



GREAT RICH TECHNOLOGIES SPECIAL FUNCTIONAL FILMS PROJECT

NON-TECHNICAL SUMMARY

CNR-REP-GR-NTS-001

FEBRUARY 2026

(Final)

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Project Owner	Great Rich Technologies Limited
Address	3201 Jarding House, 1 Connaught Place, Central, Hong Kong
Project Title	Annual Production Of 280 Million Square Meters of Designable Nanoporous Materials Project
Project Location	Evrensekiz/Kırklareli
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ABBREVIATIONS AND ACRONYMS

AIIB	Asian Infrastructure Investment Bank
ÇINAR	Çınar Engineering Consulting Inc.
E&S	Environmental and Social
EHS	Environment, Health, and Safety
EIA	Environmental Impact Assessment
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standards
ESYP	Environmental and Social Management System
GIIP	Good Industrial Practices
GRM	Grievance Redress Mechanism
IFC	International Finance Corporation
ILO	International Labor Organization
OHS	Occupational Safety and Health
OHSMP	Occupational Safety and Health Management Plan
OIZ	Organized Industrial Zone
PPE	Personal Protective Equipment
PS	Performance Standards
SEP	Stakeholder Engagemanet Plan
VOC	Volatile Organic Compounds
WB	World Bank
WBG	World Bank Group

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1. INTRODUCTION

1.1. Scope and Purpose of the ESIA

This Environmental and Social Impact Assessment (ESIA) Report has been prepared to evaluate the potential environmental and social risks and impacts of the Great Rich Technologies Project, a greenfield investment for the establishment of a nanoporous materials manufacturing facility in Evrensekiz OIZ, Lüleburgaz, Kırklareli Province. ESIA provides a comprehensive assessment framework to ensure that environmental and social considerations are integrated into the project's planning, design, construction, and operational phases.

The scope of the ESIA encompasses the identification, prediction, and evaluation of potential environmental and social impacts across the project lifecycle, including construction, operation, and decommissioning phases. Key thematic areas of assessment include:

- Land use and soils
- Air quality, noise, and vibration
- Surface and groundwater resources
- Biodiversity and ecosystem services
- Occupational health and safety
- Community health, safety, and security
- Labour and working conditions
- Socio-economic aspects, including livelihoods and affected stakeholders
- Cultural heritage resources

ESIA not only identifies potential adverse impacts but also sets out appropriate avoidance, minimization, mitigation, or compensation measures, along with monitoring and management mechanisms.

The overarching purposes of the ESIA are to:

- Provide decision-makers (regulatory authorities, financiers, project proponents) with the necessary information to make informed decisions on project approval, modification, or rejection.
- Anticipate, prevent, and mitigate potential negative impacts, thereby reducing environmental and social risks throughout project implementation.
- Ensure compliance with applicable national legislation, as well as Good International Industry Practice (GIIP) and relevant international standards, including the IFC Performance Standards (PS1, PS2, PS3, PS4, PS6, PS8) and applicable Environmental and Social Standards under the AIIB Environmental and Social Framework (2024).
- Promote transparency and accountability by disclosing environmental and social implications of the project to stakeholders and the public.

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- Support stakeholder engagement, including meaningful consultation with potentially affected people, disadvantaged and vulnerable groups, and other interested parties, ensuring that their concerns are reflected in project planning.
- Foster conflict resolution and consensus-building through structured consultation and an accessible grievance redress mechanism.

Given the project's potential for moderate but manageable environmental and social impacts, the Nanoporous Materials Project has been classified as a **Category B project** under both the IFC's Policy on Environmental and Social Sustainability (2012) and the AIIB Environmental and Social Framework (2024). This classification underscores the importance of applying a structured environmental and social risk management approach, while acknowledging that impacts are site-specific, largely reversible, and capable of being mitigated through well-designed management measures.

1.2. Structure of the ESIA Report

The ESIA studies have been structured to cover all relevant environmental and social aspects of the Great Rich Technologies Project in a systematic manner. The studies are organized into the following main chapters:

- **Chapter 1 - Introduction:** Provides an overview of the Project, the scope and purpose of the ESIA studies, methodology, area of influence, and study limitations.
- **Chapter 2 – Regulatory Frameworks:** Describes the national legal and institutional context, applicable international conventions, and requirements of international financial institutions such as the IFC Performance Standards and the AIIB Environmental and Social Framework. A gap analysis between national legislation and international standards is also presented.
- **Chapter 3 – Project Description:** Details the project location, components, phases of development (construction, operation, and decommissioning), and project alternatives considered.
- **Chapter 4 – Environmental and Social Baseline, Impact Assessment and Mitigation Measures:** Summarizes baseline conditions of the physical, biological, and socio-economic environments within the project area of influence. The chapter identifies potential environmental and social impacts and proposes corresponding mitigation measures.
- **Chapter 5 – Environmental and Social Management System (ESMS)** Explains the Company's ESMS framework and organizational arrangements for managing environmental and social performance throughout the project lifecycle.
- **Chapter 6 – Cumulative Impact Assessment:** The Cumulative Impact Assessment (CIA) was conducted for the Project followed the methodologies specified by relevant international guidelines. Being one of the most recent and comprehensive documents, the Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (IFC, August 2013) is the primary document for the methodology to be applied in this chapter.
- **Chapter 7 – Stakeholder Engagement:** Provides information on stakeholder identification, consultation activities carried out, issues raised, and how stakeholder input was incorporated into project planning.

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- **Chapter 8 – Grievance Mechanism:** Describes the mechanism for receiving, recording, and resolving grievances from affected communities and other stakeholders, ensuring accessibility and accountability.

1.3. Objectives of the ESIA Studies

The ESIA studies aim to identify, predict, evaluate, and propose measures to prevent or minimize potential environmental and social impacts that may arise during the planning, construction, and operation phases of the Project. The objectives are:

- To assess the baseline environmental and social conditions within the Project's area of influence.
- To identify potential positive and adverse impacts associated with the Project.
- To propose practical and cost-effective mitigation measures to avoid, minimize, or offset adverse impacts while enhancing potential benefits.
- To ensure compliance with national environmental and social legislation as well as international standards and best practices.
- To incorporate the views and concerns of stakeholders, including affected communities, government authorities, and other interested parties, into the assessment process.
- To develop an Environmental and Social Management Plan (ESMP) that provides a framework for monitoring, managing, and reporting environmental and social performance throughout the Project lifecycle.
- To support informed decision-making by providing a comprehensive analysis of the Project's environmental and social implications.

1.4. Scope of the ESIA Studies

The ESIA studies cover all environmental and social components that may be directly or indirectly affected by the Project throughout its lifecycle. The scope has been defined in accordance with national regulatory requirements, relevant international standards, and good industry practices.

Key elements of the scope include:

- **Project Area of Influence:** Assessment of impacts within the footprint of the Project as well as associated facilities, access roads, construction sites, and other areas potentially affected by Project activities.
- **Environmental Baseline:** Collection and analysis of data on climate, air quality, noise, geology, soils, surface and groundwater, biodiversity, and land use.
- **Social Baseline:** Examination of demographic structure, livelihoods, health, education, infrastructure, vulnerable groups, cultural heritage, and community dynamics.
- **Impact Identification and Evaluation:** Analysis of potential positive and negative impacts during pre-construction, construction, operation, and decommissioning phases.

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- **Mitigation and Management Measures:** Development of strategies to avoid, reduce, or compensate for adverse impacts, and to enhance beneficial outcomes.
- **Stakeholder Engagement:** Consultation with affected communities, relevant institutions, and other stakeholders to incorporate their views into the ESIA studies.
- **Cumulative Impacts:** Consideration of the combined effects of the Project together with other existing or planned developments in the region.
- **Environmental and Social Management Framework:** Preparation of an Environmental and Social Management Plan (ESMP) outlining responsibilities, monitoring, reporting, and capacity requirements.

The ESIA studies therefore provide an integrated assessment that supports decision-making and ensures that the Project is developed in an environmentally and socially responsible manner.

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1.5. ESIA Methodology

The methodology for characterizing the environmental and social risks and impacts resulting from the Project's implementation has been formulated based on the frameworks outlined in relevant UK government publications on Environmental Impact Assessment (Institute of Environmental Management and Assessment-IEMA, 2011: The State of Environmental Impact Assessment Practice in the UK; Highways Agency 205/08: Volume 11, Chapter 2 Environmental Impact Assessment and Handbook for Scoping Projects: Environmental Impact Assessment), Scottish Natural Heritage's (SNH) Handbook on Environmental Impact Assessment (2013) and other available guidance documents on impact assessment (Canter, 1993; Standards Association of Australia, 1999, etc.).

According to the best GIIP practices, the significance of impacts will be assessed by considering the overall magnitude of the Project's impact on that particular receptor and the sensitivity of the receptor. The magnitude of the impact will be evaluated utilizing quantitative methods whenever feasible, or alternatively, qualitative approaches primarily relying on professional judgment when quantitative assessment is not feasible. It is important to note that environmental and/or social impacts may vary in their nature, being either beneficial or adverse.

The overall magnitude of impacts will be assessed based on several key components. The magnitude of an impact or effect will be assessed through a comprehensive analysis of criteria, which may include but are not limited to the following:

- Geographical extent (wide, local or restricted)
- Reversibility (long term reversible/irreversible, medium-term reversible or short-term reversible)
- Duration (long term, medium term or short term)
- Frequency (continuous, recurrent, intermittent or one-off/rare)

Criteria for magnitude factors are provided in Table 1-1.

Table 1-1. Magnitude Factors and Scales

Factor	Scales		
	High	Medium	Low
Geographical extent	Wide	Local	Restricted
	Beyond the area of influence	Within the area of influence	Within the project site
Reversibility	Long-term reversible / Irreversible	Medium-term reversible	Short-term reversible
	Reversible after the operation period or irreversible	Reversible within the operation period	Reversible within construction period or after one year of construction period
Duration	Long-term	Medium-term	Short-term
	After the operation period	Within the operation period	Within construction period
Frequency	Continuous/Recurrent	Intermittent	One-off/rare

On the other hand, **the sensitivity of the receptor** will be determined based on comprehensive baseline information, taking into account factors such as public interest, designations, legal requirements, acceptability, sustainability, and any other relevant considerations. Additionally, where applicable, consultation with affected communities will be undertaken to ensure a thorough understanding of the sensitivity of the receptors involved.

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The general criteria for assessing the sensitivity of the receptor and determining the overall magnitude are outlined in Table 1-2. Specific assessments and any methodological variations for individual environmental and/or social components are detailed in the relevant chapters of the ESIA Report.

Table 1-2. General Criteria for Identification of Receptor Sensitivity and Impact Magnitude Levels

Level	Receptor Sensitivity	Impact magnitude	
		Adverse	Beneficial
High	Highly important (national and international scale of importance), high rarity, potential for substitution very limited	Loss of resource and/or quality and integrity of resources; severe damage to key characteristics, features or elements.	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Medium	Moderately important (regional scale of importance) and moderate rarity, potential for substitution limited	Loss of resource, but not adversely affecting integrity; partial loss of/damage to key characteristics, features and elements	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Minor importance (local scale of importance), not rare	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	No or very low importance and rarity	No or very minor loss or detrimental alteration to one or more characteristics, features or elements	No or very minor benefit to or positive addition of one or more characteristics, features or elements

Following the identification overall magnitude of an impact on that specific receptor and receptor sensitivity, the significance of the impact will be determined by using a standard matrix style approach, which consists of a 4x4 matrix. The matrix and general descriptions of each significance level identified in the matrix are provided in Table 1-3.

Table 1-3. Significance Assessment Matrix

		Receptor Sensitivity			
		High	Medium	Low	Negligible
Overall Magnitude	High				
	Medium				
	Low				
	Negligible				
Major		Impacts are considered to be very important and are likely to be material in decision-making, which would be associated with sites or features of international, national or regional importance as well as local importance if the site or feature is subject to a major change. Mitigation measures are imperative to reduce the significance to lower levels before proceeding with the Project.			
Moderate		Impacts are not likely to be key decision-making factors. The cumulative impacts of such factors may influence decision-making, if they lead to an increase in the overall adverse impact on a particular receptor. If possible, impact significance is to be reduced to lower levels by taking mitigation measures; otherwise acceptance of associated risks is required for proceeding with the Project.			
Minor		Impacts may be raised as local factors, which are unlikely to be critical in the decision-making process, but important in enhancing the subsequent design of the Project. Assurance of compliance with standards and safety criteria is sufficient to proceed.			
Negligible		No impact or impacts are beneath the level of perception so that they are acceptable with normal operating procedures.			

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Source: Adapted from IEMA, 2011; UK HA 205/08 Volume 11, Chapter 2; Canter, L., 1993; and other impact assessment methodology guidance/handbooks.

2. IMPACT ASSESSMENT & MITIGATION AND MANAGEMENT MEASURES

2.1. Land Use and Soil

The construction and operation phases of the project have the potential to affect land use and soil quality through activities such as excavation, grading, and movement of heavy machinery. During the construction phase, soil may experience **erosion, compaction, and contamination**, while topsoil may be lost if not properly managed. Excavation and storage of construction materials, along with chemical handling, also pose risks to soil integrity and long-term fertility.

2.1.1. Construction Phase Impacts and Mitigation Measures

The construction phase is expected to have temporary but notable impacts on soil resources. Key risks include the loss of fertile topsoil, mixing of soil layers, and potential contamination from chemicals, fuels, or oils. To mitigate these effects, the following measures will be implemented:

- **Erosion Control:**
 - Temporary silt fences, sediment barriers, and erosion control blankets or geotextiles will be used in exposed areas.
 - Vegetation will be restored as quickly as possible to stabilize soils.
 - Stormwater runoff will be managed with sedimentation ponds, swales, and diversion channels to prevent sediment discharge into surrounding areas.
- **Topsoil Management:**
 - Topsoil will be stripped separately from subsoil, stockpiled in designated areas with slopes not exceeding 45 degrees, and protected from wind and water erosion.
 - Once construction is complete, topsoil will be re-spread to restore soil fertility and support vegetation re-establishment.
- **Compaction Prevention:**
 - Machinery movement will be restricted to designated access routes, and lighter vehicles will be used in sensitive areas.
 - Soil moisture will be monitored to avoid compaction from working on wet soils.
 - Aeration techniques such as deep ripping will be applied where compaction occurs.
- **Chemical Management:**
 - All chemicals, fuels, and hazardous materials will be stored in secure, labelled containers with secondary containment.

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- Spill kits will be available, and personnel will be trained in proper handling and emergency response.
- Waste chemicals will be disposed of according to local regulations, preventing contamination of soil and water.

Additional measures include grading according to natural slope and drainage, establishing drainage systems to prevent flooding, and reinstatement of vegetation to reduce erosion post-construction. Regular maintenance of vehicles and machinery, and compliance with relevant regulations for soil pollution and waste management, are integral to minimizing impacts.

2.1.2. Operation Phase Impacts and Mitigation Measures

During the operation phase, potential soil impacts are primarily linked to chemical spills, leakage from storage tanks, and improper waste handling. Contaminants may include organic solvents, adhesives, coatings, and VOC residues, which, if uncontrolled, could affect both soil and groundwater quality.

Mitigation measures for the operational phase include:

- **Waste Management:** Segregation, secure storage, recycling, and proper disposal of hazardous and non-hazardous wastes.
- **Spill Response and Containment:** Secondary containment systems, spill kits, and trained personnel to promptly address accidental releases.
- **Regular Inspections:** Routine monitoring of storage areas, pipelines, and waste management systems to identify and mitigate risks.
- **Sustainable Land Use Practices:** Periodic soil health assessments, minimal disturbance to surrounding land, and soil restoration where necessary.

2.1.3. Impact Significance and Residual Effects

With proper implementation of the above measures:

- Loss of topsoil, mixing of soil layers, and improper handling of excavation waste are expected to have **minor residual impacts**.
- Erosion potential and short-term soil contamination are reduced to **negligible levels**.
- Natural hazards may still pose some risk, but adherence to disaster-resilient design standards mitigates potential damage.

By combining proactive management strategies during construction and operation, the project will **protect soil resources, maintain land productivity, and ensure sustainable land use**.

2.2.Noise and Vibration

The project's construction and operation phases have the potential to generate noise and vibration, primarily from heavy machinery, construction vehicles, and operational equipment. Noise levels are assessed with respect to the closest settlements, Yenibedir (4.2 km) and Evrensekiz (3.5 km), to evaluate potential impacts on the local community.

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2.2.1. Construction Phase Impacts and Mitigation Measures

During the 9-month construction period, noise will be generated by trucks, excavators, forklifts, and loaders. Calculations based on the most conservative scenario—assuming all machinery operating simultaneously at the same location—indicate the following total noise levels at the settlements:

- **Yenibedir:** 44.06 dB
- **Evrensekiz:** 45.49 dB

These levels are below typical daytime noise limits for residential areas (55 dB) as recommended by the World Health Organization (WHO) and Turkish noise regulations. Nevertheless, mitigation measures are proposed to minimize any potential disturbances:

- Minimize the number of machinery and equipment operating simultaneously.
- Maintain vehicles and machinery regularly to ensure proper working conditions.
- Avoid unnecessary idling of engines and driving construction vehicles through settlements when possible.
- Restrict night-time construction work and keep it to a minimum.
- Use portable noise barriers or buffer zones to reduce sound propagation toward nearby communities.
- Comply with the Regulation on Environmental Noise Control and WBG General EHS Guidelines for noise levels.
- Provide induction and environmental awareness training to all personnel regarding noise reduction practices.
- Notify local communities in advance about construction activities likely to generate noise.
- Implement a grievance mechanism to respond promptly to noise complaints, including corrective actions and measurement if required.
- Provide protective equipment to personnel as specified in the Occupational Health and Safety Law.

These measures ensure that noise impacts during the construction phase are kept **negligible**.

2.2.2. Operation Phase Impacts and Mitigation Measures

During operation, noise generation is expected to be minimal. Equipment such as transformers, inverters, and routine maintenance machinery is designed to operate quietly, and operational activities primarily involve administrative and management tasks. Noise management strategies include:

- Selecting machinery and equipment with low noise levels according to technical specifications.
- Regular maintenance of operational machinery and vehicles to prevent noise from mechanical failures.

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- Architectural and building design emphasizing soundproofing and noise reduction.
- Monitoring and addressing complaints through the project grievance mechanism, including immediate corrective actions.

With these measures in place, operational noise is also expected to remain **negligible**, ensuring minimal disturbance to nearby communities and compliance with national and international standards.

The application of targeted noise mitigation measures during both construction and operation phases effectively controls the potential impacts on Yenibedir, Evrensekiz, and surrounding areas. By combining proper scheduling, equipment maintenance, community engagement, and engineering controls, the project ensures that noise and vibration remain within acceptable limits throughout its lifecycle.

2.3. Air Quality and Greenhouse Gas Emissions

The project has the potential to affect air quality during both the construction and operation phases, primarily through dust generation, exhaust emissions, and volatile organic compounds (VOCs). Impacts are assessed with respect to local communities and occupational health.

2.3.1. Construction Phase Impacts and Mitigation Measures

The construction site covers approximately 37,800 m², with an estimated soil excavation depth of 30 cm, generating roughly 113,400 m³ (≈1,820 tons) of excavation material. Dust emissions during construction are calculated at 0.714 kg/hr, below the 1 kg/hr threshold that requires detailed air quality modeling according to the RCIAR. Key mitigation measures include:

- **Watering:** Regularly wetting the construction site and access roads to prevent dust generation.
- **Dust Control Equipment:** Use of dust suppression systems on machinery and vehicles.
- **Material Handling:** Minimize soil handling during dry conditions; cover transported materials to reduce dust emissions.
- **Traffic Management:** Implement and enforce speed limits for vehicles on unpaved roads.
- **Storage Management:** Cover stored topsoil and maintain temporary storage areas to prevent dust dispersion.
- **Operational Practices:** Reduce vehicle idling, conduct loading/unloading carefully, and operate a minimum number of machinery simultaneously.
- **Regulatory Compliance:** Ensure adherence to Turkish air quality limits and WBG General EHS Guidelines.
- **Community Engagement:** Provide notifications to nearby communities and implement a grievance mechanism to address dust complaints promptly.

With these measures, dust and air quality impacts during construction are considered **negligible**.

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2.3.2. Operation Phase Impacts and Mitigation Measures

During operation, VOCs and dust particles from production processes, material handling, and heating/ventilation systems are the primary air pollutants. Key mitigation measures include:

- **VOC Treatment:** Use of a Regenerative Thermal Oxidizer (RTO) incinerator to thermally oxidize VOC emissions at 800–1000°C, achieving over 99% VOC destruction. Heat recovery is applied to improve energy efficiency.
- **Gas Absorption Systems:** Capture VOCs and other gaseous pollutants from production areas before atmospheric release.
- **Process Management:** Utilize low-VOC materials, improve workspace ventilation, implement closed systems for VOC-emitting processes, and regularly maintain equipment to prevent leaks.
- **Dust Control:** Enclose dust-generating processes and conduct regular cleaning using HEPA-filtered vacuum systems.
- **Waste Gas Management:** Collect and treat emissions from process equipment, cooking fumes, and vehicle exhaust, ensuring compliance with emission standards.
- **Monitoring and Compliance:** Continuous monitoring of emissions ensures alignment with national and international air quality standards, and maintenance personnel promptly address any system malfunctions.

The combined effect of these measures ensures that air quality and greenhouse gas emissions during operation remain **negligible**, protecting both human health and the environment.

Through proactive dust control, VOC treatment, and operational best practices, the project minimizes air quality impacts and complies with national regulations and international guidelines. Both construction and operational emissions are effectively managed, ensuring minimal environmental disturbance and sustainable project performance.

2.4. Climate Change Risk Assessment

The Project site in Kirklareli is expected to experience climate changes in the mid- and far-future, including rising average and extreme temperatures, increased minimum winter temperatures, decreased winter precipitation, and higher frequency and intensity of extreme weather events such as heatwaves, storms, and heavy rainfall. These climate trends have been considered for both construction and operation phases to identify potential climate hazards and their impacts on project components, staff, and surrounding areas.

2.4.1. Construction Phase Climate Risks

Since construction activities are short-term, the assessment focuses on mid-future projections (2040–2059). Climate variables show minor differences between SSP1-2.6, SSP2-4.5, and SSP5-8.5 scenarios. Likelihood and severity of climate hazards are therefore assessed qualitatively. Key findings include:

- **High Summer Temperatures & Heatwaves**
 - **Receptors affected:** Construction equipment, office/welfare facilities, staff.
 - **Impacts:** Engine overheating, reduced productivity, heat-related illnesses.

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- **Mitigation:** Daily inspection and maintenance of machinery, air-conditioned rest areas for workers, proper PPE (cooling vests, headbands), optimized work schedules, and heat stress training.
- **Residual Risk:** Negligible for equipment and offices; low for worker health.
- **Drought / Low Precipitation**
 - **Receptors affected:** Material stockpiles, soil laydown areas.
 - **Impacts:** Increased dust generation, dry soil stockpiles.
 - **Mitigation:** Dust suppression, regular watering, stockpile design minimizing runoff, air quality monitoring.
 - **Residual Risk:** Negligible.
- **Extreme Winds and Storms**
 - **Receptors affected:** Materials, temporary facilities, workers.
 - **Impacts:** Material displacement, unsafe working conditions, potential damage to temporary structures.
 - **Mitigation:** Dust suppression, closed design of facilities, Emergency Response Plan implementation.
 - **Residual Risk:** Negligible for materials/facilities; low for health and safety.
- **Extreme Rainfall / Precipitation Changes**
 - **Receptors affected:** Material stockpiles, machinery, access roads.
 - **Impacts:** Runoff, erosion, waterlogging, restricted access.
 - **Mitigation:** Erosion Control Management Plan, emergency response, site drainage measures.
 - **Residual Risk:** Negligible.

Overall, the embedded mitigation measures and best practices reduce the construction phase climate risks to **negligible or low levels**, ensuring the safety of personnel and protection of materials and equipment.

2.4.2. Operation Phase Climate Risks

For the operation phase, mid-future (2040–2059) and far-future (2060–2079) scenarios were assessed. Key climate risks include:

- **Wildfire Risk (Droughts & Heatwaves)**
 - **Receptors affected:** Buildings, access roads, facilities, staff.
 - **Impacts:** Structural damage, threats to health and safety.
 - **Mitigation:** Fire protection and suppression systems, Emergency Response Plan.
 - **Residual Risk:** High.

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- **Reduced Ice and Frost Days (Warmer Winters)**
 - **Receptors affected:** Machinery, building structures.
 - **Impacts:** Ice shedding/ice throw risks decrease.
 - **Mitigation:** Ice risk assessments, regular maintenance.
 - **Residual Risk:** Negligible.
- **Lightning Risk (Increased Storm Frequency)**
 - **Receptors affected:** Electrical equipment.
 - **Impacts:** Equipment damage, operational interruptions.
 - **Mitigation:** Lightning protection and earthing systems.
 - **Residual Risk:** Negligible.
- **Extreme Rainfall / Flooding**
 - **Receptors affected:** Electrical equipment, staff access.
 - **Impacts:** Equipment failure, restricted access, operational delays.
 - **Mitigation:** Regular monitoring and inspection, Emergency Response Plan.
 - **Residual Risk:** Negligible to low.

Embedded mitigation measures have been incorporated into the design and operational procedures to minimize climate-related risks, and ongoing monitoring will allow for adaptive responses to future climate conditions.

2.5. Water Resources, Water Quality, and Wastewater Management

Water resources at the project site include both surface and groundwater systems, which are vital for human consumption, agriculture, and ecosystem services. The project may influence these resources through water abstraction, wastewater generation, and potential contamination from construction and operational activities. Effective management and treatment of wastewater are essential to protect environmental quality and comply with relevant regulations, including the Water Pollution Control Regulation (Official Gazette, 31.12.2004, No. 25687).

2.5.1. Construction Phase Impacts and Mitigation Measures

Water Use

During the construction phase, approximately 200 workers will be employed. Water demand for personnel is estimated as follows:

- **Personnel Consumption:** 200 workers × 230 L/person/day = **46.0 m³/day**
Drinking water will be supplied via tankers sourced from nearby settlements. An additional **10 m³/day** of water will be used for dust suppression during excavation and soil handling. Water used for dust suppression is largely evaporated and does not contribute to wastewater generation.

Wastewater Generation

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The wastewater from personnel is expected to be **46.0 m³/day**, consisting of domestic sewage with the following approximate pollutant loads:

Table 2-1. Domestic Sewage Approximate Pollutant Loads

Pollutant	Load (kg/day)
BOD ₅	4.5–5.4
COD	7.2–10.26
TOC	2.7–5.4
Total Solids	17–22
Suspended Solids	7–14.5
Chlorides	0.4–0.8
Total Nitrogen	0.6–1.2
Free Ammonia	0.36–0.72
Phosphorus	0.06–0.45

These pollutants will be managed on-site using **leach-proof septic tanks**, designed to accommodate the projected wastewater volume. Septic tanks will be emptied regularly by licensed vacuum trucks and transported to approved treatment facilities, ensuring compliance with environmental standards and protection of soil and groundwater.

Potential Environmental Impacts

- **Surface Water:** Risk of contamination from untreated wastewater, sediment runoff, or accidental chemical spills.
- **Groundwater:** Potential contamination from leaking septic systems or chemical storage areas.
- **Mitigation Measures:** Proper septic system design, regular inspections, buffer zones from water sources, and contingency plans for spills minimize these risks.

2.5.2. Operation Phase Impacts and Mitigation Measures

Water Use

Operational water demand will serve multiple purposes:

- **Domestic Consumption:** 191 employees × 230 L/person/day ≈ **43.93 m³/day**
- **Industrial Use:** Water-based cooling for machinery, coating, and curing processes.
- **Fire-Fighting Water:** Supplied via DN100 galvanized pipes.

Water will be sourced from the municipal network through a DN200 main supply, with pipelines arranged in a ring and radial network configuration to ensure reliable distribution.

Wastewater Generation and Management

Wastewater during operations arises from three main sources:

1. **Personnel Domestic Wastewater** – Managed via on-site septic tanks until municipal connection is established.

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2. **Process Wastewater** – Originating from coating, curing, equipment cleaning, and air pollution control systems, containing adhesives, solvents, VOCs, COD, TSS, and chemical residues.
3. **Stormwater** – Collected separately via site drainage; only initial rainwater may be combined with process water temporarily for reuse.

All wastewater streams will be treated before discharge:

- **Domestic Wastewater:** Sent to the on-site sewage treatment station, disinfected, and discharged to the municipal system.
- **Process Wastewater:** Treated or reused within the facility wherever possible, minimizing external discharge.
- **Monitoring:** Regular water quality monitoring and preventive maintenance ensure compliance with discharge standards.

Potential Environmental Impacts

- **Surface Water:** Untreated or poorly treated wastewater may increase turbidity, COD, nutrient loads, and toxicity to aquatic ecosystems.
- **Soil and Groundwater:** Risk of contamination from chemical spills or leaks.
- **Mitigation Measures:** Advanced treatment systems, separation of clean and dirty water, containment bunds, employee training, emergency spill response plans, and continuous monitoring.

2.6. Resource and Waste Management

2.6.1. Construction Phase Impacts and Mitigation Measures

During construction, various waste materials such as sand, gravel, lime, concrete, and waste bricks will be generated. Improper disposal of these materials can negatively impact the surrounding environment. Additionally, daily activities of construction workers will produce household waste. Proper management of these wastes is essential to avoid environmental and health hazards.

Mitigation Measures:

- Regular site cleaning and prompt collection of construction waste.
- Transport of waste for recycling or approved disposal.
- Avoid long-term accumulation to minimize dust generation.
- Separate collection and regular removal of household waste by the sanitation department.
- Prohibit random piling of waste to prevent rotting, breeding of mosquitoes and flies, foul odors, and the spread of diseases.
- Ensure timely disposal to protect workers' health and the surrounding environment, in line with the Waste Management Regulation.

Potential Impacts of Improper Waste Management:

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- Soil and water contamination.
- Nuisance to the community and occupational health risks.
- Loss of materials suitable for reuse, recovery, or recycling.

Waste Estimates:

Domestic Waste:

- 200 workers during construction.
- Average municipal waste per capita: 1 kg/day (Kırklareli Province, 2022).
- Total waste: 1 kg/day × 200 = 200 kg/day.

Excavation Waste:

- Project area: 37,800 m², excavation depth: 30 cm.
- Excavated material: 113,400 m³ ≈ 1,370 tons

Waste Composition (Construction Phase):

Table 2-2. Waste Composition - Construction

Waste Type	Waste Code	Percentage	Construction (kg/day)
Kitchen	20 03 01	39%	16.35
Paper	15 01 01	3%	1.26
Cardboard	—	6%	2.52
Plastic	15 01 02	14%	5.87
Glass	15 01 07	8%	3.35
Metal	15 01 11	1%	0.42
Garden	20 02 01	5%	2.10
Other	—	17%	7.13

Soil Management:

- **Vegetative Soil:** Temporarily stored in designated areas, covered to minimize dust and nutrient leaching.
- **Excavation Soil:** Segregated stockpiles monitored to prevent contamination, waterlogging, and erosion. Prioritized for reuse (backfilling, landscaping). Non-reusable soil transported to approved disposal sites.

Risks of Improper Soil Storage:

- Dust emissions affecting air quality and health.
- Soil erosion leading to loss of fertile land.
- Water contamination through runoff and leachate.
- Negative impacts on local wildlife and habitat disruption.

Medical Waste:

- Infirmary established for ≥50 employees; 80 personnel planned for construction.

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- Estimated medical waste: 13.8 kg/year, managed per National Regulation on Control of Medical Wastes.

Other Hazardous Wastes:

- End-of-life tyres, waste oils, PPE, solvents, paints, batteries, electrical/electronic equipment.
- Managed according to relevant Turkish regulations (Waste Oil Management Regulation, Control of Waste Batteries and Accumulators, Electrical and Electronic Equipment Control Regulation).

2.6.2. Operation Phase

Industrial Waste:

- Production of car coat films, energy-saving window films, CO2 capturing materials, and VOC adsorption materials generates both hazardous and non-hazardous waste.
- **Non-hazardous waste:** Packaging materials (cardboard, plastic, metal), scrap films and membranes, spent filters, construction and maintenance waste.
- **Hazardous waste:** Used solvents, chemical residues, spent catalysts, waste acids/alkalis, defective products, spent batteries.

Waste Estimates:

- Domestic waste from 191 employees: 191 kg/day.

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Waste Composition (Operation Phase – Domestic):

Table 2-3. Waste Compositin - Operation

Waste Type	Waste Code	Percentage	Operation (kg/day)
Kitchen	20 03 01	44.68%	85.34
Paper	15 01 01	4.26%	8.13
Cardboard	—	4.26%	8.13
Volumed Cardboard	—	4.26%	8.13
Plastic	15 01 02	14.89%	28.45
Glass	15 01 07	9.57%	18.29
Metal	15 01 11	1.06%	2.03
Other	—	17.02%	32.51

Waste Management Measures (Construction & Operation):

- Compliance with national Waste Management Regulations.
- Segregation of hazardous/non-hazardous and recyclable/non-recyclable waste.
- Temporary storage in designated, impermeable, ventilated areas with spill response measures.
- Waste collection agreements with licensed firms or municipalities.
- Official waste declarations submitted to the MoEUCC online system.
- Grievance mechanism in place for corrective actions.

Industrial Waste Management (Operation):

- Development of a project-specific Pollution Prevention and Waste Management Plan.
- Regular inspections and personnel training.
- Implementation of Hazardous Materials and Hazardous Waste Liability Insurance.
- Ensuring zero waste burning, disposal, or burying.
- Centralized management of hazardous waste with clear departmental responsibilities.
- Use of proper labeling, storage, and transport of hazardous materials.
- Adoption of best practices from Chinese operations adapted to Turkish regulations.

OIZ Context:

- OIZ infrastructure will provide centralized wastewater treatment, stormwater management, and solid waste coordination.
- Waste management will follow a structured hierarchy: prevention → reduction → reuse → recycling → disposal.

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2.7. Biological Environment

2.7.1. Demolition and Construction Phase

Potential Impacts

Noise and Air Pollution: Construction equipment and activities may generate noise, dust, and emissions, potentially affecting nearby environments.

Waste Generation: Construction activities may produce solid and hazardous waste requiring proper management.

Impact on Water Resources: Potential contamination of nearby water bodies due to runoff from construction sites.

Biodiversity and Habitat Disturbance: Although unlikely in an industrial zone, any unplanned expansion or operational spillovers could impact nearby habitats. To prevent the introduction and spread of alien invasive species during the demolition and construction phase, key measures include sourcing materials locally and inspecting equipment for contaminants, using native plant species for landscaping, and disposing of organic waste properly. Construction activities should be confined to designated areas.

Mitigation Measures

Air Quality Control: Use dust suppression techniques like water spraying on unpaved roads. Ensure construction equipment is well-maintained to minimize emissions.

Noise Mitigation: Limit construction activities to designated hours. Use noise-reducing equipment and provide acoustic barriers if necessary.

Waste Management: Separate and proper disposal of construction waste. Implement measures for safe handling and disposal of hazardous materials.

Water Resource Protection: Store and manage construction materials to prevent contamination of water bodies. Design drainage systems to prevent runoff into natural water courses.

Biodiversity: to prevent Alien Invasive Species, clean machinery before site entry, use native, certified materials, and restore disturbed areas with native plants. Slow moving animals should be relocated during construction for conservation of biodiversity.

Monitoring and Compliance

- Regularly inspect and monitor environmental controls to ensure effectiveness.
- Train construction personnel on environmental practices and compliance requirements

2.7.2. Operation Phase

Potential Impacts

Noise and Air Pollution: Facility activities generate noise, dust, and emissions, potentially affecting nearby environments.

Waste Management: Operational activities may generate solid and hazardous waste that requires proper disposal and handling.

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Water Pollution: Discharge of untreated or inadequately treated wastewater could impact nearby water bodies.

Mitigation Measures

Noise and Air Pollution: Impact mitigation measures should be effectively implemented, and necessary analyses should be conducted.

Waste Management: Develop a comprehensive waste management plan for proper segregation, recycling, and disposal. Ensure hazardous waste is handled and disposed of following regulatory requirements.

Wastewater Management: Treat wastewater to meet regulatory discharge standards before release. Regularly inspect and maintain wastewater treatment systems.

Monitoring and Compliance

Establish environmental monitoring programs for air, water, noise, and waste to ensure compliance with environmental regulations. Perform regular environmental audits and provide training to staff on best practices in environmental management.

2.8. Socio-Economic and Cultural Environment

2.8.1. Construction Phase

Approximately 200 workers will be employed during the construction phase. Due to its proximity to Lüleburgaz and Çorlu district centers, which are the major districts of the region, no labor influx is expected, therefore no impact is expected on the neighborhoods near the project area.

Since the project area and transportation to the project area do not pass directly through residential areas and 27 thousand vehicles pass daily on the road to be used according to 2023 data¹, there is no increased risk to road safety. However, driver trainings will be carried on preventing accidents.

In addition, stakeholder participation and communication strategies should be developed to maintain transparency and to eliminate community concerns. Stakeholder engagement meetings with local residents should be held in order to provide information about construction activities, potential disorders and measures taken to minimize them. Creating a grievance mechanism (GM) will also allow community members to express their complaints and get quick responses.

2.8.2. Operation Phase

In the operational stage, approximately 191 permanent workers will be employed. Similar to construction phase no labor influx is expected. Labor training programs will be created in order to recruit from local.

The factory will not have adverse impacts on the nearby agricultural lands during the operation phase.

Similar to construction phase, no significant adverse impact is expected on traffic and road safety during the operation phase. However, driver trainings will be carried on preventing accidents.

¹

extension://efaidnbmnnnibpcjpcglclefindmkaj/https://www.kgm.gov.tr/SiteCollectionDocuments/KGMdocuments/Istatistikler/TrafikveUlasimBilgileri/23TrafikUlasimBilgileri.pdf

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However, to maintain transparency and to eliminate community concerns, regular reports on the environmental and social performance of the factory in Turkish will be disclosed on the website of the company. The grievance mechanism (GM) will also allow community members to express their complaints and get quick responses.

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3. ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)

The Environmental and Social Management System (ESMS) for the Project is a structured framework designed to identify, assess, and manage the environmental and social risks and impacts associated with the Project. It provides a systematic approach to ensure compliance with applicable laws, standards, and best practices, while promoting sustainable and socially responsible operations. The ESMS integrates environmental and social considerations into decision-making processes, aligns Project activities with broader sustainability goals, and enhances stakeholder confidence.

The system is built on the principles of prevention, mitigation, and continuous improvement, addressing both direct and indirect impacts across the Project lifecycle—from planning and construction to operation and decommissioning. It ensures the effective management of key aspects, including biodiversity conservation, resource efficiency, waste management, community engagement, worker health and safety, and grievance mechanisms.

By providing a clear and organized approach to managing environmental and social aspects, the ESMS reduces risks, improves Project outcomes, and aligns with the expectations of regulators, investors, and communities.

3.1. Organizational Responsibility

Great Rich Technologies Limited (GRT) is responsible for the overall environmental and social performance of the Project, including the technical performance of contractors and subcontractors. The company will establish an effective organizational structure to ensure smooth implementation and adherence to the environmental and social management requirements outlined in the Environmental and Social Impact Assessment (ESIA).

Organizational structure:

- **HR & Administration Department (HR Expert):** Responsible for labor and working conditions, including the Workers' Grievance Mechanism.
- **Safety and Environmental Protection Department Department (under General Manager):** Responsible for all other social aspects and environmental and occupational health and safety (OHS) aspects. Oversee ESMP implementation, monitor environmental performance, and ensure compliance with ESIA commitments, national legislation, and international standards. Ensure contractor compliance with the Occupational Health and Safety Management Plan (OHSMP) and maintain a safe working environment.
- **Information Department (Corporate Communications and Public Relations Specialist) :** Implement the Stakeholder Engagement Plan (SEP), manage community concerns, and mitigate potential social impacts.

The Client ensures that tender documents for construction include environmental and social (E&S) specifications aligned with IFC requirements. Contractors are responsible for implementing mitigation measures outlined in the ESIA during construction, appointing their own E&S and OHS personnel, and maintaining compliance with national and international standards. Non-conformities will be recorded, communicated, and corrective actions promptly implemented.

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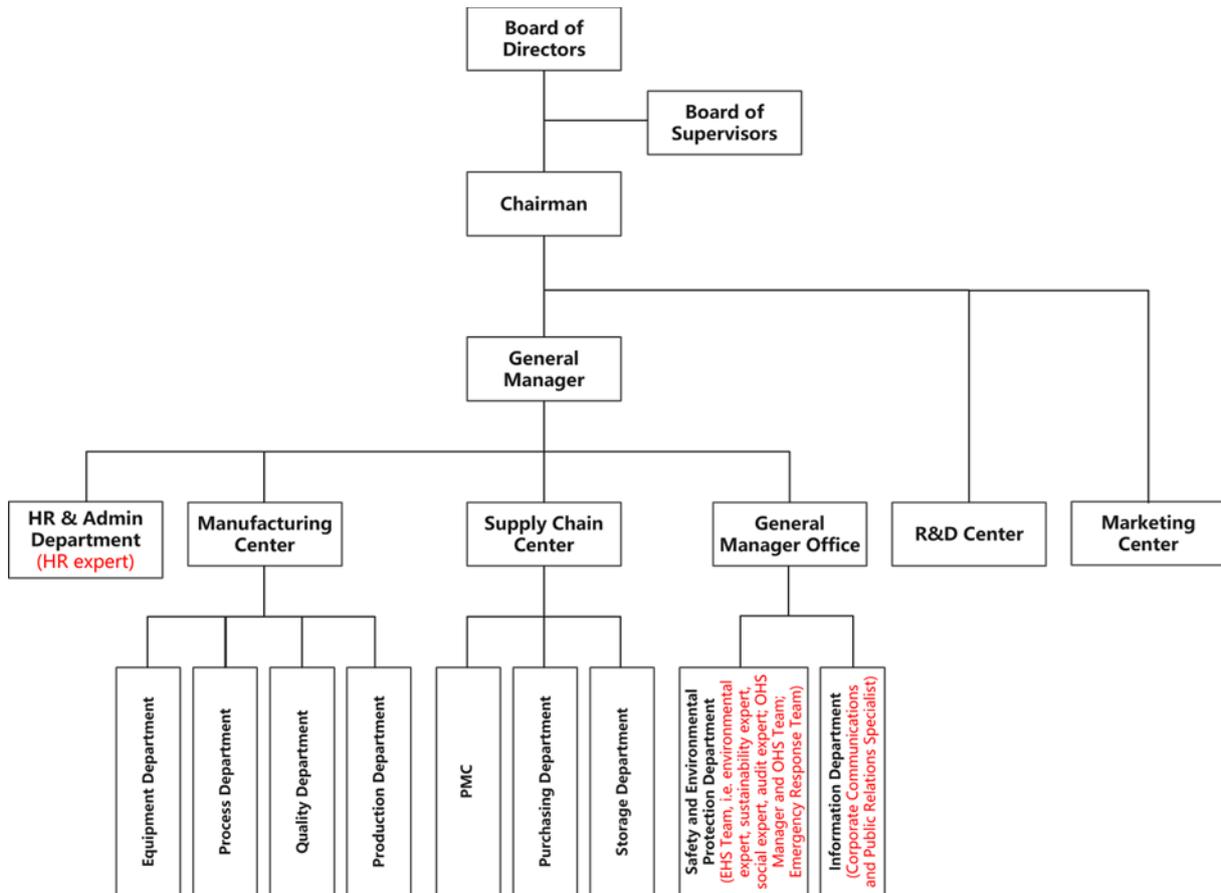


Figure 3-1. Organizational structure of Great Rich Technologies Limited

3.2. Environmental and Social Management System

GRT will establish an ESMS proportionate to the Project's environmental and social impacts. The system aligns with Good International Industry Practices (GIIPs) and the scale of the Project. It will be regularly monitored and updated to maintain effectiveness in managing environmental and social risks.

Sub-management plans supporting the ESMS will be developed for construction and operation phases (Section 5.3 of the ESIA Report). The Company will integrate ISO standards (ISO 9001, ISO 14001, ISO 45001, IATF 16949, T/AITRE 10003) to ensure high-quality environmental, social, and safety performance. GRT also possesses comprehensive testing and laboratory analysis capabilities for thorough evaluation of Project aspects.

3.3. Environmental and Social Mitigation Plan

The Environmental and Social Mitigation Plan outlines measures to prevent, minimize, or mitigate adverse effects on the environment and communities. Key elements include:

- **Air Quality Management:** Dust control via water spraying, barriers, and other measures.
- **Waste Management:** Proper separation, collection, recycling, and disposal of waste per regulations.

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- **Water Resource Management:** Monitoring water usage and ensuring treated wastewater meets regulatory standards.
- **Noise and Vibration Control:** Use of sound barriers, machinery maintenance, and limiting work near sensitive receptors.
- **Biodiversity Conservation:** Protecting wildlife and ecosystems, habitat restoration, and replanting.
- **Community Health and Safety:** Health protocols, emergency response plans, and traffic management.

Contractor ESMP (C-ESMP) will include:

- Pollution Prevention and Waste Management Plan (PPWMP)
- Occupational Health and Safety Management Plan (OHSMP)
- Emergency Preparedness and Response Plan (EPRP)
- Labor Management Plan (LMP)
- Worker Accommodation Plan (if applicable)
- Chance Finds Procedure (CFP)

During operation, the Client will implement and update:

- PPWMP, OHSMP, EPRP, LMP
- Stakeholder Engagement Plan (SEP)

Mitigation measures will be regularly reviewed and updated based on monitoring results.

3.4. Environmental and Social Monitoring Plan

The Environmental and Social Monitoring Plan (part of the ESMP) outlines procedures for tracking the effectiveness of mitigation measures and overall Project performance. Key components include:

- **Air and Water Quality Monitoring:** Regular sampling to ensure compliance with regulations.
- **Waste Management Monitoring:** Track generation, disposal, and recycling rates.
- **Occupational Health and Safety Monitoring:** PPE inspections, safety compliance, and accident reporting.
- **Community Engagement and Social Impact Monitoring:** Evaluate grievance mechanism and stakeholder consultation effectiveness.
- **Biodiversity and Ecosystem Monitoring:** Periodic assessment of biodiversity and ecosystems.

Monitoring will be carried out by environmental and social teams, with regular reporting to management for prompt issue resolution.

3.5. Training

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Training ensures all personnel, contractors, and stakeholders understand their environmental and social responsibilities. The program includes:

- **Environmental Awareness:** Waste management, pollution prevention, resource conservation.
- **Social Responsibility:** Community engagement, human rights, labor conditions.
- **Health and Safety Training:** Safe work practices, PPE use, accident prevention.
- **Emergency Response Training:** Drills for workers and local communities for effective emergency response.

Training will occur at project initiation and at regular intervals, with specialized training for key personnel as needed.

3.6. Reporting

The Project will implement a robust reporting system to track environmental and social performance:

- **Monthly Progress Reports:** Compliance with ESMP, monitoring results, corrective actions.
- **Environmental and Social Audits:** Assess compliance with national laws, international standards, and ESMP.
- **Incident and Non-Conformity Reporting:** Document accidents, pollution events, and deviations; outline corrective measures.
- **Stakeholder Reporting:** Periodic updates to communities and regulators on Project performance, engagement, and grievances.

Reporting ensures transparency and keeps all stakeholders informed of environmental and social performance.

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