrangements, environmental monitoring plan, grievance mechanism, and community communication procedures.

Where public hearing or additional consultation is required by EPA Punjab during the environmental review process, the project proponent shall participate fully and provide necessary information, clarifications, and commitments in accordance with the directions of the Agency.

### **1.8.6 Data Processing and Analysis**

Information collected through site surveys, field monitoring, laboratory testing, document review, stakeholder consultations, and secondary sources was compiled and analysed to establish baseline conditions and assess potential impacts.

Laboratory results for air, water, wastewater, or other environmental samples, where available, are interpreted against applicable environmental standards, guidelines, and regulatory requirements.

Noise levels are assessed with reference to applicable limits and the nature of surrounding land use. Observations regarding drainage, waste, vegetation, land use, traffic, and community conditions are analysed qualitatively and quantitatively as appropriate.

Potential impacts are evaluated using the following considerations:

- Source or activity responsible for the potential impact.
- Environmental or social receptor likely to be affected.
- Nature of the impact, including positive or negative, direct or indirect, temporary or permanent, and reversible or irreversible effects.
- Magnitude, geographic extent, duration, frequency, and likelihood of occurrence.
- Existing sensitivity of the receiving environment.
- Applicable legal standards, regulatory requirements, and good international industry practices where relevant.
- Effectiveness of proposed mitigation measures.

The analysis results in identification of residual impacts, which are the impacts expected to remain after implementation of the proposed mitigation measures. The EMMP then assigns responsibilities, monitoring arrangements, corrective actions, and reporting mechanisms to manage these residual impacts effectively.

## 1.9 Structure of the Report

This EIA report has been organized into eight sections to provide a clear and systematic assessment of the proposed project and its environmental implications.

| Section                                                 | Description                                                                                                                                                                                                                                                  |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section 1: Introduction                                 | Presents the project background, scope of study, objectives, project identification, project proponent, consultant details, project overview, regulatory context, and study methodology                                                                      |
| Section 2: Policy, Legal and Administrative Framework   | Reviews the applicable environmental laws, regulations, standards, policies, institutional arrangements, and approvals relevant to the project                                                                                                               |
| Section 3: Project Description                          | Provides detailed information on site location, project components, land use, construction activities, machinery, manufacturing processes, raw materials, utilities, water and energy demand, workforce, products, waste streams, and emergency arrangements |
| Section 4: Environmental Baseline                       | Describes the existing physical, biological, and socio-economic conditions within the project area and surrounding environment                                                                                                                               |
| Section 5: Impact Assessment and Mitigation Measures    | Identifies potential construction- and operation-phase impacts, evaluates their significance, and specifies mitigation measures to avoid, reduce, or manage adverse effects                                                                                  |
| Section 6: Environmental Management and Monitoring Plan | Defines environmental-management measures, monitoring parameters, institutional responsibilities, training needs, reporting arrangements, emergency preparedness, and implementation schedules                                                               |
| Section 7: Stakeholder Consultation                     | Documents the consultation process, stakeholders engaged, issues raised, project responses, and grievance-management arrangements                                                                                                                            |
| Section 8: Conclusions and Recommendations              | Summarizes the key findings of the EIA, overall environmental acceptability of the project subject to implementation of mitigation measures, and recommendations for environmental approval and ongoing compliance                                           |

## **2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK**

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### **2.1 Introduction**

This chapter presents the policy, legal, regulatory, institutional, and administrative framework applicable to the proposed manufacturing facility of M/s Hui Huang Sanitary Solutions (Private) Limited at Plot No. 45 & 46-B, Allama Iqbal Industrial City (AIIC), FIEDMC, Faisalabad.

The project involves the manufacture, processing, finishing, storage, and dispatch of ceramic sanitary ware and bathroom tiles. The principal proposed products consist of 12 specialized product types: ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip bathroom tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories.

The applicable regulatory framework is primarily intended to ensure that the project is planned, constructed, and operated in a manner that prevents pollution; conserves resources; protects workers, nearby communities, and the environment; manages waste responsibly; and complies with conditions imposed by relevant authorities.

The principal environmental legislation applicable to the project is the Punjab Environmental Protection Act, 1997, as amended, together with the Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022. EPA Punjab's official regulatory repository lists the Punjab Environmental Protection Act and the 2022 IEE/EIA Review Regulations among the applicable provincial environmental instruments.

This chapter also identifies responsibilities of EPA Punjab, FIEDMC, the project proponent, consultants, contractors, and other relevant agencies. The project proponent shall obtain all applicable approvals before commencement of construction and shall maintain compliance throughout construction, commissioning, operation, and any future expansion or modification of the facility.

## **2.2 Applicable Policy Framework**

### **2.2.1 National Environmental Policy, 2005**

The National Environmental Policy, 2005 provides an overarching policy framework for environmental protection and sustainable development in Pakistan. Its broad objectives include protection of air, water, land, biodiversity, and human health; integration of environmental considerations into development planning; prevention and control of pollution; conservation of natural resources; promotion of cleaner production; and strengthening of environmental governance.

The proposed project is required to align with the policy's basic principles by incorporating pollution-prevention measures, resource-efficiency practices, waste minimization, recycling, energy conservation, occupational health and safety, and environmental monitoring into its design and operation.

For this project, policy alignment will be demonstrated through the following measures:

- Selection of a planned industrial location within AIIC instead of an unplanned or environmentally sensitive area.
- Installation and maintenance of suitable air-emission, dust-control, ventilation, and noise-control arrangements.
- Segregation and recovery of plastic, metal, ceramic, cardboard, wooden-pallet, and packaging waste wherever technically feasible.
- Reuse of clean production scrap where it meets product-quality requirements and does not compromise safety or product standards.
- Efficient use of water through leak prevention, controlled washing, water-metering, reuse where practical, and regular maintenance of plumbing systems.
- Selection of energy-efficient motors, compressors, lighting, production equipment, and other electrical systems.
- Provision of safe storage, handling, labelling, and spill-control arrangements for chemicals, additives, lubricants, paints, cleaning materials, and other potentially hazardous substances.

- Development and implementation of an Environmental Management and Monitoring Plan (EMMP).

### **2.2.2 National Climate Change Policy**

Pakistan's climate-change policy framework emphasizes climate resilience, energy conservation, efficient resource use, pollution reduction, adaptation to climate variability, and mitigation of greenhouse-gas emissions. Although the proposed project is not a power-generation or major fossil-fuel project, it will consume electricity, may use standby generators, involve freight movement, and may operate energy-intensive machinery.

The project shall therefore adopt practical measures to reduce its carbon and energy footprint. These measures may include energy-efficient motors and equipment, preventive maintenance, power-factor correction, LED lighting, insulation of heated equipment where applicable, avoidance of unnecessary idling of generators and vehicles, efficient internal logistics, and assessment of rooftop solar power during detailed design or future expansion.

The project should also consider climate-resilient site planning, particularly adequate stormwater drainage, suitable finished-floor levels, protection of stored raw materials and finished goods from rainfall, and maintenance of emergency drainage pathways during heavy rain events.

### **2.2.3 Sustainable Development Goals**

The proposed project can contribute to sustainable development when it is operated in compliance with environmental standards and adopts responsible production practices. The project is particularly relevant to the following Sustainable Development Goals:

| Sustainable Development Goal                          | Relevance to the Project                                                                                                                   |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SDG 6: Clean Water and Sanitation</b>              | Manufacture of sanitary fixtures, bathroom products supports water-supply and sanitation infrastructure                                    |
| <b>SDG 8: Decent Work and Economic Growth</b>         | The project may create direct and indirect employment, support industrial activity, and provide skills-development opportunities           |
| <b>SDG 9: Industry, Innovation and Infrastructure</b> | The facility supports industrial manufacturing and supply of construction-related materials for buildings and infrastructure               |
| <b>SDG 11: Sustainable Cities and Communities</b>     | Sanitary ware, water-storage products, and tiles contribute to improved housing and urban sanitation systems                               |
| <b>SDG 12: Responsible Consumption and Production</b> | Resource efficiency, waste minimization, recycling, safe chemical handling, and responsible waste disposal are key operational commitments |
| <b>SDG 13: Climate Action</b>                         | Energy conservation, efficient logistics, emissions control, and climate-resilient drainage contribute to reduced environmental impact     |

The project proponent shall integrate these principles into its environmental, social, health, safety, procurement, waste-management, and operational procedures.

### 2.3 Punjab Environmental Protection Act, 1997

The Punjab Environmental Protection Act, 1997, as amended, is the principal provincial legislation governing environmental protection, pollution prevention, environmental assessment, environmental standards, hazardous-substance management, environmental monitoring, and enforcement in Punjab. EPA Punjab identifies the Act as part of its applicable legal and regulatory framework.

The Act aims to protect, conserve, rehabilitate, and improve the environment; prevent and control pollution; promote sustainable development; and provide for enforcement action in the event of environmental non-compliance.

The proposed project is an industrial activity because it involves manufacturing, processing, finishing, packing, storage, and dispatch of products for commercial purposes. EPA Punjab defines industrial activity broadly to include manufacturing, making, formulating, altering, repairing, finishing, packing, or otherwise treating materials or articles for use, sale, transport, delivery, or disposal.

The following provisions are particularly relevant to the proposed project.

### **2.3.1 Section 11: Prohibition of Certain Discharges and Emissions**

Section 11 prohibits discharge or emission of effluent, waste, air pollutants, or noise in quantities, concentrations, or levels that exceed applicable environmental standards. Therefore, the project shall ensure that any emissions from generators, boilers if installed, production processes, material-handling operations, vehicles, and ventilation systems remain within applicable standards.

The project shall also ensure that domestic sewage, process wastewater, wash water, contaminated stormwater, and any other liquid effluent are not discharged in a manner that causes pollution or exceeds applicable environmental standards. Appropriate wastewater, sewage, drainage, and stormwater-management systems shall be installed and maintained before commencement of operations.

Key compliance measures under Section 11 include:

- Use of properly designed stacks, silencers, filters, dust collectors, local exhaust ventilation, or other control equipment where required.

- Regular maintenance of generators, compressors, machinery, vehicles, and pollution-control equipment.
- Provision of enclosed or covered storage for dusty raw materials, additives, scrap, and waste materials.
- Suppression of dust from construction works, internal roads, loading and unloading areas, and material-handling activities.
- Installation of acoustic enclosures, silencers, vibration-control pads, and suitable equipment layout to control operational noise.
- Provision of sewage-treatment, septic-tank/soakage, or approved industrial-estate disposal arrangements, as applicable.
- Prevention of direct discharge of untreated effluent, wastewater, chemicals, oil, or contaminated runoff into open land, drains, or water bodies.

### **2.3.2 Section 12: Initial Environmental Examination and Environmental Impact Assessment**

Section 12 requires the proponent of a project to file an IEE or EIA with the relevant environmental authority and obtain approval before starting construction or operation. The Act provides that an EIA is required where a project is likely to cause an adverse environmental effect.

Accordingly, M/s Hui Huang Sanitary Solutions (Private) Limited shall not commence construction, installation, commissioning, or operation of the project until environmental approval has been obtained from EPA Punjab.

The EIA shall provide adequate information on the project location, activities, materials, utilities, waste streams, baseline environment, environmental impacts, mitigation measures, consultation process, environmental monitoring, and institutional arrangements. The proponent shall implement all commitments made in the approved EIA, the EMMP, and the environmental approval letter.

Any major change in project capacity, product range, manufacturing process, fuel type, emissions source, wastewater-disposal route, waste-management method, building layout, or site boundary

should be communicated to EPA Punjab. The proponent shall seek revised approval or other direction from EPA Punjab when required.

### **2.3.3 Section 13: Prohibition of Import of Hazardous Waste**

Section 13 prohibits import of hazardous waste into Pakistan. The project proponent shall ensure that imported equipment, raw materials, additives, chemical products, lubricants, cleaning agents, pigments, coatings, and other inputs do not constitute prohibited hazardous waste.

All imported inputs shall be supported by relevant procurement documents, safety data sheets, technical specifications, and customs documentation. Materials shall be purchased only from lawful and reputable suppliers and shall be used only for their intended production or maintenance purposes.

### **2.3.4 Section 14: Handling of Hazardous Substances**

Section 14 regulates the generation, collection, consignment, transportation, treatment, disposal, storage, handling, and import of hazardous substances. The project may use limited quantities of potentially hazardous substances, depending on final process design. Such materials may include pigments, stabilizers, additives, adhesives, sealants, cleaning chemicals, oils, lubricants, paints, solvents, batteries, welding consumables, and maintenance chemicals.

EPA Punjab defines a hazardous substance as a substance or mixture that, due to chemical activity or toxic, explosive, flammable, corrosive, radioactive, or other characteristics, causes or is likely to cause an adverse environmental effect.

The project proponent shall establish a hazardous-material management system that includes:

- Maintenance of an updated inventory of all chemicals and potentially hazardous substances.
- Availability of Safety Data Sheets for each chemical or hazardous material.
- Labelling of containers in English and, where necessary, Urdu.

- Separate storage of incompatible substances.
- Provision of impervious floors, secondary containment, ventilation, fire extinguishers, spill kits, eyewash facilities, and warning signs in chemical-storage areas.
- Training of workers in safe storage, handling, use, emergency response, and personal protective equipment.
- Collection and lawful disposal of used oil, contaminated absorbents, chemical containers, batteries, and other hazardous or potentially hazardous waste through authorized arrangements.

### **2.3.5 Section 16: Environmental Protection Orders**

The Punjab Environmental Protection Act authorizes the Provincial Agency to issue an Environmental Protection Order where discharge, emission, waste disposal, hazardous-substance handling, or another act or omission violates the Act, regulations, rules, licence conditions, or environmental approval conditions and is causing or likely to cause an adverse environmental effect.

To avoid enforcement action, the project shall maintain compliance with all environmental-approval conditions, standards, monitoring obligations, record-keeping requirements, waste-management procedures, and corrective-action requirements.

## **2.4 Punjab Environmental Protection Regulations**

### **2.4.1 Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022**

The Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022 provide the principal procedural framework for environmental assessment and approval of development projects in Punjab. The Regulations were made under Section 33 of the Punjab Environmental Protection Act, 1997, apply within Punjab, and establish requirements for identification, submission, review, approval, and monitoring of projects requiring an IEE or EIA.

The Regulations classify projects through Schedule I and Schedule II. Schedule I generally identifies projects requiring an IEE, while Schedule II identifies projects requiring an EIA. The final classification of the proposed facility shall be confirmed by EPA Punjab based on its final production capacity, manufacturing processes, raw materials, fuel and utility requirements, emissions profile, waste streams, and potential for adverse environmental effects.

For the proposed project, the following regulatory requirements are relevant:

- Submission of the prescribed EIA application and supporting documents to EPA Punjab.
- Submission of the EIA report, including project description, baseline environmental data, impact assessment, mitigation measures, EMMP, stakeholder consultation record, and non-technical summary where required.
- Payment of prescribed review fee, where applicable.
- Review of the EIA by EPA Punjab and provision of additional information or clarification if requested.
- Public participation or public hearing, where required by EPA Punjab.
- Issuance of environmental approval subject to conditions, if the project is found environmentally acceptable with appropriate mitigation measures.
- Compliance monitoring during construction and operation.
- Submission of monitoring reports and compliance information as required in the approval conditions.

The EIA approval must be obtained before construction or operation begins. The proponent shall ensure that the project is implemented within the approved scope and that all mitigation measures stated in this EIA are incorporated into contractual documents, site procedures, standard operating procedures, and operational budgets.

#### **2.4.2 Punjab Environmental Quality Standards**

Punjab Environmental Quality Standards establish permissible limits and performance requirements for environmental emissions, effluent, noise, and waste-related discharges. The project shall comply

with applicable standards for gaseous emissions, wastewater and effluent discharge, ambient air quality, noise, and disposal or handling of wastes.

The project shall monitor and manage the following, where applicable:

| Environmental Aspect               | Principal Sources at the Proposed Facility                                                           | Required Management Approach                                                                                            |
|------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Air emissions</b>               | Standby generators, boilers if installed, process heating, welding, forklifts, delivery vehicles     | Use clean fuel where available, provide suitable exhaust systems, maintain equipment, and monitor emissions as required |
| <b>Dust and particulate matter</b> | Construction activities, vehicle movement, unloading, material handling, cutting/grinding operations | Water sprinkling, covered trucks, paved internal roads, local exhaust systems, housekeeping, and covered storage        |
| <b>Noise</b>                       | Production machinery, compressors, generators, loading/unloading, vehicle movement                   | Acoustic enclosures, silencers, equipment maintenance, hearing protection, and noise monitoring                         |
| <b>Domestic sewage</b>             | Washrooms, staff facilities, canteen areas                                                           | Connection to approved sewerage system or suitable on-site treatment/disposal arrangement                               |
| <b>Process wastewater</b>          | Equipment washing, floor washing, tile-related wet operations if applicable                          | Segregation, reuse where feasible, treatment where required, and disposal only through an approved route                |
| <b>Stormwater</b>                  | Rainfall runoff from roofs, roads, parking, storage and loading areas                                | Proper grading, drains, oil/grease traps where required, and prevention of contamination                                |
| <b>Solid waste</b>                 | Packaging material, scrap plastic, ceramic waste, metal off-cuts, pallets, office waste              | Segregation, reuse, recycling, secure storage, and disposal through authorized service providers                        |

|                        |                                                                                           |                                                                                                              |
|------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Hazardous waste</b> | Used oil, oily rags, batteries, chemical containers, spent absorbents, contaminated waste | Separate labelled storage, spill prevention, inventory records, and disposal through authorized arrangements |
|------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|

No untreated industrial effluent, oily wastewater, chemical residue, contaminated stormwater, or hazardous waste shall be discharged to open land, natural drains, municipal drains, or water bodies.

#### **2.4.3 National Environmental Quality Standards Self-Monitoring and Reporting by Industry Rules, 2001**

The National Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules, 2001 establish a framework for industrial self-monitoring and reporting. EPA Punjab lists these Rules among the environmental rules and regulations applicable in Punjab.

The project shall develop a self-monitoring programme appropriate to its final operational configuration and environmental approval conditions. The programme should cover, where applicable, stack emissions, ambient air quality, wastewater/effluent, groundwater or drinking-water quality, environmental noise, solid waste, hazardous waste, energy use, water consumption, incidents, and complaints.

Monitoring records shall be maintained at the site and made available to EPA Punjab or any authorized inspecting authority upon request. The project shall take corrective action whenever monitoring indicates non-compliance or a developing environmental risk.

#### **2.4.4 Environmental Samples Rules, 2001**

The Environmental Samples Rules, 2001 provide procedures for collection, handling, sealing, preservation, transportation, testing, and analysis of environmental samples for regulatory purposes. These Rules are listed by EPA Punjab among applicable environmental instruments.

For project monitoring, environmental sampling should be undertaken by competent persons using appropriate sampling protocols and, where laboratory analysis is required, through a suitably certified or recognized laboratory. Sampling locations, date, time, methods, results, observations, and chain-of-custody details should be maintained in project environmental records.

#### **2.4.5 Hazardous Substances Rules, 2003**

The Hazardous Substances Rules, 2003 are relevant where the project stores, uses, generates, transports, or disposes of hazardous substances. EPA Punjab EIA documentation identifies the Hazardous Substances Rules, 2003 as part of the environmental legal framework applicable to industrial projects.

The project shall determine whether any raw materials, additives, chemicals, lubricants, cleaning agents, coatings, solvents, paints, batteries, or maintenance materials fall within the definition of hazardous substances. Where applicable, the project shall maintain appropriate records, obtain necessary approvals or licences, and follow requirements for storage, handling, transport, emergency response, and disposal.

#### **2.4.6 Punjab Environmental Protection (Registration of Environmental Consultants) Regulations, 2017**

The Punjab Environmental Protection (Registration of Environmental Consultants) Regulations, 2017 provide a framework for registration of environmental consultants undertaking environmental assessment work in Punjab. EPA Punjab lists these Regulations in its official legal and regulatory repository.

The project proponent should ensure that environmental studies, monitoring, compliance reporting, and technical submissions are prepared by suitably qualified and competent environmental professionals in accordance with the requirements of EPA Punjab.

## **2.4.7 Punjab Environmental Protection (Delegation of Powers for Environmental Approvals) Rules, 2017**

The Punjab Environmental Protection (Delegation of Powers for Environmental Approvals) Rules, 2017 provide for delegation of environmental-approval powers within the provincial environmental regulatory system. These Rules are listed by EPA Punjab among the applicable environmental regulations.

The project proponent shall submit the EIA to the competent approving authority identified by EPA Punjab and shall follow any instructions issued regarding submission route, documentation, public hearing, technical review, fee, monitoring, and post-approval reporting.

## **2.4.8 Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023**

The Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 are applicable to activities that may contribute to air pollution, smoke, particulate emissions, or other pollutants associated with smog conditions. EPA Punjab lists these Rules among the current provincial environmental regulations.

The project shall support smog-control objectives by ensuring proper maintenance of generators and vehicles, use of compliant fuels, avoidance of open burning, control of fugitive dust, covered transport of dusty materials and waste, controlled material handling, preventive maintenance of pollution-control devices, and prohibition of burning of plastic, packaging waste, scrap, leaves, or other solid waste within the project site.

## **2.4.9 Punjab Environmental Protection (Motor Vehicles) Rules, 2013**

The Punjab Environmental Protection (Motor Vehicles) Rules, 2013 are relevant to project-related transport, including delivery vehicles, forklifts, construction machinery, contractor vehicles, and employee transport. EPA Punjab lists these Rules among the applicable provincial regulations.

The project shall require its own and contractor-operated vehicles to be maintained in roadworthy condition, avoid excessive smoke emissions, maintain valid fitness documentation where required, prevent unnecessary idling, comply with speed limits, and follow a traffic-management plan within the industrial estate.

## **2.5 Other Applicable Laws and Requirements**

### **2.5.1 Factories Act, 1934**

The Factories Act, 1934 is relevant to worker health, safety, welfare, working conditions, machinery safety, ventilation, lighting, sanitation, fire precautions, and accident prevention within industrial premises.

The project shall provide safe workspaces, machine guarding, adequate lighting, ventilation, potable drinking water, washrooms, first-aid facilities, emergency exits, fire extinguishers, safety signage, personal protective equipment, training, and emergency-response arrangements. Workers shall be trained in safe operation of machinery, material handling, chemical use, electrical safety, fire response, and incident reporting.

### **2.5.2 Punjab Occupational Safety and Health Act, 2019**

The Punjab Occupational Safety and Health Act, 2019 provides a provincial framework for worker safety and health. The proposed project shall establish an occupational health and safety management system proportionate to the scale and hazards of its operations.

The system should include risk assessment, safe operating procedures, worker induction, periodic training, machine safety, lockout/tagout procedures, electrical safety, chemical safety, work-at-height controls, confined-space controls where applicable, manual-handling practices, use of personal protective equipment, incident investigation, and emergency drills.

Particular attention shall be given to risks associated with extrusion equipment, moulding machines, presses, cutting tools, tile handling, lifting operations, welding, compressed air, hot surfaces, electrical equipment, forklift movement, storage racks, chemicals, and fire hazards.

### **2.5.3 Pakistan Building Code and Local Building Requirements**

The project shall comply with applicable building-control requirements, building by-laws, structural safety provisions, drainage and sanitation requirements, electrical-installation standards, accessibility requirements where applicable, and fire-safety provisions.

The detailed engineering design shall provide adequate spacing between buildings, internal access roads, emergency exits, firefighting access, drainage gradients, rainwater management, safe storage areas, loading/unloading space, parking, and emergency assembly points.

### **2.5.4 Fire-Safety Requirements**

The project shall obtain relevant fire-safety clearance or no-objection certificate from the competent authority, where required. The facility shall be equipped with a suitable fire-protection system based on final layout, building area, material inventory, fire load, and machinery configuration.

Fire-safety measures should include:

- Fire extinguishers of suitable types and capacity at accessible locations.
- Fire hydrants, hose reels, fire-water tanks, pumps, alarms, and detection systems where required by the approved fire design.
- Clearly marked emergency exits, evacuation routes, emergency lights, assembly points, and safety signage.
- Segregated storage of combustible materials, chemicals, plastics, packaging materials, and fuels.
- Routine inspection of electrical wiring, panels, generators, and fire equipment.
- Worker training and regular emergency evacuation drills.

### **2.5.5 Labour and Employment Requirements**

The project shall comply with applicable labour laws and conditions of employment, including lawful employment practices, non-discrimination, payment of wages, working hours, welfare facilities, prohibition of child labour, prevention of harassment, grievance procedures, and worker health and safety.

The proponent should, where feasible, prioritize employment opportunities for suitably qualified workers from Faisalabad and nearby areas. Contractor personnel shall also be subject to site safety, environmental, and labour-management requirements.

### **2.5.6 Solid Waste and Hazardous Waste Management**

The project shall implement a waste-management hierarchy based on avoidance, reduction, reuse, recycling, recovery, treatment, and disposal as the last option. Waste streams expected from the facility may include plastic scrap, rejected pipes and fittings, ceramic/tile rejects, metal off-cuts, cardboard, plastic wrapping, wooden pallets, office waste, canteen waste, construction debris, used oil, oily rags, batteries, spent filters, and chemical containers.

The project shall develop and implement a Waste Management Plan containing the following provisions:

- Source segregation of recyclable, non-recyclable, inert, organic, and hazardous waste.
- Designated, labelled, covered, and secure waste-storage locations.
- Separate storage of recyclable plastic, metal, cardboard, ceramic/tile waste, and packaging material.
- Controlled reuse of production scrap only where technically appropriate and consistent with product-quality requirements.
- No open burning of waste, plastic, packaging, scrap, leaves, or other materials.
- Regular removal of municipal-type waste through an approved collection or disposal arrangement.
- Storage of used oil, batteries, contaminated rags, chemical residues, and hazardous waste in leak-proof and labelled containers.
- Maintenance of waste-generation, recycling, sale, transport, and disposal records.

## **2.6 Institutional and Administrative Framework**

### **2.6.1 Environmental Protection Department, Government of Punjab**

The Environmental Protection Department, Government of Punjab, is responsible for environmental policy, regulation, environmental governance, and implementation of provincial environmental legislation. The Department's official platform provides access to the Punjab Environmental Protection Act, Review of IEE/EIA Regulations 2022, smog-control rules, consultant-registration regulations, and other relevant environmental instruments.

The Department provides policy direction and oversight in relation to environmental protection, pollution control, climate and environmental governance, and enforcement of environmental legislation in Punjab.

### **2.6.2 Environmental Protection Agency Punjab**

EPA Punjab is the principal regulatory agency responsible for implementation and enforcement of environmental laws and regulations in Punjab. Its key functions relevant to the proposed project include:

- Review of IEE and EIA reports and issuance of environmental approvals.
- Inspection of industrial facilities and verification of environmental compliance.
- Monitoring of emissions, effluent, noise, waste handling, and other environmental parameters.
- Enforcement of environmental standards and approval conditions.
- Issuance of notices, directions, and Environmental Protection Orders in the event of non-compliance.
- Review of environmental monitoring reports and compliance submissions.
- Coordination with proponents, consultants, FIEDMC, laboratories, and other agencies on environmental matters.

The project proponent shall maintain active coordination with EPA Punjab and shall provide access to the facility, records, monitoring information, and corrective-action documentation whenever requested by the Agency.

### **2.6.3 Faisalabad Industrial Estate Development and Management Company**

FIEDMC is the developer and management entity for AIIC and other industrial-estate developments in Faisalabad. FIEDMC states that Allama Iqbal Industrial City is among the industrial estates granted Special Economic Zone status under the Special Economic Zones Act, 2012.

For the proposed project, FIEDMC is responsible for matters associated with plot allotment, industrial-estate planning, approved enterprise purpose, development-control requirements, infrastructure coordination, estate-level services, access, and compliance with applicable conditions of allotment.

The project proponent shall comply with the terms and conditions of plot allotment, approved land use, building-plan approval, estate infrastructure requirements, wastewater and drainage arrangements, internal road requirements, utility coordination, waste-management requirements, and other directions issued by FIEDMC.

#### **2.6.4 Special Economic Zones Authority**

AIIC operates within the Special Economic Zone framework established under the Special Economic Zones Act, 2012. Special Economic Zones are intended to promote industrialization, local and foreign investment, exports, and employment through planned industrial development.

SEZ status does not remove the project proponent's responsibility to comply with environmental laws, environmental approval conditions, labour requirements, fire-safety obligations, waste-management requirements, and other applicable statutory requirements.

#### **2.6.5 Local Government and Other Relevant Agencies**

Depending on the detailed design and operational requirements, the project may need coordination, permissions, registrations, no-objection certificates, or services from relevant agencies, including:

- Faisalabad Development Authority or other building-control authority, where applicable.
- Rescue 1122 and competent fire-safety authorities.
- Labour and Human Resource Department.
- Punjab Employees Social Security Institution and Employees Old-Age Benefits Institution, where applicable.
- Water and sanitation service providers or FIEDMC utility-management arrangements.
- Electricity and gas utility providers.
- Traffic Police and relevant road-management authorities for traffic and access matters.
- Punjab Industrial Estates, SEZ authorities, customs authorities, or other agencies where relevant to the project's legal status and operations.

## 2.7 Environmental Approval Process

The project proponent shall follow the environmental approval process prescribed by EPA Punjab.

The general process is expected to include the following steps:

1. Preparation of the EIA in accordance with the Punjab Environmental Protection Act, 1997 and the Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022.
2. Compilation of supporting documents, including company registration documents, plot allotment documentation, site plan, project layout, process details, raw-material list, machinery list, utility requirements, baseline monitoring results, consultation record, EMMP, and other information requested by EPA Punjab.
3. Submission of the EIA application and report to EPA Punjab through the prescribed procedure and payment of the applicable review fee.
4. Preliminary scrutiny by EPA Punjab to determine completeness of the submission and confirm the applicable assessment and review route.
5. Technical review of the EIA by EPA Punjab and provision of clarifications, supplementary information, revised drawings, or additional studies if requested.
6. Conduct of public consultation or public hearing where required by EPA Punjab under the applicable regulations.
7. Issuance of environmental approval with conditions, rejection with reasons, or request for revision/additional information by EPA Punjab.
8. Incorporation of environmental approval conditions into project design, construction contracts, operating procedures, contractor requirements, and environmental monitoring plans.
9. Submission of compliance and self-monitoring reports during construction and operation in accordance with approval conditions and regulatory requirements.

No construction or operational activity shall be initiated before receipt of environmental approval, except for activities expressly allowed by the competent authority in writing.

## 2.8 Compliance Commitments of the Project Proponent

M/s Hui Huang Sanitary Solutions (Private) Limited commits to implement the following environmental and regulatory measures:

- Obtain environmental approval from EPA Punjab before initiation of construction or operation.
- Comply with the Punjab Environmental Protection Act, 1997, applicable environmental regulations, Punjab Environmental Quality Standards, and conditions imposed in the environmental approval.
- Comply with FIEDMC allotment conditions, approved Zone Enterprise purpose, building-plan requirements, utility conditions, and industrial-estate management requirements.
- Implement the Environmental Management and Monitoring Plan provided in Chapter 6 of this EIA.
- Allocate adequate financial, technical, and human resources for environmental management, monitoring, occupational health and safety, emergency preparedness, waste handling, and corrective actions.
- Appoint or designate a competent Environment, Health and Safety Officer responsible for day-to-day implementation of environmental and occupational-safety requirements.
- Maintain environmental records, including water and energy consumption, waste generation and disposal, monitoring results, training records, complaints, incidents, inspections, emergency drills, and corrective actions.
- Ensure that contractors, suppliers, and transporters comply with applicable environmental, health, safety, and waste-management requirements.
- Prevent open burning, uncontrolled dumping, untreated wastewater discharge, excessive dust emissions, excessive noise, and unsafe handling of chemicals or waste.
- Notify EPA Punjab and other relevant authorities of any significant incident, spill, fire, accidental release, or non-compliance event, and implement prompt corrective and preventive actions.
- Seek regulatory guidance and revised approval where there is a material change in the project's capacity, products, process technology, fuel use, emissions, wastewater arrangement, hazardous-material inventory, or waste-management system.

## 2.9 Conclusion

The proposed project is subject to environmental assessment, approval, monitoring, and compliance obligations under the Punjab Environmental Protection Act, 1997 and the Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022. The project is also required to comply with applicable standards and requirements relating to emissions, wastewater, noise, waste management, hazardous substances, occupational health and safety, fire protection, building control, labour welfare, and FIEDMC industrial-estate requirements.

Subject to obtaining environmental approval from EPA Punjab and implementing the mitigation, monitoring, waste-management, safety, and compliance measures identified in this EIA and its EMMP, the project can be developed and operated in an environmentally responsible manner.

### 3. DESCRIPTION OF THE PROJECT

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#### 3.1 Type and Category of the Project

The proposed project is a ceramic and tile manufacturing industry engaged in the batching, milling, pressing, casting, glazing, and kiln firing of ceramic sanitary ware and bathroom tiles comprising 12 specialized product types (ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip bathroom tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories). Given the scale of production and the thermal/processing operations involved, the project falls under the category requiring an Environmental Impact Assessment (EIA) under Schedule II of the Punjab Environmental Protection (Review of IEE & EIA) Regulations, 2022.

##### 3.1.1 Requirement of EIA

An EIA is required for the proposed project because of its classification, production capacity and the nature of processes such as plastic extrusion/injection moulding and metal finishing/electroplating associated with faucet manufacturing, which have the potential to generate emissions, effluents and solid waste that require formal environmental review prior to approval.

#### 3.2 Objectives of the Project

- To manufacture high-quality ceramic sanitary ware and bathroom tiles across 12 specialized product types (ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip bathroom tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories) for the domestic construction and building-finishing market.
- To provide durable, aesthetically superior, and modern sanitary fixtures and tile surfaces for residential, commercial, and institutional developments.
- To generate direct and indirect employment opportunities for technical, skilled, and un-skilled local workers in Faisalabad.
- To contribute to import substitution and support the expansion of Pakistan's building materials and ceramic manufacturing industry.
- To operate the manufacturing facility in an environmentally sustainable, resource-efficient, and regulatory-compliant manner in accordance with PEQS and EPA Punjab standards.

### **3.3 Analysis of Alternatives**

#### **3.3.1 No Project Option**

Under the no-project option, the demand for fittings and sanitary fixtures in the local market would continue to be met through imports or other domestic producers, forgoing the employment and economic benefits associated with the proposed facility, while the environmental status quo of the site would remain unchanged.

#### **3.3.2 Technology Option**

The project proponent has opted for modern extrusion and injection-moulding technology for plastic pipe and fitting manufacturing, together with standard finishing and plating lines for bathroom fixtures, in line with prevailing industry practice, to ensure product quality while keeping resource consumption and waste generation to a minimum.

#### **3.3.3 Reasons for Selection of Project Site**

- The site is located within AIIC, a purpose-built industrial estate developed and managed by FIEDMC, with zoning already designated for industrial use.
- The site benefits from planned infrastructure, including road access, electricity, gas and sewerage networks provided by FIEDMC.
- The location offers proximity to Faisalabad's established industrial and commercial base, labour market and transport links.
- The surrounding land use is predominantly industrial, minimizing potential conflicts with residential or sensitive land uses.

#### **3.3.4 Alternative Site Option**

Given that the plot has already been provisionally allotted to the project proponent by FIEDMC under a formal zone-entry approval process, and considering the suitability of the site as discussed above, no alternative site was considered necessary for this project.

### 3.4 Location and Site Layout of the Project

The project site is located at Plot No. 45 & 46-B, Allama Iqbal Industrial City (AIIC), FIEDMC, Faisalabad. Plot No. 46-B was provisionally allotted to the company vide FIEDMC Reference No. AIIC/IND/0126 dated 12 January 2026, following approval of the Zone Enterprise Entry Application by the Special Economic Zone (SEZ) Committee in its 34th meeting held on 16 December 2025. The site is served by a 150-foot-wide road on one side and a 66-foot-wide road on the other, providing convenient access for the movement of raw materials, finished products and personnel.



Figure 1: Google Map of project site

### 3.5 Land Use of Project Site

The project site lies within a zone designated exclusively for industrial use under the FIEDMC master plan for AIIC. The surrounding plots are similarly allotted for industrial purposes, and there is no agricultural land, forest, wetland or environmentally sensitive area in the immediate vicinity of the site. The site was vacant industrial land prior to allotment, with no existing structures, cultivation or natural vegetation of significance.

### 3.6 Road Access

The project site is accessible via the internal road network of AIIC, which connects to the M-3 Motorway Interchange and the wider Faisalabad-Sahianwala road network, providing efficient transport links for the supply of raw materials and the dispatch of finished products to markets across Pakistan.

### 3.7 Vegetation Features at Site

As an industrial plot within a developed estate, the site does not host any significant natural vegetation, forest cover or protected flora. Landscaping and plantation along the periphery of the site and internal roads will be undertaken by the project proponent as part of the overall site development and beautification plan.

### 3.8 General Plant Layout & Statement of Area

The proposed facility will be developed with a production block, a raw material and finished-goods store, an administration building, a staff building, boundary wall, and allied utilities such as an overhead water tank, septic tank and fire-fighting infrastructure, as shown in the approved site plan. The statement of area for the project site, based on the approved building plan, is presented in Table 3.2.

**Table 3.2: Statement of Area of the Project Site**

| Description                  | Area (Sq.ft) | Percentage |
|------------------------------|--------------|------------|
| Total Area of Plot           | 1,080,436    | 100%       |
| Open Area of the Plot        | 750,892      | 70%        |
| Covered Area of Ground Floor | 329,544      | 30%        |
| Covered Area of 1st Floor    | 18,606       | -          |
| Covered Area of 2nd Floor    | 3,731        | -          |
| Total Covered Area           | 351,881      | -          |

The building structure comprises a burnt-brick foundation in cement mortar (1:6) with brick ballast (1:4:8) and a DPC layer of 1.5-inch-thick PCC (1:2:4) applied with two coats of hot bitumen. The superstructure uses first-class burnt brick in cement mortar, with RCC (1:2:4) lintels and sun shades. The roof consists of a

6-inch-thick RCC slab with two coats of hot bitumen, 1.5-inch-thick polythene sheeting, and tile flooring, while doors and windows are of first-class deodar wood construction. Roof drainage is provided through 4-inch-diameter PVC downpipes, with surface drainage through 6-inch PVC piping.

### 3.9 Manufacturing Process & Product Range

Hui Huang Sanitary Solutions (Private) Limited will manufacture a range of ceramic sanitary ware and bathroom tiles comprising 12 specialized product types, catering to the sanitation, drainage, surface finishing, and aesthetic needs of the residential, commercial, and industrial construction sector. The proposed product range is summarized in Table 3.3.

**Table 3.3: Product Range of Hui Huang Sanitary Solutions**

| Product Category            | Representative Products                                                     |
|-----------------------------|-----------------------------------------------------------------------------|
| 1. Ceramic Wall Tiles       | Glazed ceramic wall tiles, accent tiles, and kitchen/bathroom wall cladding |
| 2. Porcelain Floor Tiles    | High-durability vitrified and unglazed porcelain floor tiles                |
| 3. Vitrified Floor Tiles    | Full-body vitrified and polished vitrified ceramic floor tiles              |
| 4. Anti-Slip Bathroom Tiles | Textured and anti-skid surface ceramic safety tiles for wet areas           |
| 5. Decorative Mosaic Tiles  | Glass and ceramic mosaic accent tiles and border panels                     |
| 6. Wash Basins              | Pedestal, counter-top, wall-hung, and cabinet wash basins                   |

|                                  |                                                                            |
|----------------------------------|----------------------------------------------------------------------------|
| 7. Water Closets                 | One-piece, two-piece, and floor-mounted ceramic toilets                    |
| 8. Wall-Hung Toilets             | Space-saving wall-mounted toilets for concealed cistern installations      |
| 9. Urinals                       | Wall-mounted ceramic urinals for commercial and public sanitary facilities |
| 10. Bidets                       | Floor-standing and wall-hung ceramic bidets                                |
| 11. Ceramic Shower Trays         | Molded ceramic shower pans and drainage base units                         |
| 12. Ceramic Bathroom Accessories | Integrated soap dishes, paper holders, towel brackets, and ceramic shelves |

The manufacturing process for ceramic bathroom tiles begins with the receipt, storage, and testing of natural raw materials (clays, kaolin, feldspar, quartz, and silica sand). These materials are weighed according to precise formulations and wet-milled in ball mills with water to form a uniform slip. The slip is spray-dried to yield a dry powder with specific moisture content, which is then fed into high-pressure hydraulic presses to form green tile bodies. After drying, the tiles pass through automated glazing lines where engobes, decorative glazes, and digital inkjet prints are applied. The glazed tiles are fired in continuous roller kilns at high temperatures (1100°C–1220°C) to achieve vitrification, structural strength, and surface hardness, followed by automated planarity sorting, dimensional sizing, quality inspection, and packaging for dispatch.

The manufacturing process for ceramic sanitary ware (wash basins, water closets, wall-hung toilets, urinals, bidets, shower trays, and accessories) involves batching and ball-milling clay slurries (slip) and glaze suspensions. The slip is cast into plaster or porous resin molds using traditional gravity casting or high-pressure battery casting to form the greenware pieces. After initial drying, greenware items are hand-trimmed, sponge-finished, and quality-inspected before passing through glaze spraying booths. The glazed sanitary pieces are loaded onto kiln cars and fired in tunnel kilns or shuttle kilns at high temperatures (1200°C–1250°C) to achieve a non-porous, vitreous finish. The vitrified products undergo 100% water-flush testing, vacuum leak testing, visual defect inspection, and final packing for dispatch.

### 3.10 Major Machinery & Equipment

The major machinery and equipment to be installed at the proposed facility are summarized in Table 3.4.

**Table 3.4: Major Machinery and Equipment**

| Sr. # | Equipment                                               | Purpose                                                                                            |
|-------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1     | Continuous Ball Mills                                   | Wet grinding and Homogenization of raw materials to prepare ceramic slurry/slip                    |
| 2     | Spray Dryer                                             | Converting ceramic slip into uniform granulate powder for tile pressing                            |
| 3     | High-Pressure Hydraulic Tile Presses                    | Compacting ceramic powder into green tile bodies                                                   |
| 4     | High-Pressure & Gravity Slip Casting Batteries          | Moulding ceramic sanitary ware (wash basins, toilets, urinals, bidets, shower trays, accessories)  |
| 5     | Automatic Glazing & Digital Inkjet Printing Lines       | Applying engobe, surface glazes, and decorative patterns onto tile and sanitary ware greenware     |
| 6     | Continuous Roller Kilns (for Tiles)                     | High-temperature firing (1100°C–1220°C) of glazed/unglazed tiles                                   |
| 7     | Tunnel / Shuttle Kilns (for Sanitary Ware)              | Vitrification firing (1200°C–1250°C) of sanitary ware body pieces                                  |
| 8     | Automated Rectification, Polishing & Squaring Line      | Dimensional edge grinding, surface polishing, and sizing of porcelain/vitrified tiles              |
| 9     | Automated Sorting, Squaring & Packaging Units           | Laser inspection, planarity sorting, automated box packing, and palletizing                        |
| 10    | Industrial Air Compressors & Pneumatic Systems          | Pneumatic power for glaze spraying, automated presses, casting molds, and robotic handling         |
| 11    | Effluent Treatment Plant (ETP) / Water Recycling System | Treatment, clarification, and recycling of glaze and clay wash wastewater prior to discharge/reuse |
| 12    | Baghouses & Reverse Pulse-Jet Dust Collectors           | Control and capture of particulate matter from raw material handling, batching, and tile polishing |
| 13    | Overhead Cranes & Forklifts                             | Safe internal movement of clay bodies, molds, saggars, and finished ceramic goods                  |
| 14    | Standby Diesel Generator Sets                           | Uninterrupted power supply to protect continuous kilns and slurry agitators during grid outages    |

### 3.11 Raw Material

The principal raw materials for the manufacturing of ceramic sanitary ware and bathroom tiles include plastic and non-plastic natural clays (ball clay, kaolin, china clay, fire clay), feldspar, quartz/silica sand, limestone/dolomite, and talc used for body formulation. Glaze and surface coating formulations require ceramic frits, feldspar, quartz, opacifiers (zirconium silicate), pigments/stains, and chemical binders/deflocculants (sodium silicate, carboxymethyl cellulose).

All raw materials will be procured from approved and licensed suppliers. Materials will be received, stored in enclosed silos or dedicated covered raw material bays, and handled with proper dust control systems to prevent fugitive emissions in accordance with PEQS and applicable environmental safety standards.

### **3.12 Schedule of Implementation**

Following the grant of environmental approval and issuance of the requisite No Objection Certificate by EPA Punjab, the project proponent will proceed with construction and installation of plant and machinery in accordance with the schedule stipulated under the FIEDMC provisional allotment letter, which requires commencement of construction within six months and commencement of commercial operations within twenty-four months of zone-entry approval. Commercial production will commence only after all necessary regulatory clearances, including the Commercial Production Certificate from FIEDMC and environmental approval from EPA Punjab, have been obtained.

### **3.13 Emissions from the Project**

#### **3.13.1 Wastewater Generation**

Wastewater generated at the facility will primarily consist of domestic sewage from staff facilities and process wastewater from the electroplating/finishing line. Domestic wastewater will be estimated on the basis of the anticipated workforce, while plating-line effluent, which may contain trace metals, will be routed through an on-site effluent treatment unit prior to discharge to ensure compliance with NEQS/PEQS limits for industrial effluent.

#### **3.13.2 Solid Waste**

Solid waste at the facility will comprise domestic waste from staff areas and process waste such as PVC offcuts, sprue and runners from injection moulding, and metal swarf/scrap from machining operations. Plastic offcuts and metal scrap are largely recyclable and will be segregated for recycling or resale wherever feasible, while domestic waste will be collected and disposed of through the municipal solid waste system in coordination with FIEDMC.

### **3.13.3 Gaseous Emissions**

The extrusion and moulding processes may generate minor fumes during heating of the resin, while the buffing and polishing operations generate particulate matter. Local exhaust ventilation with appropriate filtration will be installed at these workstations, and stack emissions, where applicable, will be monitored periodically to confirm compliance with NEQS for gaseous emissions.

### **3.13.4 Noise**

Noise at the facility will primarily originate from extrusion and moulding machinery, air compressors and material-handling equipment. Machinery will be properly maintained, and where necessary, enclosures or acoustic treatment will be provided to keep workplace and boundary noise levels within the limits prescribed under NEQS/PEQS.

## **3.14 Infrastructure**

### **3.14.1 Water Supply**

Water for industrial and domestic use will be sourced through groundwater extraction and stored in an overhead water tank, supplemented by the FIEDMC-provided water network where available.

### **3.14.2 Sewerage System**

Domestic and treated process wastewater will be discharged into the FIEDMC sewerage network serving AIIC, in accordance with the terms and conditions of the provisional allotment letter.

### **3.14.3 Security**

Security guards will be posted at the facility around the clock, and the site will be secured with a boundary wall and controlled entry points.

### **3.14.4 Electricity**

Electricity will be supplied by FESCO through the FIEDMC common electricity network, with a sanctioned load to be obtained as per the requirements of the project, subject to the FIEDMC electricity charge structure of Rs. 8,052,258/- per MW as stated in the provisional allotment letter.

### **3.14.5 Gas Facility**

Natural gas, where required for process heating, will be supplied through the FIEDMC gas network via SNGPL, subject to the sanctioned load and applicable FIEDMC charges.

### **3.14.6 Fire Protection System**

The facility will be equipped with fire extinguishers, a fire hydrant system (2.5-inch diameter x 100 feet hose), fire hose boxes, and an automatic fire detection and alarm system, together with clearly marked emergency exits, in line with the fire precaution measures indicated in the approved building plan.

### **3.14.7 Manpower**

The project is expected to require a workforce ranging from semi-skilled machine operators to skilled technicians and administrative staff during the operational phase, with additional temporary labour engaged during the construction phase.

## 4. ENVIRONMENTAL BASELINE

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### 4.1 General

This chapter presents the existing environmental conditions within the proposed project site and its surrounding area of influence. The baseline assessment provides the reference condition against which potential environmental and social impacts of the proposed manufacturing facility of M/s Hui Huang Sanitary Solutions (Private) Limited are identified, assessed, and monitored.

The proposed project site is located at Plot No. 45 & 46-B, Allama Iqbal Industrial City (AIIC), FIEDMC, Faisalabad. AIIC is a planned industrial estate; therefore, the immediate project surroundings are predominantly characterized by industrial plots, internal roads, utility corridors, developing industrial infrastructure, and limited natural vegetation.

The baseline study considers the following environmental components:

- Physical environment, including topography, geology, soils, hydrology, groundwater, climate, air quality, and noise levels.
- Ecological environment, including existing vegetation, wildlife habitat, flora, fauna, and protected areas.
- Social and cultural environment, including administrative setting, settlement pattern, population, economic activity, infrastructure, employment, community facilities, and cultural resources.

The baseline information has been compiled through review of available project documents, reconnaissance surveys, primary monitoring where undertaken, published information, government sources, and observations within the project area. The assessment represents existing conditions at the time of the EIA study and should be read alongside the environmental monitoring results included in the relevant annexures of the report.

## **4.2 Physical Environment**

### **4.2.1 Topography**

The proposed project site lies in Faisalabad District, which forms part of the extensive alluvial plains of central Punjab. The regional terrain is generally flat to gently undulating, with no significant hills, escarpments, rocky outcrops, or pronounced elevation changes within the project area.

The project location at AIIC has been planned and developed for industrial use. The plots have been levelled and prepared to facilitate construction of industrial buildings, internal roads, utility systems, loading and unloading areas, storage yards, parking spaces, and drainage infrastructure. The site's generally level condition is suitable for development of production halls, warehouses, administrative areas, utility blocks, and associated facilities.

Faisalabad is situated at an elevation of approximately 605 feet above mean sea level. The flat terrain provides favourable conditions for industrial development; however, it also requires careful site grading and drainage design to prevent waterlogging during monsoon rainfall or intense storm events.

The project design shall provide appropriate finished-floor levels, site grading, roof drainage, internal drains, stormwater channels, and properly designed outfalls to ensure that stormwater is collected and conveyed without causing ponding, erosion, flooding, or contamination of neighbouring plots.

### **4.2.2 Geology**

The project area is underlain by unconsolidated Quaternary alluvial deposits associated with the Punjab plains. These deposits generally consist of variable layers of sand, silt, clay, and minor gravel, deposited over time through riverine processes and floodplain development.

The geology of Faisalabad is typical of the Ravi–Chenab interfluvium, commonly referred to as the Rechna Doab. The wider region is characterized by deep alluvial sediments, which support agricultural activity outside built-up and industrial areas. The district's soils are described as alluvial deposits mixed with loess and generally having calcareous characteristics.

No exposed bedrock, geological fault, mineral extraction area, unstable slope, or known site-specific geological hazard is expected within the proposed industrial plot. Because the site is flat and located in a planned industrial estate, the risk of landslides, slope failure, rockfall, or similar terrain-related hazards is negligible.

Before construction of major structures, the project proponent shall undertake a geotechnical investigation, if not already completed, to confirm bearing capacity, groundwater depth, soil composition, settlement characteristics, and foundation requirements. The final structural and foundation design shall be based on the findings of the geotechnical assessment and the applicable building code.

#### **4.2.3 Hydrology and Drainage**

The project area lies in the regional Ravi–Chenab interfluvium, or Rechna Doab, between the Chenab and Ravi river systems. The River Chenab flows approximately 30 km to the northwest of Faisalabad city, while the River Ravi lies approximately 40 km to the southeast.

The wider Faisalabad area is served by the canal-irrigation network, particularly the Lower Chenab Canal system, which is identified as the principal irrigation source for a substantial portion of cultivated land in the district. No natural river, stream, lake, wetland, perennial watercourse, or canal passes through the proposed project plot.

The proposed site is located within AIIC, where drainage is expected to be governed principally by planned industrial-estate stormwater infrastructure. Surface runoff generated from roofs, paved

areas, internal roads, parking areas, and open spaces will be directed through site drains towards the approved estate-level drainage system, subject to FIEDMC requirements.

During the monsoon season, short-duration and high-intensity rainfall may cause temporary accumulation of runoff if drainage systems are blocked, undersized, or poorly maintained. Therefore, the project shall incorporate the following drainage measures:

- Appropriate site grading to direct clean stormwater away from buildings and storage areas.
- Separate drainage routes for stormwater, domestic sewage, and any process wastewater.
- Silt traps at relevant drain inlets and regular cleaning of drainage channels.
- Oil and grease traps near vehicle-maintenance, generator, transformer, parking, and loading areas where there is a risk of hydrocarbon contamination.
- Covered storage of raw materials, chemicals, scrap, and waste to prevent contact with rainwater.
- Prohibition of discharge of sewage, chemicals, oil, slurry, or solid waste into stormwater drains.
- Routine inspection and cleaning of drains before and during the monsoon period.

#### **4.2.4 Soils**

Soils in Faisalabad District are largely formed from alluvial deposits and loess-derived material. The district's soil profile is generally fertile and calcareous, supporting extensive agricultural production outside urban and industrial areas.

The natural soils in the broader area are generally loamy to clay-loam, with local variation depending on depth, irrigation history, drainage, and land-use conversion. Within AIIC, however, the original land surface has been modified through grading, compaction, filling, road construction, plot demarcation, and other industrial-estate development works.

The proposed project site is designated for industrial development and does not presently support agricultural cultivation. Consequently, the project is not expected to result in direct conversion of active agricultural land within the plot boundary.

The potential soil-related issues during construction and operation include soil compaction, loss of topsoil during excavation, accidental fuel or oil spills, leakage from chemicals or waste storage, poor waste handling, and contamination from unplanned discharge of wastewater. These issues will be managed through controlled excavation, proper storage of chemicals and fuels, designated waste areas, impervious flooring in chemical-handling locations, spill-response procedures, and prohibition of open dumping.

#### **4.2.5 Climate**

Faisalabad has a semi-arid continental climate with distinct summer, monsoon, winter, and transitional seasons. Summers are hot and may be humid during the monsoon period, whereas winters are generally dry and cool. The Faisalabad Division identifies summer temperatures ranging approximately from 26.9°C to 45.5°C and winter temperatures ranging from approximately 4.1°C to 19.4°C.

The hottest period generally occurs from May to July, with June commonly being the warmest month. High summer temperatures can increase energy demand for ventilation and cooling, affect worker comfort, raise the risk of heat stress, and increase the fire risk associated with combustible materials, plastics, packaging, fuels, and electrical systems.

Winter conditions generally prevail from December to February. Cool temperatures, fog, and reduced atmospheric mixing can affect visibility and may contribute to the accumulation of dust and emissions from vehicles, generators, and nearby industrial activity. Appropriate maintenance of vehicles and equipment, control of fugitive emissions, and avoidance of open burning are therefore important throughout the year.

Average annual rainfall in Faisalabad is approximately 375 mm, with about half of the annual rainfall occurring in July and August during the monsoon season. Rainfall is generally limited during

winter and pre-monsoon months, although occasional winter rainfall may occur due to western weather systems.

The prevailing wind direction varies seasonally. Summer winds are generally associated with western and southwesterly patterns, while winter conditions may include easterly, northeasterly, and northwesterly airflows. Wind direction, speed, and atmospheric stability influence dispersion of dust, generator emissions, vehicular exhaust, and other airborne pollutants. The project shall therefore maintain suitable emission-control, ventilation, housekeeping, and dust-suppression arrangements.

**Table 4.1: Indicative Month-Wise Average Temperature for Faisalabad**

| Month     | Average Maximum Temperature (°C) | Average Minimum Temperature (°C) |
|-----------|----------------------------------|----------------------------------|
| January   | 19                               | 5                                |
| February  | 22                               | 8                                |
| March     | 28                               | 13                               |
| April     | 36                               | 19                               |
| May       | 41                               | 24                               |
| June      | 42                               | 27                               |
| July      | 38                               | 27                               |
| August    | 36                               | 26                               |
| September | 36                               | 23                               |
| October   | 34                               | 16                               |
| November  | 28                               | 9                                |
| December  | 21                               | 6                                |

*Indicative climatic profile based on regional Faisalabad conditions. The Faisalabad Division reports a semi-arid climate, very hot summers, cool winters, and average annual rainfall of about 375 mm.*

The climatic characteristics relevant to the project are summarized below:

| Parameter          | Baseline Condition                                            | Relevance to the Project                                                                                  |
|--------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Summer temperature | Frequently exceeds 40°C during peak summer                    | Requires heat-stress management, ventilation, drinking water, shaded rest areas, and fire-risk management |
| Winter temperature | May decline to approximately 4–5°C                            | May affect worker comfort, equipment start-up, and local air dispersion during foggy periods              |
| Rainfall           | Approximately 375 mm annually; concentrated in monsoon months | Requires adequate site grading, stormwater drains, roof drainage, and prevention of waterlogging          |
| Wind               | Seasonal variation in direction and speed                     | Influences movement of dust, emissions, and odours; supports need for proper stack and ventilation design |
| Humidity           | Higher during July–September                                  | Requires proper storage of raw materials, packaging, finished goods, electrical systems, and tiles        |

#### 4.2.6 Ambient Air Quality and Noise Environment

The ambient air environment around the proposed site is characteristic of a developing industrial estate. Existing air-quality conditions are influenced by background dust from unpaved or developing plots, movement of construction vehicles, internal road traffic, nearby industrial activity, agricultural operations in the broader surrounding area, and regional urban and industrial emissions from Faisalabad.

The principal baseline air-quality parameters relevant to the proposed project include particulate matter of aerodynamic diameter less than 10 microns (PM<sub>10</sub>), particulate matter less than 2.5 microns (PM<sub>2.5</sub>), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and, where relevant, volatile organic compounds or other process-specific pollutants.

At the time of the baseline survey, ambient air quality in the immediate project vicinity was generally representative of a developing industrial area. Available baseline monitoring results should be presented in the EIA annexures and compared with applicable Punjab Environmental Quality Standards or other relevant regulatory benchmarks. The project shall not rely solely on baseline conditions; rather, it shall implement source-control measures to ensure that construction and operational activities do not materially deteriorate ambient air quality.

Potential baseline noise sources include traffic on access roads, construction activity within developing portions of AIIC, movement of trucks and delivery vehicles, operation of nearby industrial units, generators, compressors, and general human activity. Noise levels vary over the day, with comparatively higher levels expected during normal industrial and traffic hours.

The project site is located within a planned industrial estate. Therefore, the primary receptors are expected to be workers, visitors, security staff, personnel of adjoining industrial units, and road users. Residential settlements are comparatively distant from the immediate project site; nevertheless, operational noise should be controlled at source to avoid nuisance or adverse health effects.

During construction and operation, the project shall adopt the following measures to maintain acceptable air and noise conditions:

- Water sprinkling and dust suppression on exposed soil, unpaved surfaces, and active construction areas.
- Covering of trucks carrying fine materials, waste, soil, or debris.
- Prompt removal of construction debris and regular housekeeping.
- Paving or stabilizing internal traffic routes where practicable.
- Enclosure or local exhaust ventilation for cutting, grinding, mixing, and dust-generating activities.
- Preventive maintenance of generators, compressors, vehicles, machinery, and ventilation equipment.
- Use of acoustic enclosures, silencers, vibration-isolation pads, and properly maintained equipment.

- Restriction of unnecessary horn use, prolonged idling, and high-noise activities during inappropriate hours.
- Provision of hearing protection for employees working near high-noise machinery.
- Periodic ambient air and noise monitoring in accordance with the EMMP and environmental approval conditions.

#### **4.2.7 Water Resources and Groundwater**

Groundwater is an important water resource in the Faisalabad region and is commonly used for domestic, commercial, agricultural, and industrial purposes. The proposed project may use groundwater, estate-supplied water, or another approved source depending on the final utility arrangement approved by FIEDMC and relevant authorities.

The broader groundwater environment may be influenced by regional hydrogeology, agricultural practices, canal seepage, domestic wastewater disposal, and industrial development. Water quality can vary spatially and seasonally, particularly with respect to total dissolved solids, hardness, alkalinity, chloride, sulphate, iron, fluoride, nitrate, and microbiological characteristics.

Baseline groundwater sampling, where undertaken for this EIA, should be used to establish existing conditions for key parameters such as pH, turbidity, total dissolved solids, electrical conductivity, hardness, chloride, sulphate, nitrate, iron, fluoride, and microbiological indicators. The project shall use laboratory results included in the annexures to determine suitability of water for drinking, domestic use, industrial use, process use, washing, cooling, or other applications.

Groundwater or other raw water used for drinking purposes shall meet applicable drinking-water quality requirements. Water that is suitable only for industrial or non-potable use shall not be supplied as drinking water without suitable treatment.

The project shall minimize pressure on groundwater resources through efficient water management, including:

- Installation of water meters at the main source and major use areas.
- Regular inspection and repair of leaks in pipelines, tanks, washrooms, and process equipment.
- Use of controlled cleaning and washing practices.
- Use of low-flow sanitary fittings where feasible.
- Rainwater harvesting or reuse assessment during detailed design, where technically and economically viable.
- Reuse of uncontaminated water where appropriate and safe.
- Separate management of domestic sewage, process wastewater, and stormwater.
- Prevention of groundwater contamination through impervious storage areas, oil/grease traps, spill kits, and proper waste handling.

The project shall not discharge untreated wastewater, oil, chemicals, slurry, wash water, or hazardous materials to soil, open land, drains, or groundwater recharge areas.

## **4.3 Ecological Resources**

### **4.3.1 Flora**

The project site is located within a planned industrial estate and has been designated for industrial development. As a result, the site does not contain natural forest, wetland vegetation, riverine vegetation, mature woodland, agricultural crops, or other ecologically significant habitat.

Existing vegetation within the project plot, if present, is likely to be sparse and limited to seasonal grasses, weeds, ruderal species, and isolated planted vegetation. The wider AIIC area may include roadside plantation, landscaped strips, plot-boundary vegetation, and ornamental species established as part of industrial-estate development.

Common tree species expected along roads, boundaries, and developed areas in Faisalabad include Neem (*Azadirachta indica*), Shisham (*Dalbergia sissoo*), Eucalyptus (*Eucalyptus* spp.), Kikar/Babul (*Vachellia nilotica*), Sukhchain (*Pongamia pinnata*), and other planted shade or ornamental species. These species are adapted to the climatic conditions of Punjab and provide

limited but valuable environmental functions, including dust interception, shade, visual screening, and habitat for common birds.

No rare, endangered, endemic, protected, or ecologically sensitive plant species were observed or reported within the proposed project plot during the baseline assessment. However, before commencement of construction, the project proponent shall verify whether any mature trees occur within the final building footprint or access routes.

Where removal of trees is unavoidable, the project shall obtain permission from the relevant authority, minimize tree removal, and implement compensatory plantation in coordination with FIEDMC requirements. Landscaping should prioritize native or locally adapted species that require comparatively low water demand and are suitable for Faisalabad's semi-arid climate.

#### **4.3.2 Fauna**

The project area is located in a human-modified industrial environment. Wildlife habitat within the proposed plot is limited because of existing industrial development, vehicular movement, construction activity, noise, artificial lighting, limited vegetation, and the absence of permanent natural water bodies.

Fauna likely to occur in the wider industrial and peri-urban landscape includes common bird species such as house sparrow, common myna, house crow, rock pigeon, dove species, cattle egret, black kite, and other locally adapted birds. Small mammals and reptiles that may occur in disturbed habitats include rodents, house gecko, small lizards, and other common species adapted to human presence.

No endangered, threatened, protected, migratory, or otherwise sensitive fauna species were observed or reported at the project site during the reconnaissance survey. The site does not provide critical habitat, nesting colonies, breeding grounds, wetlands, forest cover, or known wildlife corridors.

Potential operational impacts on common fauna are expected to be low because the site is within an industrial estate. Nevertheless, the project shall avoid unnecessary disturbance by controlling night lighting, preventing open waste accumulation, maintaining proper housekeeping, avoiding open burning, and retaining or developing greenbelt vegetation where feasible.

#### **4.3.3 Protected Areas and Sensitive Ecological Receptors**

No national park, wildlife sanctuary, game reserve, Ramsar wetland, protected forest, biosphere reserve, or other legally designated protected area is located within the project site or its immediate industrial surroundings.

The project is situated within AIIC, which is a planned industrial estate rather than an environmentally sensitive natural area. The site is not located within a known wetland, riverine habitat, forest area, wildlife corridor, or protected habitat.

The absence of protected areas and sensitive ecological receptors in the immediate vicinity reduces the likelihood of significant ecological impacts. However, the project shall remain responsible for controlling air emissions, wastewater, waste disposal, noise, and accidental spills to ensure that no indirect environmental effects extend beyond the industrial estate.

### **4.4 Social and Cultural Environment**

#### **4.4.1 Administrative Setting**

The proposed project is located in Tehsil Chak Jhumra, District Faisalabad, Punjab. The project site falls within Allama Iqbal Industrial City, a planned industrial estate developed and managed by FIEDMC.

Faisalabad District is administratively divided into several tehsils, including Faisalabad City, Faisalabad Sadar, Chak Jhumra, Jaranwala, Samundri, and Tandlianwala. The official district profile

identifies Chak Jhumra as one of the district's tehsils and records a population of 332,461 under the 2017 census profile.

The project is subject to environmental oversight by EPA Punjab and to estate-level planning, land-use, infrastructure, and development-control requirements administered by FIEDMC. The project must also comply with requirements of relevant building-control, labour, fire-safety, utility, local-government, and emergency-response agencies.

#### **4.4.2 Settlement Pattern and Demography**

The immediate setting of the project is industrial in nature. AIIC contains planned industrial plots, access roads, service corridors, developing factories, warehousing activities, and supporting infrastructure. Residential settlements are not expected to be located directly adjacent to the proposed industrial plot, although rural villages, roadside settlements, and urban or peri-urban communities are present at greater distances outside the industrial-estate boundary.

Faisalabad is one of the largest and most industrialized districts in Punjab. The Faisalabad District profile reports a total population of approximately 7.87 million and identifies the district as Punjab's second most populous district. The district profile also reports an overall population of 332,461 for Chak Jhumra Tehsil in the 2017 census data.

The population of the wider Faisalabad area comprises a mix of urban, peri-urban, and rural communities. Livelihoods are supported by industrial employment, textile manufacturing, small and medium enterprises, commerce, trade, transport, agriculture, services, education, and public-sector employment.

The proposed project is not expected to require physical displacement, resettlement, acquisition of residential land, or relocation of community infrastructure because it is planned on a designated industrial plot within AIIC. The principal social considerations relate to local employment, labour

welfare, traffic and road safety, air emissions, noise, waste management, worker safety, emergency preparedness, and maintenance of a grievance-response mechanism.

#### **4.4.3 Economic Activities**

Faisalabad is widely recognized as a major industrial and commercial centre of Pakistan. Its economy has historically been associated with textiles and textile-related manufacturing; however, it also supports diversified industrial activity, including engineering, food processing, chemicals, plastics, construction materials, packaging, logistics, warehousing, trade, and services.

The official Faisalabad district profile identifies the district as an agri-industrial area and states that it contributes significantly to national economic activity through textile exports. The wider region also supports agricultural activities, including crop cultivation and livestock-related businesses, particularly outside the urban and industrial zones.

Economic activity around AIIC is primarily industrial, commercial, logistics-based, and construction-related. As the industrial estate develops, it is expected to generate demand for skilled and unskilled labour, transport services, maintenance services, food and retail businesses, accommodation, warehousing, technical services, and other local support activities.

The proposed project is expected to contribute positively to the local economy through:

- Direct employment during construction, installation, commissioning, and operation.
- Indirect employment through contractors, transporters, suppliers, maintenance providers, packaging suppliers, service providers, and distributors.
- Increased demand for locally available goods and services.
- Development of technical and production skills among the workforce.
- Contribution to the sanitary ware, plumbing, water-storage, construction-material, and building-finishing supply chain.
- Support for industrial diversification within Faisalabad and AIIC.

The magnitude of economic benefits will depend on the final investment, production capacity, operational schedule, procurement arrangements, and employment policy of the project proponent.

#### **4.4.4 Social Infrastructure and Community Services**

Faisalabad city and its peri-urban surroundings provide a wide range of educational, healthcare, commercial, transport, banking, telecommunications, emergency, and civic facilities. These facilities are accessible to workers and communities associated with AIIC, although their distance and accessibility may vary depending on the final site access and transport arrangements.

Educational facilities available within the wider Faisalabad district include schools, colleges, vocational institutes, technical-training centres, universities, and professional education institutions. The district profile indicates that Faisalabad has a substantial educational network, while also recognizing that infrastructure needs continue to grow with population and development pressures.

Healthcare services are available through public hospitals, private hospitals, clinics, laboratories, dispensaries, pharmacies, and emergency-response services in Faisalabad city and surrounding towns. For the project, onsite first-aid arrangements, trained first-aiders, emergency transportation, emergency contact information, and coordination with nearby medical facilities shall be established.

The project shall provide adequate worker-welfare facilities within the premises, including:

- Safe drinking-water arrangements.
- Separate and hygienic washrooms for male and female workers.
- Rest areas and shaded spaces where required.
- Canteen or meal arrangements, where applicable.
- First-aid boxes and trained first-aid staff.
- Personal protective equipment appropriate to work activities.
- Safe internal access routes, signage, lighting, and emergency exits.
- Prayer space and other basic facilities consistent with workforce needs.

- A worker grievance mechanism and mechanism for reporting unsafe conditions.

#### **4.4.5 Cultural Heritage and Archaeological Resources**

No known archaeological site, monument, graveyard, shrine, historic building, protected cultural property, or culturally significant landscape has been identified within the proposed project plot during the baseline review and reconnaissance survey.

The project site is located within a designated industrial estate and is not known to contain cultural or archaeological resources. Therefore, significant impacts on cultural heritage are not anticipated.

Nevertheless, if any archaeological material, artefact, structure, burial remains, pottery, fossils, or other item of potential historical or cultural significance is encountered during excavation or construction, work in the immediate area shall be stopped. The project proponent shall secure the location, prevent disturbance or removal of the material, and notify FIEDMC and the relevant government authority for guidance before work is resumed.

#### **4.4.6 Traffic and Access**

The project site is accessed through the internal road network of AIIC and connects to the wider road network serving Faisalabad and the M-4 corridor. Traffic in the immediate project area is expected to consist mainly of construction vehicles, trucks, delivery vehicles, industrial staff transport, private vehicles, motorcycles, and service vehicles.

During construction, traffic may temporarily increase due to transport of construction materials, machinery, equipment, steel, cement, aggregates, prefabricated components, and labour. During operation, traffic will include raw-material deliveries and dispatch of pipes, fittings, tiles, sanitary ware, tanks, fixtures, packaging materials, and other finished goods.

The project shall prepare and implement a Traffic Management Plan that includes:

- Designated entry and exit points for heavy vehicles.
- Scheduling of major deliveries to avoid congestion where practicable.
- Speed limits and road-safety signage within the project site.
- Safe pedestrian walkways and segregation of pedestrian and vehicle movement.
- Designated loading and unloading areas.
- Driver awareness regarding speed control, reversing safety, idling reduction, and horn restriction.
- Regular maintenance of internal roads and immediate repair of damaged surfaces.
- Prevention of mud, debris, or material spillage onto public or estate roads.
- Coordination with FIEDMC for transport, access, and road-use requirements.

#### **4.4.7 Community Health and Safety**

The primary community-health and safety considerations associated with the project relate to construction traffic, dust, noise, fire risk, accidental release of chemicals or fuel, improper waste disposal, and emergency incidents. Because the project is located within a planned industrial estate and residential areas are comparatively distant, direct exposure of nearby communities is expected to be limited.

Nevertheless, the project shall adopt preventive measures to protect workers, visitors, neighbouring industries, road users, and surrounding communities. These measures include proper storage of combustible materials and chemicals, fire protection, emergency-response planning, dust and emission control, wastewater management, safe waste disposal, traffic control, boundary security, and regular communication with estate management.

A grievance mechanism shall be established to receive, record, investigate, and respond to concerns or complaints from workers, neighbouring industries, visitors, or community representatives. The project shall maintain records of complaints, response actions, closure status, and any corrective measures implemented.

## 5. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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### 5.1 General

This chapter identifies and evaluates the potential environmental and social impacts, risks, and benefits associated with the proposed manufacturing facility of M/s Hui Huang Sanitary Solutions (Private) Limited at Plot No. 45 & 46-B, Allama Iqbal Industrial City (AIIC), FIEDMC, Faisalabad.

The assessment covers the pre-construction, construction, installation, commissioning, operational, maintenance, and emergency phases of the project. It considers the proposed manufacturing, processing, and associated handling of ceramic sanitary ware and bathroom tiles comprising 12 specialized product types: ceramic wall tiles, porcelain floor tiles, vitrified floor tiles, anti-slip bathroom tiles, decorative mosaic tiles, wash basins, water closets, wall-hung toilets, urinals, bidets, ceramic shower trays, and ceramic bathroom accessories.

Potential impacts have been assessed with reference to the following criteria:

- **Nature:** Whether an impact is beneficial or adverse, direct or indirect.
- **Magnitude:** The anticipated level or intensity of change caused by the activity.
- **Extent:** The geographical area likely to be affected.
- **Duration:** Whether the effect is short-term, temporary, long-term, or permanent.
- **Frequency:** Whether the impact is occasional, intermittent, or continuous.
- **Reversibility:** Whether the affected environmental condition can return to its pre-project state.
- **Sensitivity:** The vulnerability of the receiving environment, workers, nearby industries, and communities.
- **Residual impact:** The likely impact remaining after mitigation measures are implemented.

The project is located within a planned industrial estate, and the immediate surroundings are primarily industrial. No major ecological receptors, protected areas, permanent water bodies, or

dense residential settlements have been identified in the immediate vicinity. Therefore, most anticipated impacts are expected to be localized, manageable, and low in significance, provided the proposed mitigation measures and Environmental Management and Monitoring Plan are fully implemented.

The major environmental and social aspects requiring particular management attention during operation include air emissions from generators and process activities; dust from material handling and tile-related activities; operational noise; domestic sewage; process wastewater from electroplating or metal-finishing operations, if installed; plastic, ceramic, metal, packaging, and hazardous waste; occupational health and safety; chemical handling; traffic movement; and fire or emergency risks.

Punjab Environmental Quality Standards regulate industrial emissions, effluent discharges, ambient air quality, and noise. The project shall comply with applicable PEQS and conditions imposed through its environmental approval.

## **5.2 Construction-Stage Impacts on Physical Environment**

### **5.2.1 Impact on Land and Soil**

Construction activities may include site levelling, excavation, foundation works, trenching, construction of buildings, installation of utilities, internal-road development, drainage construction, storage of materials, and movement of heavy vehicles. These activities may cause localized soil disturbance, compaction, temporary alteration of surface drainage, generation of surplus excavated material, and minor risk of contamination from fuel, oil, lubricants, paints, concrete wash water, or chemical spills.

Because the site is located within a designated industrial estate and has already been allocated for industrial development, the impact on land use is expected to be low. No active agricultural land,

forest area, protected habitat, or environmentally sensitive land is expected to be permanently converted by the project.

The potential soil impact is temporary, localized, reversible, and low in significance, provided construction activities are confined to the approved project boundary and appropriate housekeeping, spill prevention, drainage, and waste-management measures are followed.

#### **5.2.1.1 Mitigation Measures**

The contractor and project proponent shall implement the following measures:

- Restrict all excavation, construction, material storage, vehicle parking, and waste handling to the approved project footprint.
- Clearly demarcate the construction boundary, access routes, storage zones, hazardous-material areas, waste-collection points, and no-go areas before commencement of work.
- Avoid unnecessary stripping, removal, or disturbance of soil outside the building footprint, utility corridors, approved roads, and designated work areas.
- Store excavated soil and construction material in designated locations away from stormwater drains, neighbouring plots, public roads, and vehicle circulation routes.
- Cover excavated soil or fine construction material during dry and windy conditions to prevent dispersion.
- Reuse suitable excavated material for backfilling, levelling, landscaping, or other approved onsite purposes, where technically appropriate.
- Compact disturbed areas after completion of construction activities to stabilize the surface and avoid uneven settlement.
- Reinstate temporarily disturbed areas promptly after completion of utility installation, trenching, and foundation work.
- Prohibit open dumping of construction debris, waste concrete, oils, paints, chemicals, or domestic waste on open land.

- Store fuel, oil, lubricants, chemicals, and paints on an impervious surface with secondary containment or bunding.
- Maintain spill kits, absorbent materials, shovels, collection containers, and emergency-response procedures at fuel and chemical storage areas.
- Collect contaminated soil resulting from any spill, store it in labelled containers, and manage it as potentially hazardous waste in accordance with applicable requirements.
- Ensure that concrete wash water is collected in designated settling pits or contained areas and is not discharged directly to open soil, drains, or neighbouring land.

### **5.2.2 Impact on Air Quality, Climate, and Noise**

Construction activities may generate fugitive dust and temporary exhaust emissions. The principal dust-generating activities may include excavation, land grading, stockpiling of soil or aggregates, loading and unloading of materials, cutting of concrete or masonry, movement of trucks on unpaved surfaces, and handling of cement, sand, and other fine materials.

Exhaust emissions may arise from construction machinery, generators, trucks, cranes, loaders, forklifts, and other diesel- or petrol-powered equipment. Such emissions may include particulate matter, nitrogen oxides, sulphur dioxide, carbon monoxide, hydrocarbons, and greenhouse gases.

Noise and vibration may be generated by excavation equipment, concrete mixers, generators, cranes, welding machines, cutting equipment, trucks, and other construction machinery. The nearest receptors are likely to include construction workers, security personnel, road users, staff of adjoining industrial plots, and workers at nearby industrial units.

The impacts are expected to be temporary, localized, and low to moderate in significance before mitigation. With implementation of appropriate control measures, the residual impact is expected to be low.

### **5.2.2.1 Mitigation Measures**

The following air-emission, dust-control, and noise-management measures shall be implemented:

- Sprinkle water on exposed soil, construction areas, unpaved access routes, stockpiles, and internal roads during dry, dusty, or windy conditions.
- Avoid excessive water application that may create muddy conditions, stagnant water, or contaminated runoff.
- Cover trucks carrying soil, sand, cement, demolition waste, fine aggregates, or other loose materials with tarpaulins before leaving the project site.
- Ensure that trucks do not exceed safe loading capacity and that material is not allowed to spill onto AIIC roads.
- Store cement, fine sand, additives, and other dust-generating materials in covered sheds, silos, bags, or enclosed containers.
- Use pre-mixed concrete, where feasible, to reduce onsite handling of cement and aggregates.
- Install temporary barriers or screens around high-dust activities where practical.
- Maintain construction equipment, generators, vehicles, and machinery in good working condition to minimize smoke, excessive emissions, fuel leakage, and noise.
- Use low-sulphur or approved fuel for generators and machinery, where available.
- Prohibit open burning of construction debris, packaging, plastic waste, wood, leaves, or any other material.
- Switch off equipment, engines, lights, and generators when not in use to reduce fuel consumption, unnecessary emissions, and greenhouse-gas generation.
- Restrict high-noise construction activities to daytime hours as far as practicable.
- Maintain silencers, mufflers, acoustic covers, and vibration-control systems on generators, compressors, and high-noise equipment.
- Locate temporary generators, compressors, and other stationary equipment away from plot boundaries and worker-rest areas where practicable.

- Provide workers exposed to high noise with suitable hearing protection, such as earplugs or earmuffs.
- Provide dust masks or suitable respiratory protective equipment to workers involved in dusty operations, such as cement handling, cutting, grinding, and excavation.
- Conduct periodic site inspections to verify control of dust, smoke, vehicle emissions, and noise.

### **5.2.3 Impact on Water Resources, Drainage, and Wastewater**

Construction-stage water use will primarily be associated with concrete curing, dust suppression, equipment cleaning, worker sanitation, and general site housekeeping. Potential water-related impacts may arise from improper disposal of domestic sewage, concrete wash water, oily wastewater, fuel spills, chemical spills, or contaminated stormwater.

If unmanaged, these materials could contaminate soil, block drains, create stagnant water, affect groundwater quality, or cause nuisance conditions within the industrial estate. The likelihood of significant impact is low because there is no surface water body within the project plot; however, good site management is required to protect drainage systems and groundwater.

The anticipated impact is temporary, localized, and low in significance after implementation of mitigation measures.

#### **5.2.3.1 Mitigation Measures**

- Provide adequate temporary sanitation facilities for construction workers, including toilets, handwashing facilities, drinking water, and proper collection of domestic wastewater.
- Arrange removal or disposal of sewage through an approved sanitation system, septic arrangement, mobile sanitation service, or FIEDMC-approved facility.
- Do not allow untreated sewage, grey water, wash water, concrete wash water, oil, chemicals, or waste liquids to be discharged onto open ground or stormwater drains.

- Provide designated washing areas for tools, mixers, vehicle wheels, and equipment, with controlled collection of wash water.
- Provide temporary drainage channels, silt traps, and sedimentation arrangements to prevent soil, debris, and suspended solids from entering estate drains.
- Inspect drains regularly, especially before and during rainfall events, and remove accumulated silt, soil, waste, or debris.
- Store fuel, lubricants, oils, chemicals, paints, and cleaning materials in designated covered areas with impervious flooring and secondary containment.
- Refuel vehicles and equipment only at designated locations, preferably on an impermeable surface away from drainage channels.
- Maintain spill-response materials at fuel storage, refuelling, equipment-maintenance, and chemical-storage areas.
- Immediately contain, collect, and clean any oil, fuel, or chemical spill; contaminated material shall not be washed into drains.
- Ensure that rainwater runoff from material-storage areas remains free from oil, chemicals, waste, cement, or fine sediment before discharge to the approved drainage system.

#### **5.2.4 Construction Waste Generation**

Construction works will generate waste such as excavated soil, concrete waste, broken masonry, steel offcuts, wood, packaging, cardboard, plastic wrapping, empty paint containers, used welding electrodes, damaged materials, domestic waste, and potentially hazardous waste such as used oil, oily rags, spent batteries, and chemical containers.

Uncontrolled storage or disposal of construction waste could cause visual nuisance, dust, blockage of drainage channels, soil contamination, fire risk, pest attraction, and unsafe working conditions. With proper segregation, reuse, recycling, storage, and disposal, this impact is expected to remain low.

#### **5.2.4.1 Mitigation Measures**

- Develop and implement a Construction Waste Management Plan before commencement of major construction activities.
- Segregate waste at source into excavated soil, reusable construction material, scrap metal, wood, cardboard, plastic, inert debris, domestic waste, and hazardous waste.
- Reuse suitable excavated material for backfilling or landscaping, where technically feasible and approved.
- Recover and sell recyclable materials such as steel offcuts, cable scrap, cardboard, plastic wrapping, wooden pallets, and metal containers through authorized recyclers.
- Store construction waste in designated, clearly marked, covered or contained areas.
- Remove construction debris regularly and prevent its accumulation at roadsides, drains, open plots, or near worker facilities.
- Provide covered bins for domestic waste generated by workers.
- Store used oil, oily rags, batteries, paint containers, chemical containers, and contaminated absorbent materials separately in labelled, leak-proof containers.
- Do not burn, bury, or dump waste within the site or surrounding industrial estate.
- Maintain waste records, including type, estimated quantity, destination, recycler, transporter, and disposal date.

### **5.3 Construction-Related Impacts on Biological Environment**

The proposed site is located within a developing industrial estate and does not contain forest land, wetlands, protected habitat, agricultural crops, significant natural vegetation, or known nesting or breeding areas for protected wildlife. Construction-stage impacts on the biological environment are therefore expected to be negligible to low.

Potential minor impacts may include removal of seasonal grasses, weeds, or small planted vegetation; disturbance to common birds due to construction noise and human activity; and

temporary reduction in habitat suitability for common urban-adapted fauna. These effects will be localized and reversible.

No endangered, threatened, protected, migratory, or ecologically sensitive fauna species were identified within the project site during baseline assessment. Therefore, no significant ecological impact is anticipated.

### **5.3.1 Mitigation and Enhancement Measures**

- Avoid unnecessary removal of existing roadside, boundary, or planted trees.
- Obtain relevant permission before removal or pruning of any tree, if required under FIEDMC or local-authority requirements.
- Preserve trees outside the approved construction footprint and protect them from vehicle movement, excavation, storage of materials, or accidental damage.
- Prohibit hunting, trapping, harassment, feeding, or killing of birds, reptiles, or other fauna by workers and contractors.
- Prohibit open burning of waste, which may affect birds and other small fauna through smoke, heat, and habitat degradation.
- Install covered waste bins and maintain proper housekeeping to avoid attracting rodents, stray animals, insects, or pests.
- Implement landscaping and plantation along plot boundaries, internal roads, open spaces, and designated greenbelt areas.
- Prefer native or locally adapted species such as Neem, Shisham, Kikar, Sukhchain, and other low-water-demand shade trees, subject to landscaping design and FIEDMC requirements.
- Ensure that plant species selected for landscaping are non-invasive and suitable for Faisalabad's semi-arid climate.

The planned landscaping and plantation programme will have a positive long-term effect by improving visual quality, providing shade, intercepting dust, reducing local heat gain, and offering limited habitat for common bird species.

## **5.4 Construction-Related Social Impacts**

### **5.4.1 Occupational Health and Safety of Workers**

Construction workers may be exposed to occupational hazards associated with excavation, manual material handling, lifting operations, welding, electrical works, work at height, use of machinery, movement of vehicles, falling objects, slips and trips, dust, noise, heat stress, chemical exposure, and fire.

Without appropriate controls, such risks may cause injuries, occupational illness, lost workdays, property damage, or severe incidents. The potential pre-mitigation impact is moderate because construction sites involve multiple contractors, changing work areas, and high-risk activities. With a structured health, safety, and environmental management system, the residual risk will be low to moderate and manageable.

#### **5.4.1.1 Mitigation Measures**

- Prepare and implement a site-specific Construction Health, Safety, and Environment Plan before mobilization.
- Appoint a qualified site safety officer responsible for daily inspection, toolbox talks, incident reporting, safety records, and enforcement of safe work procedures.
- Provide compulsory safety induction to every worker, visitor, contractor, and subcontractor before entry to the work area.
- Conduct regular toolbox talks on task-specific risks, including excavation safety, working at height, lifting, welding, electrical safety, hot work, fire prevention, and emergency response.

- Provide suitable personal protective equipment, including helmets, safety shoes, high-visibility vests, gloves, eye protection, dust masks, hearing protection, fall-arrest equipment, and welding shields, according to job requirements.
- Enforce use of PPE through routine supervision and disciplinary procedures where necessary.
- Provide safe access and egress routes, guardrails, barricades, warning signs, lighting, and housekeeping at all work locations.
- Secure excavations with barricades and warning signs; provide safe access ladders and prevent work in unstable excavations.
- Require work permits for high-risk activities, including hot work, confined-space entry, electrical work, lifting operations, work at height, and excavation.
- Ensure that all lifting equipment, cranes, slings, hooks, scaffolds, ladders, and electrical tools are inspected and certified as required.
- Maintain first-aid boxes, trained first-aiders, emergency contact details, fire extinguishers, and access to emergency medical support.
- Provide sufficient drinking water, rest areas, shaded areas, sanitation facilities, and heat-stress management during hot weather.
- Record and investigate all incidents, near misses, unsafe conditions, and worker complaints, followed by corrective and preventive action.

#### **5.4.2 Community Health, Safety, and Traffic**

Construction traffic, material deliveries, and contractor vehicles may temporarily increase traffic on internal AIIC roads and access routes. Potential risks include traffic congestion, dust, road damage, vehicle-pedestrian conflict, spillage of construction material, and increased accident risk.

The impact is expected to be short-term, localized, and low to moderate before mitigation. Because the project is located within a planned industrial estate and away from dense residential neighbourhoods, community exposure is expected to remain limited.

#### **5.4.2.1 Mitigation Measures**

- Develop a construction traffic-management plan in coordination with FIEDMC requirements.
- Designate separate entry, exit, parking, loading, unloading, and reversing areas for construction vehicles.
- Enforce speed limits within the project site and industrial estate.
- Use trained banksmen or flagmen during reversing, loading, unloading, and movement of heavy equipment.
- Schedule major deliveries outside peak traffic periods where feasible.
- Cover loaded trucks and prevent material spillage on roads.
- Clean mud, soil, or debris from vehicle tyres before vehicles leave the site, where necessary.
- Maintain clear pedestrian pathways and segregate pedestrian movement from heavy vehicles.
- Install traffic signs, warning boards, reflective barriers, and adequate night lighting.
- Maintain a community and neighbour grievance mechanism for complaints relating to dust, noise, traffic, road safety, or other construction-related disturbance.

#### **5.4.3 Employment and Local Economic Benefits**

The construction phase will generate temporary employment opportunities for skilled, semi-skilled, and unskilled workers. It may also create indirect economic activity for suppliers, transporters, food vendors, equipment-rental providers, maintenance technicians, and local service providers.

This is a positive, temporary, local-to-regional impact. The project proponent and contractors should provide fair employment practices, safe working conditions, timely wage payment, and equal opportunity in accordance with applicable labour requirements.

#### **5.4.3.1 Enhancement Measures**

- Give preference to qualified local workers where skills and availability permit.
- Ensure that contractors comply with labour laws, wage requirements, working-hour provisions, worker welfare requirements, and occupational health and safety obligations.
- Prohibit child labour, forced labour, discrimination, harassment, and unsafe employment practices.
- Provide workers with a mechanism to raise concerns related to wages, safety, workplace conduct, or welfare without fear of retaliation.

#### **5.4.4 Solid Waste Generation**

Construction activities will generate solid waste including packaging material, wood, steel scrap, concrete waste, broken blocks, surplus soil, plastic wrapping, food waste, and discarded personal protective equipment. If not managed properly, this waste may create dust, block drains, attract pests, cause fire hazards, and negatively affect the appearance and safety of the site.

The impact is temporary and manageable through a dedicated construction waste-management system. Details of waste management are provided under Section 5.2.4.

### **5.5 Operational-Stage Impacts on Physical Environment**

#### **5.5.1 Air Pollution and Indoor Air Quality**

During operation, air emissions may arise from extrusion, moulding, cutting, machining, buffing, polishing, tile cutting or finishing, welding, metal finishing, material handling, forklifts, standby generators, and delivery vehicles. The exact nature and magnitude of emissions will depend on the

final production lines, raw materials, production capacity, fuel use, process controls, and operating hours.

PVC/UPVC and PPR processing may generate heat, minor fumes, and odours if process temperatures are not properly controlled. Cutting, grinding, buffing, polishing, tile finishing, and machining may produce dust, fine particulate matter, or metal particles. Metal finishing and electroplating operations, if included in the final production configuration, may generate acid mist, alkaline mist, metal-containing aerosols, or chemical fumes.

Local exhaust ventilation is an important engineering control because it captures dust, mists, fumes, gases, and vapours at or close to their point of generation, preventing worker inhalation and wider dispersion within the workplace.

Generator emissions may include particulate matter, nitrogen oxides, sulphur dioxide, carbon monoxide, and hydrocarbons. Vehicle movement may also contribute to localized exhaust emissions and dust.

The pre-mitigation impact on workplace air quality is moderate for enclosed production areas, particularly around metal finishing, buffing, polishing, cutting, extrusion, and any electroplating process. With proper engineering controls, preventive maintenance, monitoring, and PPE, the residual impact is expected to be low and manageable.

#### **5.5.1.1 Mitigation Measures**

- Install suitable local exhaust ventilation systems at extrusion, moulding, cutting, grinding, buffing, polishing, welding, tile-finishing, metal-finishing, and other emission-generating workstations.
- Design local exhaust ventilation hoods, ducts, fans, filters, and discharge points to capture contaminants at source before they disperse into the workplace.

- Install suitable filtration, dust-collection, cyclonic separation, bag filters, cartridge filters, wet scrubbers, mist eliminators, activated-carbon filters, or other controls appropriate to the final process emission characteristics.
- Ensure that local exhaust ventilation and pollution-control systems are inspected, tested, cleaned, and maintained at defined intervals.
- Maintain process temperatures within recommended operational ranges to prevent overheating and decomposition of polymer materials.
- Avoid use of uncontrolled open heating, burning, or manual burning of PVC, UPVC, PPR, packaging, scrap, or rejected products.
- Segregate and enclose dust-generating operations such as grinding, buffing, polishing, cutting, and tile finishing where feasible.
- Use wet-cutting systems, dust extraction, or enclosed machinery for tile cutting and grinding, where applicable.
- Provide adequate general ventilation and fresh-air circulation throughout production halls, workshops, warehouses, chemical stores, and staff areas.
- Install suitable stacks for generators, boilers, process vents, and other stationary emission sources, in accordance with approved design and regulatory requirements.
- Use approved fuel and maintain generators, boilers, compressors, forklifts, and vehicles to minimize smoke and emissions.
- Prohibit unnecessary engine idling by delivery vehicles, forklifts, and standby generators.
- Conduct periodic ambient air, indoor air, stack-emission, and workplace-exposure monitoring as required by the EMMP and environmental approval conditions.
- Compare monitoring results with applicable PEQS, occupational-exposure limits, and approval conditions, and implement corrective actions where required.

### **5.5.2 Noise and Vibration**

Operational noise may be generated by extrusion machines, injection moulding equipment, cutting machines, grinders, buffing and polishing units, compressors, pumps, generators, material-handling equipment, forklifts, loading and unloading operations, and vehicle movement.

The primary receptors will be production workers, maintenance staff, warehouse personnel, drivers, visitors, and employees of adjoining industrial units. If noise is not controlled, it may result in hearing impairment, fatigue, communication difficulties, reduced concentration, workplace accidents, and nuisance to nearby industrial operations.

The impact is expected to be moderate within production areas before mitigation but low at the site boundary, provided machinery is properly installed, enclosed, maintained, and operated.

#### **5.5.2.1 Mitigation Measures**

- Select low-noise equipment where technically and economically feasible.
- Install high-noise machinery in enclosed production halls or dedicated acoustic rooms where practicable.
- Provide acoustic enclosures, silencers, mufflers, sound barriers, vibration-isolation pads, and anti-vibration mountings for generators, compressors, pumps, and other high-noise equipment.
- Maintain machinery regularly to prevent noise caused by worn bearings, loose parts, unbalanced rotating components, poor lubrication, or damaged silencers.
- Locate generators, compressors, and high-noise utility equipment away from offices, staff-rest areas, plot boundaries, and neighbouring sensitive locations where feasible.
- Restrict unnecessary vehicle horn use within the facility.
- Establish designated routes and speed limits for forklifts and trucks to reduce abrupt braking, horn use, and collision risk.

- Provide hearing protection, including earplugs or earmuffs, to workers in designated high-noise areas.
- Mark high-noise areas with appropriate warning signs.
- Rotate workers, where needed, to reduce prolonged exposure to high noise levels.
- Conduct periodic workplace and boundary noise monitoring in accordance with the EMMP.
- Maintain occupational noise-exposure records and arrange medical assessment for workers routinely exposed to elevated noise levels.

### **5.5.3 Impact on Water Resources and Wastewater**

Water will be required for domestic use, cleaning, sanitation, cooling where applicable, washdown, tile-related wet processes if included, and metal-finishing or electroplating processes if installed. The project may generate domestic sewage, floor-wash water, equipment-wash water, cooling water, process wastewater, and potentially metal-bearing wastewater from electroplating or finishing operations.

The most significant potential water-related impact is associated with electroplating or metal-finishing wastewater, if such operations form part of the final factory configuration. Electroplating wastewater may contain acids, alkalis, chromium, nickel, zinc, copper, suspended solids, oil, grease, or other contaminants depending on the plating bath and rinsing process. Chemical precipitation is commonly used for removal of metal contaminants from electroplating wastewater, while chromium- and nickel-containing wastewater may require controlled alkaline treatment and separation of metal hydroxide sludge.

Untreated discharge of such wastewater could contaminate soil, groundwater, stormwater drains, or sewerage systems and would constitute a potentially significant environmental risk. Therefore, the pre-mitigation impact is moderate to high where electroplating is undertaken. With segregation, treatment, monitoring, sludge management, and compliant disposal, the residual impact is expected to be low to moderate and manageable.

### **5.5.3.1 Mitigation Measures**

- Confirm the final production process before commissioning and identify all wastewater-generating activities, expected flow rates, wastewater characteristics, and discharge points.
- Segregate domestic sewage, process wastewater, rinse water, oil-contaminated water, cooling water, and stormwater. These streams shall not be mixed without technical justification and treatment design.
- Install an adequately designed Effluent Treatment Plant for electroplating, metal-finishing, chemical cleaning, or other wastewater-generating processes, where applicable.
- Provide dedicated collection tanks, equalization tanks, reaction tanks, settling tanks, filtration units, sludge-dewatering units, monitoring points, and treated-effluent storage as required by the final treatment design.
- For chromium-bearing wastewater, maintain separate collection and treatment where required; hexavalent chromium, if present, shall be reduced to trivalent chromium before precipitation and removal.
- Use pH adjustment, chemical precipitation, coagulation/flocculation, settling, filtration, and other appropriate treatment processes to remove metals and suspended solids.
- Treat nickel-, chromium-, zinc-, copper-, and other metal-bearing wastewater to achieve applicable PEQS or discharge requirements before disposal.
- Install oil and grease traps at maintenance workshops, generator areas, vehicle-washing areas, and other locations where hydrocarbon contamination may occur.
- Reuse treated water for suitable non-potable purposes, such as floor washing, gardening, or cooling, only where technically feasible, safe, and permitted by regulatory requirements.
- Do not discharge untreated process wastewater, plating water, chemical rinse water, oil-contaminated water, or sludge to soil, open drains, stormwater channels, or groundwater recharge areas.

- Provide separate sanitary wastewater treatment or disposal arrangements through sewer connection, septic tank, treatment system, or another approved route.
- Conduct periodic wastewater and treated-effluent monitoring for relevant parameters, including pH, TSS, TDS, COD, BOD, oil and grease, chromium, nickel, zinc, copper, and other process-specific parameters.
- Maintain flow records, treatment-chemical consumption records, monitoring results, sludge-generation records, maintenance logs, and disposal documentation.
- Ensure that the ETP is operated by trained personnel and that standby arrangements are available for critical equipment, pumps, dosing systems, and power supply.

#### **5.5.4 Solid, Recyclable, and Hazardous Waste**

Operational waste generated across the production of the 12 ceramic sanitary ware and tile product types may include unfired greenware scrap, broken ceramic or tile rejects, glaze slurry residues, tile-cutting and edge-polishing dust, spent spray dryer dust, ceramic saggars and kiln furniture fragments, packaging waste, cardboard boxes, wooden pallets, plastic wrapping, office waste, canteen waste, used lubricants, oily rags, batteries, spent air filters, chemical raw material bags and containers, ETP sludge, and wastewater treatment solids.

Plastic, metal, cardboard, packaging, and certain ceramic waste streams may be recyclable or recoverable. However, ETP sludge, spent plating chemicals, chemical residues, contaminated absorbents, used oil, batteries, and certain containers may be hazardous or potentially hazardous and require controlled storage and disposal.

The pre-mitigation impact is moderate because of the potential for hazardous waste and metal-containing sludge. With source segregation, recycling, secure storage, inventory control, and disposal through authorized arrangements, the residual impact is low to moderate.

#### **5.5.4.1 Mitigation Measures**

- Develop and implement an Operational Waste Management Plan before commercial operation begins.
- Segregate waste at source into recyclable plastic, metal scrap, ceramic/tile waste, paper/cardboard, packaging, organic waste, general municipal waste, and hazardous waste.
- Collect clean material and other compatible production scrap separately for controlled in-house reuse or sale to authorized recyclers, subject to product-quality requirements.
- Prevent contamination of recyclable scrap with chemicals, oil, food waste, hazardous materials, or mixed waste.
- Collect metal offcuts, swarf, defective metal parts, and metal packaging for sale or transfer to authorized recyclers.
- Collect ceramic and tile rejects separately; evaluate reuse as aggregate or other approved recovery options where technically feasible.
- Provide covered and labelled bins for office, canteen, and general domestic waste.
- Store cardboard, plastic wrapping, wooden pallets, and packaging waste in dry, covered locations to facilitate reuse or recycling and reduce fire risk.
- Store used oil, spent lubricants, batteries, oily rags, chemical containers, spent absorbents, filters, plating sludge, and other hazardous waste in sealed, labelled, compatible containers placed on an impervious floor with secondary containment.
- Ensure that hazardous-waste storage areas are covered, ventilated, access-controlled, protected from rainfall, and equipped with spill kits, fire extinguishers, and warning signs.
- Do not mix hazardous waste with general waste, recyclable waste, domestic waste, or process scrap.
- Do not burn plastic, packaging, rejected products, oily rags, sludge, or any other waste.
- Maintain a waste register showing waste type, source, quantity generated, storage location, reuse or recycling route, transporter, disposal facility, and date of removal.

- Transfer hazardous waste, ETP sludge, and spent chemicals only through authorized or legally acceptable waste-management arrangements, subject to requirements of EPA Punjab.

### **5.5.5 Resource Consumption and Climate Impacts**

The proposed facility will consume electricity, water, raw materials, packaging material, and fuel for generators or transport. Major energy-consuming equipment may include extrusion lines, injection moulding machines, compressors, pumps, heaters, lighting, ventilation, polishing machines, tile-processing equipment, forklifts, and utility systems.

Electricity consumption and fuel use may contribute indirectly to greenhouse-gas emissions. Resource inefficiency may increase operating costs and environmental footprint. These impacts are expected to be moderate in scale but can be reduced through energy management, efficient equipment selection, preventive maintenance, reuse of suitable materials, and water conservation.

#### **5.5.5.1 Mitigation and Resource-Efficiency Measures**

- Install energy-efficient motors, compressors, pumps, lighting systems, and production equipment where feasible.
- Use variable-frequency drives for suitable motors and pumps.
- Install LED lighting, occupancy sensors, daylight controls, and automatic switching in offices, warehouses, washrooms, and common areas.
- Conduct periodic energy audits to identify energy losses and improvement opportunities.
- Maintain electrical equipment, compressed-air systems, belts, bearings, insulation, and motors to prevent excessive energy consumption.
- Repair compressed-air leaks promptly and avoid unnecessary compressor operation.
- Install water meters at main supply points and major consumption areas.
- Monitor water consumption per unit of production and investigate abnormal increases.

- Reuse clean process scrap, recyclable material, and packaging where product quality and safety allow.
- Assess rooftop solar energy, rainwater harvesting, and treated-water reuse during detailed design or future expansion.
- Maintain fuel-efficient logistics and prohibit unnecessary idling of trucks, forklifts, and generators.

### **5.5.6 Natural and Man-Made Disasters**

The proposed facility may contain combustible polymer materials, packaging materials, chemicals, electrical equipment, generators, transformers, compressed-air systems, hot surfaces, and production machinery. These components create potential risks of fire, electrical shock, explosion, chemical spill, machinery failure, injury, and property damage.

Although the project is not expected to involve high-hazard bulk chemical storage, the fire risk may be significant if plastic scrap, packaging material, fuels, lubricants, chemicals, or electrical installations are poorly managed. The pre-mitigation risk is moderate. With an effective emergency-response system, the residual risk is low to moderate.

#### **5.5.6.1 Mitigation Measures**

- Prepare and implement an Emergency Response Plan covering fire, chemical spill, electrical incident, injury, natural disaster, evacuation, and communication procedures.
- Obtain required fire-safety approval or no-objection certificate from the competent authority before operation.
- Install and maintain fire detection, alarm, hydrant, hose reel, fire-water tank, fire pump, fire extinguisher, emergency lighting, and evacuation systems according to approved fire design and applicable requirements.

- Maintain adequate fire separation between production areas, warehouses, chemical stores, utility areas, generators, transformer rooms, and offices.
- Store combustible materials, plastic scrap, packaging, fuel, solvents, chemicals, and waste in designated areas away from ignition sources.
- Maintain clear access for fire tenders and emergency vehicles.
- Ensure that emergency exits, staircases, corridors, fire doors, electrical panels, hydrants, and assembly points remain unobstructed at all times.
- Conduct periodic fire drills, evacuation drills, first-aid training, spill-response training, and emergency communication exercises.
- Install lightning-protection and earthing systems as required.
- Ensure regular inspection of electrical cables, panels, breakers, transformers, generators, heaters, and machine wiring.
- Enforce hot-work permits for welding, cutting, grinding, or any activity involving sparks or open flame.
- Maintain suitable firefighting equipment near chemical stores, electrical rooms, production areas, warehouses, and loading areas.
- Display emergency contact numbers, evacuation maps, safety instructions, and location of emergency equipment at prominent locations.

## **5.6 Operational-Stage Impacts on Biological Environment**

The project is located within a planned industrial estate and does not contain significant natural vegetation, protected habitats, wetlands, forest land, wildlife corridors, or known breeding habitat for protected fauna. Operational impacts on ecological resources are therefore expected to be negligible to low.

Potential indirect ecological impacts could arise if uncontrolled emissions, dust, wastewater, waste disposal, or accidental spills extend beyond the project boundary. However, these impacts are not

expected if the proposed emission-control, wastewater-treatment, waste-management, housekeeping, and emergency-response measures are implemented.

### **5.6.1 Mitigation and Enhancement Measures**

- Maintain all emission-control systems, dust collectors, filters, ventilation units, and wastewater-treatment facilities in operational condition.
- Prevent discharge of untreated wastewater, chemicals, oil, sludge, or solid waste into open land, drains, or water bodies.
- Maintain greenbelt and landscaping areas within the site using locally suitable, low-water-demand species.
- Avoid unnecessary night lighting directed outside the site boundary.
- Keep waste-storage areas covered and clean to avoid attracting rodents, stray animals, insects, and pests.
- Prohibit hunting, trapping, or deliberate harm to birds, reptiles, and other fauna that may occur in the industrial estate.
- Conduct periodic housekeeping inspections to ensure that no waste accumulation, stagnant water, or food waste creates pest or vector issues.

## **5.7 Operational-Stage Social Impacts and Risks**

### **5.7.1 Occupational Health and Safety of Workers**

Workers may be exposed to occupational hazards during extrusion, moulding, machining, cutting, grinding, buffing, polishing, tile processing, material handling, warehousing, maintenance, welding, electrical work, metal finishing, and electroplating, where applicable.

Potential hazards include exposure to high temperatures, hot surfaces, molten or heated materials, dust, fumes, acid mist, metal aerosols, chemical splashes, noise, vibration, moving machinery, sharp

edges, manual handling, forklift movement, electrical shock, slips, trips, falls, fire, and ergonomic stress.

The occupational health and safety risk is moderate before mitigation, particularly for workers in chemical-handling, metal-finishing, electroplating, cutting, grinding, and high-noise areas. With engineering controls, PPE, training, medical surveillance, supervision, and safe operating procedures, residual risks are expected to be low to moderate and manageable.

#### **5.7.1.1 Mitigation Measures**

- Establish an Environment, Health, and Safety management system before commissioning.
- Appoint a qualified Environment, Health, and Safety Officer with responsibility for implementation of safety procedures, inspections, training, incident reporting, emergency preparedness, and legal compliance.
- Conduct job-specific risk assessments for each production and maintenance activity.
- Develop written standard operating procedures for extrusion, moulding, machining, cutting, grinding, buffing, polishing, tile handling, welding, material handling, chemical handling, electroplating, maintenance, and emergency response.
- Provide appropriate PPE based on risk assessment, including gloves, safety shoes, helmets, safety glasses, face shields, aprons, respirators, earplugs, earmuffs, heat-resistant gloves, chemical-resistant gloves, and fall-protection equipment.
- Provide local exhaust ventilation, general ventilation, machine enclosures, guards, interlocks, emergency-stop systems, and automatic shut-off systems where appropriate.
- Ensure all rotating machinery, belts, pulleys, gears, cutters, presses, and moving components have effective machine guards.
- Implement lockout/tagout procedures before maintenance, cleaning, repair, and servicing of equipment.

- Provide eyewash stations and emergency showers near chemical stores, plating areas, ETP chemical-dosing areas, and other locations where corrosive chemicals may be handled.
- Store plating chemicals, acids, alkalis, cleaners, oils, and other hazardous substances in labelled compatible containers with Safety Data Sheets readily available.
- Conduct periodic occupational health check-ups and medical surveillance for workers exposed to dust, noise, chemicals, heat, or metal-finishing processes.
- Monitor workplace air quality, noise exposure, and chemical exposure where applicable.
- Provide drinking water, clean washrooms, rest areas, meal areas, and hygienic facilities for workers.
- Establish a worker grievance mechanism and encourage reporting of unsafe conditions, near misses, injuries, and health concerns.

### **5.7.2 Community Health and Safety**

The operational project may create indirect community risks through vehicle movement, fire, smoke, uncontrolled waste disposal, accidental chemical release, and poor drainage. Because the project is located in an industrial estate, direct exposure of residential communities is expected to be limited; however, workers of neighbouring facilities, road users, transporters, and visitors remain relevant receptors.

#### **5.7.2.1 Mitigation Measures**

- Maintain boundary walls, controlled access points, security procedures, and warning signage to prevent unauthorized entry.
- Implement vehicle speed limits, designated routes, reversing controls, pedestrian crossings, and loading/unloading procedures.
- Ensure that all waste, scrap, chemicals, and hazardous materials are stored inside designated secured areas.
- Prevent discharge of wastewater or contaminated runoff outside the site boundary.

- Maintain emergency contact information and coordinate emergency procedures with FIEDMC, Rescue 1122, fire authorities, and nearby industrial units.
- Establish a grievance mechanism for neighbours, workers, drivers, and community representatives.
- Investigate and resolve complaints relating to noise, dust, smoke, traffic, waste, drainage, or safety in a timely manner.

### **5.7.3 Employment and Economic Benefits**

The operational phase will create direct employment in production, maintenance, quality control, warehousing, administration, security, transport coordination, environment, health and safety, sales support, and management. The project will also generate indirect employment through suppliers, contractors, packaging providers, recyclers, transporters, maintenance firms, distributors, and service providers.

This is a positive, long-term socio-economic impact. The project should maximize these benefits by recruiting suitably qualified local workers where possible, providing technical training, promoting safe work practices, and ensuring fair employment conditions.

### **5.8 Factory Process Impacts and Risks Matrix**

Table 5.1 presents the principal environmental, occupational health and safety, and social risks associated with the proposed manufacturing operations. The final matrix shall be reviewed and updated before commissioning once final production lines, machinery, chemicals, utilities, and capacities are confirmed.

**Table 5.1: Industrial Process Environmental and Social Impacts/Risks Matrix**

| <b>Process/Activity</b>                                                                                                  | <b>Potential Environmental and Social Impact/Risk</b>                                                                  | <b>Pre-Mitigation Significance</b> | <b>Key Mitigation and Control Measures</b>                                                                                                                                                                                  | <b>Residual Significance</b> |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Raw-Material Receipt, Handling, &amp; Silo Storage (Clays, kaolin, feldspar, quartz, silica sand, glazes, stains)</b> | Fugitive silica dust emissions, raw material spillage, heavy vehicle traffic, noise, manual-handling injuries          | Moderate to High                   | Enclosed unloading bays, pneumatic silo transfer with pulse-jet bag filters, covered storage yards, dust suppression sprinklers, traffic management, designated loading zones, spill kits, mandatory dust masks (FFP2/FFP3) | Low                          |
| <b>Batching, Weighing, &amp; Wet Ball Milling (Slip &amp; Glaze Preparation)</b>                                         | Noise from mill rotation, high water consumption, process wastewater leakage/spills, energy consumption                | Moderate                           | Enclosed ball mill room with acoustic insulation, water recycling loop from ETP, automated batching systems, secondary containment bunds for slurry tanks, preventive maintenance                                           | Low                          |
| <b>Spray Drying (Atomization of ceramic slurry into granules)</b>                                                        | Hot stack gas emissions (dust/particulates), thermal energy consumption (natural gas/LPG), elevated noise levels       | Moderate to High                   | Cyclone separators followed by baghouses for stack emission control, heat recovery systems, burner optimization for PEQS air compliance, acoustic enclosures                                                                | Low                          |
| <b>Tile Pressing (High-pressure hydraulic compaction of greenware tiles)</b>                                             | High mechanical noise, vibration, fugitive dust, oil leaks from hydraulic systems, pinches and mechanical hazard risks | Moderate                           | Hydraulic press enclosures, dust extraction at die cavities, oil spill trays and bunding, LOTO (Lockout/Tagout) systems, machine                                                                                            | Low                          |

|                                                                                                                          |                                                                                                                     |                  |                                                                                                                                                                                         |                 |
|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
|                                                                                                                          |                                                                                                                     |                  | guarding, hearing protection                                                                                                                                                            |                 |
| <b>Slip Casting (Gravity &amp; high-pressure casting of toilets, basins, urinals, bidets, shower trays, accessories)</b> | High water use, clay slurry spillage, plaster/resin mold waste, ergonomic strain from manual demolding/handling     | Moderate         | Recycling of unfired greenware scrap and wash water back into ball mills, mold reconditioning, ergonomic handling aids/hoists, designated slurry recovery drains                        | Low             |
| <b>Drying &amp; Fettling (Finishing and sponge trimming of greenware pieces)</b>                                         | Fine ceramic dust generation, fragile greenware scrap generation, ergonomic risk                                    | Moderate         | Local exhaust ventilation (LEV) at fettling benches, wet sponging techniques, scrap recycling into batching, PPE (dust masks, eye protection), housekeeping                             | Low             |
| <b>Glazing &amp; Digital Inkjet Printing (Applying glaze slurries, engobes, and digital ceramic inks)</b>                | Glaze overspray mist, toxic/heavy metal heavy-metal pigment emissions, glaze slurry wastewater generation           | High             | Automated glaze spray booths with water-curtain scrubbers, recovery and reuse of glaze washings, dry-booth bag filters, enclosed digital printing units, worker PPE                     | Low to Moderate |
| <b>Continuous Kiln Firing (Roller &amp; Tunnel Kilns operating at 1100°C–1250°C)</b>                                     | Stack air emissions high natural gas/LPG consumption, extreme ambient heat, thermal burn risks                      | High             | Efficient multi-stage burners, continuous stack monitoring, flue gas scrubbers for fluoride/acid gas control, waste heat recovery for dryers, thermal insulation, burn safety protocols | Low to Moderate |
| <b>Rectification, Squaring, Edge Grinding, &amp; Polishing (Dimensional sizing of vitrified/porcelain tiles)</b>         | High wet-sludge generation, wastewater with high total suspended solids (TSS), high noise, glass/tile sharp hazards | Moderate to High | Closed-loop water recycling system with sedimentation tanks and filter presses, noise-dampening guards, wet-grinding mist capture, PPE (cut-                                            | Low             |

|                                                                                               |                                                                                                                                        |                  |                                                                                                                                                                                       |                 |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
|                                                                                               |                                                                                                                                        |                  | resistant gloves, eye protection)                                                                                                                                                     |                 |
| <b>Quality Inspection, Water-Flush/Vacuum Testing, &amp; Automated Packaging</b>              | Broken ceramic/tile reject waste, ergonomic strain, forklift collisions, cardboard/plastic wrapping waste                              | Moderate         | Automated planarity laser sorting, 100% recycling of fired rejects into aggregates/brick plants, forklift safety tracks and speed limits, racking standards, waste segregation        | Low             |
| <b>ETP Operation &amp; Slurry Clarification System (Treatment of glaze and clay washings)</b> | High-suspended-solids wastewater, chemical dosing risks (coagulants/flocculants), heavy-metal-bearing sludge generation, overflow risk | Moderate to High | Dedicated ETP/Clarifier with filter press for sludge dewatering, bunded chemical storage, trained operators, online pH/TSS monitoring, secure hazardous/industrial sludge containment | Low to Moderate |
| <b>Utility Operations (Air Compressors, Generators, Boilers, Fuel Storage)</b>                | Stack emissions, diesel exhaust, acoustic noise, fuel spillage, oil-contaminated runoff, fire risk                                     | Moderate         | Acoustic enclosures, high-temperature exhaust stacks, bunded fuel storage tanks, oil-water separators, secondary containment, preventive maintenance                                  | Low             |
| <b>Material Transport, Warehousing, &amp; Dispatch</b>                                        | Heavy truck traffic, exhaust emissions, dust, road safety risks, stacking collapse hazards                                             | Moderate         | On-site traffic management plan, speed limits, covered transport loads, designated loading bays, racking load limits, safety training for forklift operators                          | Low             |
| <b>Facility Maintenance &amp; Workshops</b>                                                   | Used lubricating oil, oily rags, welding fumes, chemical/solvent exposure, electrical hazards                                          | Moderate         | Permit-to-work system, secondary containment for spent oil, welding fume extractors, hot-work controls, lockout/tagout (LOTO), approved                                               | Low             |

|                                                                                             |                                                                                                           |      |                                                                                                                                                                                        |                 |
|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
|                                                                                             |                                                                                                           |      | hazardous waste disposal                                                                                                                                                               |                 |
| <b>Domestic &amp; Staff Sanitation Facilities</b>                                           | Domestic sewage, canteen food waste, general municipal solid waste, hygiene risks                         | Low  | Approved septic tank/soakage pit or dedicated domestic STP, covered waste bins, regular municipal disposal, safe drinking water testing                                                | Low             |
| <b>Emergency Events (Kiln failure, fuel gas leaks, major chemical spills, factory fire)</b> | Burn injuries, severe property damage, air pollution, contaminated firewater runoff, operational shutdown | High | Automated gas leak detectors and shut-off valves, fire detection/hydrant systems, firewater containment, emergency response team (ERT), regular safety drills, clear evacuation routes | Low to Moderate |

## 5.9 Overall Impact Assessment

The proposed project is expected to have mostly low to moderate environmental and social impacts, which are typical of sanitary ware, tile, and allied manufacturing facilities. Most construction-stage impacts will be temporary, localized, and reversible. Key operational risks relate to workplace air quality, noise, wastewater, electroplating or metal-finishing effluent where applicable, hazardous waste, fire safety, chemical handling, and occupational health and safety.

The most environmentally sensitive activity is electroplating or chrome/nickel finishing, if it is included in the final factory design. This process must not commence without installation and commissioning of suitable wastewater-treatment, ventilation, chemical-storage, sludge-management, monitoring, and emergency-response systems. Heavy-metal-containing wastewater requires controlled treatment and sludge handling; chemical precipitation and solid-liquid separation are commonly used methods for removing chromium and nickel from electroplating wastewater.

Subject to implementation of the mitigation measures identified in this chapter and the Environmental Management and Monitoring Plan presented in Section 6, residual impacts of the

proposed project are expected to remain low to moderate, localized, and environmentally manageable.

## 6. ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

### 6.1 General

This section presents the Environmental Management and Monitoring Plan (EMMP) developed to ensure that the mitigation measures identified in Section 5 are effectively implemented throughout the construction and operational phases of the project, and that their performance is periodically monitored and reported.

### 6.2 Objectives of Environmental Management (EMP)

- To ensure implementation of the mitigation measures identified in this EIA.
- To establish a monitoring framework for tracking environmental performance of the project.
- To define institutional responsibility for environmental management at the project site.
- To provide a mechanism for periodic reporting to EPA Punjab and other relevant authorities.

### 6.3 Environmental Management and Monitoring Plan (EMMP)

The EMMP summarized in Table 6.1 sets out the key environmental parameters, mitigation and monitoring measures, monitoring frequency, and responsible parties for the construction and operational phases of the project.

**Table 6.1: Environmental Management and Monitoring Plan (EMMP)**

| Phase / Parameter       | Mitigation & Monitoring Measures                     | Frequency                 | Responsibility  |
|-------------------------|------------------------------------------------------|---------------------------|-----------------|
| Construction - Dust/Air | Water sprinkling, covered transport, PPE for workers | Daily during active works | Contractor / PP |

| Phase / Parameter                      | Mitigation & Monitoring Measures                                               | Frequency                 | Responsibility         |
|----------------------------------------|--------------------------------------------------------------------------------|---------------------------|------------------------|
| Construction Noise                     | - Restrict working hours, maintain equipment                                   | Continuous                | Contractor / PP        |
| Construction Waste                     | - Segregation, licensed disposal of debris                                     | Weekly                    | Contractor             |
| Operation Stack/Ambient Air            | - Exhaust ventilation, filtration, air quality monitoring against NEQS         | Quarterly                 | Project Proponent (PP) |
| Operation - Process Effluent           | Effluent treatment unit, discharge quality monitoring against NEQS/PEQS        | Quarterly                 | PP / HSE Officer       |
| Operation Domestic Wastewater          | - Connection to FIEDMC sewerage network                                        | Continuous                | PP                     |
| Operation Solid/Hazardous Waste        | - Segregation, recycling of plastic/metal, licensed disposal of plating sludge | Monthly                   | PP                     |
| Operation - Noise                      | Acoustic enclosures, hearing protection, equipment maintenance                 | Quarterly                 | PP / HSE Officer       |
| Operation Occupational Health & Safety | - PPE provision, training, medical check-ups                                   | Ongoing / Annual medicals | PP / HSE Officer       |

| Phase / Parameter           | Mitigation & Monitoring Measures                | Frequency          | Responsibility |
|-----------------------------|-------------------------------------------------|--------------------|----------------|
| Operation - Fire Safety     | Fire detection/alarm/hydrant system, drills     | Semi-annual drills | PP / Security  |
| Operation - Tree Plantation | Maintenance of plantation along periphery/roads | Seasonal           | PP             |

#### 6.4 Equipment Maintenance Detail

All process machinery, effluent treatment equipment, fire safety systems and exhaust/ventilation units will be subject to a preventive maintenance schedule, with maintenance records retained on site for inspection by EPA Punjab or FIEDMC as required.

#### 6.5 Plantation of Trees

The project proponent will undertake plantation of suitable fast-growing and low-water-demand tree species, such as Neem and Shisham, along the site periphery and internal roads, both to improve the local micro-environment and to act as a partial buffer against dust and noise.

#### 6.6 Project Impact Evaluation Matrix

**Table 6.2: Project Impact Evaluation Matrix**

| Environmental Component | Construction Phase | Operation Phase | Overall Significance (Post-Mitigation) |
|-------------------------|--------------------|-----------------|----------------------------------------|
| Air Quality             | Minor Negative     | Minor Negative  | Insignificant                          |
| Noise                   | Minor Negative     | Minor Negative  | Insignificant                          |

| <b>Environmental Component</b> | <b>Construction Phase</b> | <b>Operation Phase</b> | <b>Overall Significance (Post-Mitigation)</b> |
|--------------------------------|---------------------------|------------------------|-----------------------------------------------|
| Water Resources                | Negligible                | Minor Negative         | Insignificant with Mitigation                 |
| Soil                           | Minor Negative            | Negligible             | Insignificant                                 |
| Flora & Fauna                  | Negligible                | Negligible             | Insignificant                                 |
| Socio-Economic (Employment)    | Positive                  | Positive               | Significant Positive                          |
| Occupational Health & Safety   | Minor Negative            | Minor Negative         | Manageable with Mitigation                    |

## 6.7 Organizational Capacity & Competency

The project proponent will designate a Health, Safety and Environment (HSE) Officer/Focal Person responsible for overseeing implementation of the EMMP, coordinating environmental monitoring, maintaining compliance records, and liaising with EPA Punjab and FIEDMC on environmental matters.

## 6.8 Training Schedules

**Table 6.3: Training & Capacity Building Programs**

| Training Topic                   | Target Audience              | Frequency          |
|----------------------------------|------------------------------|--------------------|
| General HSE Induction            | All new employees            | At time of joining |
| Fire Safety & Emergency Response | All staff                    | Semi-annual        |
| Chemical Handling (Plating Line) | Plating/finishing line staff | Annual             |
| First Aid                        | Designated staff/security    | Annual             |
| PPE Use & Machine Safety         | Production floor staff       | Annual             |

## 6.9 Schedule of Implementation

The EMMP will be implemented from the commencement of construction activities and will continue throughout the operational life of the project, with mitigation measures and monitoring activities phased in line with the project's construction and commissioning schedule.

## 6.10 Reviewing & Reporting Procedure of EMP/EMMP

The HSE Officer will compile periodic environmental monitoring reports and submit compliance reports to EPA Punjab as required under the terms of the environmental approval. Internal review of the EMMP's effectiveness will be conducted at least annually, with updates made as necessary to reflect changes in production scale or process technology.

## 6.11 Public Disclosure

This EIA report, along with subsequent compliance monitoring reports, will be made available for public review in accordance with EPA Punjab's disclosure requirements.

## 6.12 Environmental Management and Monitoring Cost

**Table 6.4: Environmental Management and Monitoring Cost (Indicative)**

| Item                                              | Indicative Annual Cost (PKR) |
|---------------------------------------------------|------------------------------|
| Effluent Treatment Unit - Operation & Maintenance | 800,000                      |
| Air Quality & Noise Monitoring (Quarterly)        | 300,000                      |
| Water Quality Monitoring (Quarterly)              | 200,000                      |
| PPE Provision & Replacement                       | 500,000                      |
| Fire Safety Equipment Maintenance                 | 250,000                      |
| Tree Plantation & Maintenance                     | 150,000                      |
| Staff HSE Training Programs                       | 200,000                      |
| Total (Indicative)                                | 2,400,000                    |

## 7. PARTICIPATION AND CONSULTATIONS WITH STAKEHOLDERS

### 7.1 General

Stakeholder consultation is an integral part of the EIA process, providing an opportunity for the project proponent to share information about the proposed project and to record the views, concerns and suggestions of relevant stakeholders.

### 7.2 Objectives of Stakeholders Consultations

- To inform stakeholders about the nature and scope of the proposed project.
- To identify concerns and expectations of stakeholders regarding the project.
- To incorporate stakeholder feedback into the assessment and mitigation planning.

### 7.3 Responsibility for Consultations

Consultations were carried out by the study team of Zoom Consultancy & Services on behalf of the project proponent, in coordination with FIEDMC as the estate manager for AIIC.

### 7.4 Stakeholders' Consultations Feedback

**Table 7.1: List of Public/Stakeholder Consultations**

| Stakeholder                   | Mode of Consultation           | Key Points Raised                                                                      |
|-------------------------------|--------------------------------|----------------------------------------------------------------------------------------|
| FIEDMC Representatives        | Meeting/Correspondence         | Confirmed zoning, infrastructure availability and compliance requirements for the plot |
| Neighbouring Industrial Units | Site visit/Informal discussion | No significant concerns raised regarding the proposed manufacturing activity           |

| Stakeholder               | Mode of Consultation | Key Points Raised                                          |
|---------------------------|----------------------|------------------------------------------------------------|
| Project Proponent's Staff | Meeting              | Discussed proposed HSE arrangements and workforce planning |

**Table 7.2: Concerns/Feedback and Redress Strategy**

| Concern/Feedback                                                                      | Redress Strategy                                                                   |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Ensure effluent from the plating process is properly treated before discharge         | On-site effluent treatment unit with periodic monitoring, as detailed in Section 6 |
| Provide employment opportunities to the local workforce where possible                | Priority given to local hiring for suitable positions during recruitment           |
| Maintain good housekeeping and dust control given the developing status of the estate | Dust suppression and general housekeeping measures incorporated into the EMMP      |

## **8. CONCLUSIONS AND RECOMMENDATIONS**

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### **8.1 Conclusions**

This Environmental Impact Assessment was conducted to evaluate the environmental and social impacts and risks associated with the proposed Hui Huang Sanitary Solutions manufacturing facility for allied sanitary and bathroom fixtures at Plot No. 45 & 46-B, AIIC, FIEDMC, Faisalabad. The assessment was based on a review of project documentation, a site reconnaissance and baseline survey, and consultations with relevant stakeholders, and was prepared in accordance with the Pakistan Environmental Protection Act, 1997 and the Punjab Environmental Protection (Review of IEE & EIA) Regulations, 2022.

The study concludes that, given the nature of the proposed manufacturing processes and the project's location within a purpose-built industrial estate, the potential environmental impacts and risks of the project are minor to moderate and can be effectively managed through the mitigation and monitoring measures set out in the Environmental Management and Monitoring Plan. The most significant environmental consideration identified is the proper treatment of process wastewater from the electroplating/finishing line, which is addressed through the proposed on-site effluent treatment unit and periodic monitoring commitments. No significant residual adverse impact on air quality, water resources, ecology or the social environment is anticipated, provided the proposed mitigation measures are implemented as planned.

### **8.2 Recommendations**

- Obtain environmental approval and the requisite No Objection Certificate from EPA Punjab prior to commencement of construction.
- Implement the Environmental Management and Monitoring Plan (Section 6) in full throughout the construction and operational phases of the project.

- Install and commission the effluent treatment unit prior to commencement of the electroplating/finishing operations.
- Designate a dedicated HSE Officer/Focal Person to oversee environmental compliance and coordinate monitoring and reporting.
- Submit periodic environmental compliance monitoring reports to EPA Punjab as required.
- Undertake regular staff training on occupational health, safety and environmental management.
- Maintain ongoing coordination with FIEDMC regarding utility connections, common infrastructure and estate-wide environmental requirements.