

Financing Mitigation and Adaptation Projects (FMAP) in Indian MSMEs Programme

Environmental & Social Impact Assessment [ESIA] and Environmental & Social Management Plan [ESMP]

Direct Financing Foundry Sector

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In consultation with Green Climate Fund (GCF)**



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Section 1:

1. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

1.1 Executive Summary

1.1.1 Overview of the sector related to project activities and its objective

India is the second largest producer¹ of castings in the world, with an annual production of approximately 15.16 million metric tons in 2023–24, marking a growth of about 7% over the previous year. The industry comprises around 5,000 foundry units spread across major clusters, serving diverse sectors such as automotive, engineering, agriculture, and infrastructure. This sector plays a critical role in India's manufacturing ecosystem, supplying essential components for both domestic and global markets.

Industry Structure and Key Statistics: ²The Indian foundry industry generates an estimated USD 21 billion in revenue and provides employment to nearly 2 million people (including 0.5 million direct and 1.5 million indirect jobs). It produces various types of castings such as Grey Iron, Ductile Iron, Steel, Malleable Iron, and Non-ferrous castings. End-user segments include automotive (32%), industrial machinery (7%), pipes & fittings (9%), agriculture machinery (8%), railways (6%), pumps & compressors (5%), valves (4%), electrical equipment (3%), power (5%), and sanitary (8%). The sector also recorded exports worth USD 4.11 billion in 2023–24, highlighting its global competitiveness.

Growth Drivers and Opportunities: The industry's growth is driven by rising demand in automotive, infrastructure, and engineering sectors, supported by government initiatives like Make in India and technology upgradation schemes. Foundries are increasingly adopting modern practices such as energy-efficient melting systems, automation, and digital simulation to improve productivity and sustainability. With strong domestic demand, export potential, and continuous modernization, the Indian foundry sector is well-positioned to maintain its global standing and contribute significantly to India's manufacturing growth.

MSME in India stands for Micro, Small, and Medium Enterprises. These are businesses categorized based on their investment in plant and machinery/equipment and annual turnover. The MSME classification applies to both manufacturing and service industries. The classification is based on:

- **Investment in Plant & Machinery** (not land/building)
- **Annual Turnover**

All amount in Indian Rupee (₹)		
Category	Investment Limit	Turnover Limit
Micro	Up to ₹2.5 crore	Up to ₹10 crore
Small	Up to ₹25 crore	Up to ₹100 crore
Medium	Up to ₹125 crore	Up to ₹500 crore

This helps industries access priority lending, government schemes, and subsidies.

¹ Profile of Indian Foundry Industry: - By IIF-Foundry Informatics Centre, New Delhi https://foundryinfo-india.org/profile_of_indian.aspx

² Profile of Indian Foundry Industry: - By IIF-Foundry Informatics Centre, New Delhi https://foundryinfo-india.org/profile_of_indian.aspx

Environmental & Social Impacts of the Foundry Sector

The Indian foundry sector faces persistent environmental and social challenges due to energy-intensive processes, air emissions, waste generation, and occupational hazards across operations. The predominance of micro, small and medium enterprises (MSMEs) and high levels of informal employment amplify these impacts.

Key Environmental Issues

- ✚ **High Energy Use & Emissions:** Foundry operations such as metal melting and heat treatment are highly energy-intensive and rely largely on fossil fuels. Inefficient furnaces and limited adoption of energy-efficient technologies contribute to elevated greenhouse gas and air pollutant emissions.
- ✚ **Air Pollution:** Emissions from melting, sand handling, pouring, and finishing processes include particulate matter, silica dust, metal fumes, and combustion gases. Many small foundries lack adequate air pollution control systems.
- ✚ **Water Use & Wastewater:** Water is used for cooling, quenching, and pollution control. Wastewater containing oil, grease, and suspended solids is often inadequately treated, particularly in smaller and informal units.
- ✚ **Solid & Hazardous Waste:** Significant quantities of used foundry sand, slag, and refractory waste are generated. While some material is reused, improper disposal remains common, posing risks to land and groundwater.

Key Social Issues

- ✚ **Occupational Health & Safety Risks:** Workers are exposed to extreme heat, molten metal, dust, fumes, and noise, leading to respiratory illnesses, burns, and injuries. Use of personal protective equipment (PPE) remains inconsistent.
- ✚ **Working Conditions:** Long working hours, manual handling, and physically demanding tasks are prevalent, especially in unorganized units with poor shop-floor layouts and ventilation.
- ✚ **Informal Employment & Social Protection Gaps:** A large share of the workforce is informal or contractual, with limited access to social security, health benefits, and grievance redressal mechanisms, increasing vulnerability.
- ✚ **Skills & Training Gaps:** Limited access to structured training on safe operations, modern technologies, and environmental compliance constrains productivity and worker well-being.

Addressing these challenges requires coordinated action by statutory bodies, industry associations, financial institutions, and worker organizations, with a focus on cleaner technologies, improved occupational safety, capacity building, and formalization to support a sustainable and responsible MSME-dominated foundry sector in India.

Foundry Clusters in India:^{3,4}

India's foundry industry is organized into regional clusters, each specializing in particular casting types and end-use markets:

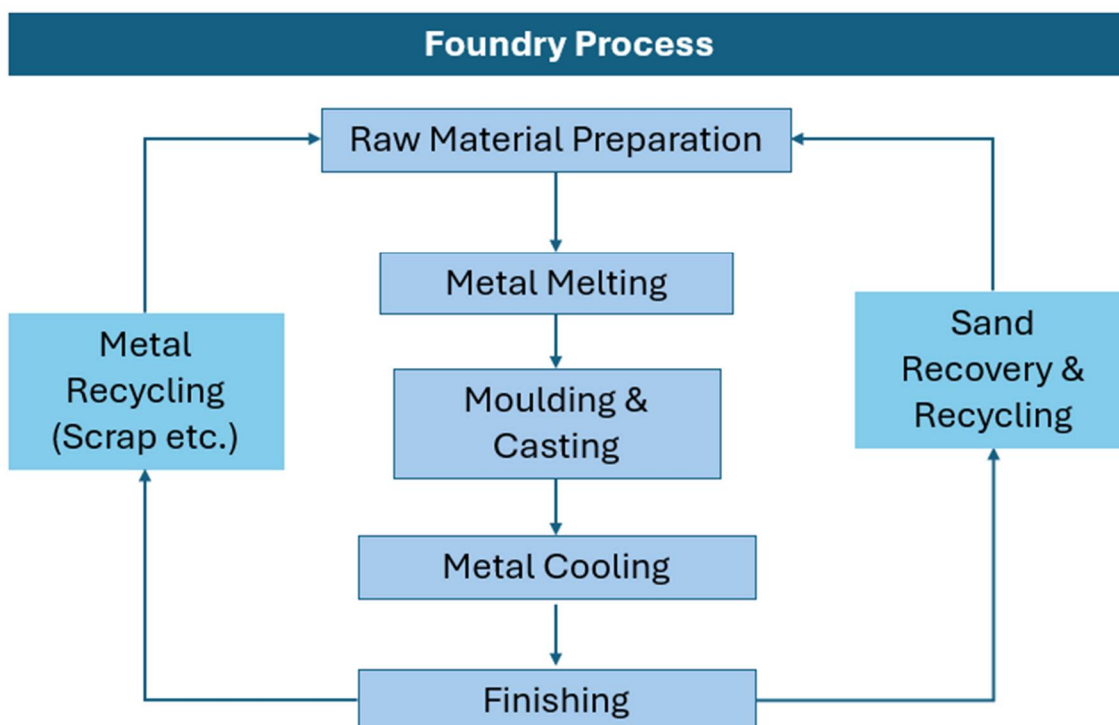
³ International Foundry Association (IFA), "IFA Profile on Foundry", <https://www.ifa.org.in/ifa-profile.html>

⁴ Bureau of Energy Efficiency (BEE), "Sector Detail- Foundry", BEE, <https://sidhiee.beeindia.gov.in/AboutUs/foundry>

1. **Howrah (West Bengal):** Howrah cluster is the oldest and largest foundry hub in India, established around 1940. The cluster specializes in general engineering castings, machinery parts, valves, and pump bodies. To modernize operations, a Foundry Park project is being developed, aimed at attracting investments and generating thousands of direct and indirect jobs.
2. **Coimbatore (Tamil Nadu):** Coimbatore, popularly known as the “Pump City of India,”. The cluster is renowned for producing pump-set castings, textile machinery parts, and engineering components. With a strong base of small and medium enterprises, Coimbatore’s foundry industry is highly export-oriented and plays a vital role in supporting both domestic and international markets.
3. **Kolhapur (Maharashtra):** Kolhapur has emerged as a major hub for automotive castings, particularly engine blocks, cylinder heads, and brake components. The cluster supports industries in Pune and Mumbai, making it strategically important for the automotive supply chain.
4. **Belgaum (Karnataka):** Belgaum specializes in automotive castings closely linked to the Pune auto industry. The cluster produces precision iron and steel castings for original equipment manufacturers (OEMs).
5. **Rajkot (Gujarat):** Rajkot is a prominent cluster focused on diesel engine castings and agricultural machinery parts. Its proximity to ports provides a strong advantage for exports, making it an important contributor to India’s casting exports. The cluster has a strong presence of SMEs and is gradually embracing automation to enhance productivity and competitiveness.
6. **Batala & Jalandhar (Punjab):** Batala and Jalandhar are traditional foundry hubs in northern India, known for producing grey iron castings, machine tools, and agricultural implements. These clusters are characterized by numerous small-scale units that primarily serve domestic markets. While they are recognized for low-cost production, modernization in these regions remains limited compared to other clusters.

Note: The above cluster list is indicative and not exhaustive; additional clusters could be added by the Accredited Entity (AE) for funding under FMAP Programme.

1.1.2 Process in Foundry Industry in Indian Setup



1.1.3 Purpose of the ESIA and its scope.

The Environmental and Social Impact Assessment (ESIA) has been developed as a programme - level assessment to evaluate and disclose potential environmental and social risks associated with MSME sub-projects financed under **the Financing Mitigation and Adaptation Projects (FMAP) in Indian MSMEs Programme**. It complements SIDBI's screening and due diligence process under its Environmental and Social Management System (ESMS) [approved by GCF Board] and ensures consistency with the Green Climate Fund (GCF) Environmental and Social Standards (ESS).

In line with ESMS procedures, all proposed sub-projects are first screened against the Exclusion List (Annexure 1) to confirm eligibility. Eligible projects are then assessed for compliance with SIDBI's Environmental and Social Management Policy which is in alignment with IFC Performance Standards. Applicants are required to submit the Environmental and Social Due Diligence (ESDD) form (Annexure 2), followed by project appraisal. During project appraisal, financial ratings of the MSME borrowers are carried out using the respective credit rating model / tool adopted by the organization alongside the Environmental Social and Governance (ESG) rating/ ESDD format. The project appraisal is carried out after carrying out project site assessments to confirm risk categorization and safeguard requirements under FMAP Programme. ESIA/ESMP shall only be applicable for **Category B projects**. The definitions of **Category B** and **Category C** projects are mentioned below.

- **Category B projects** involve technology or process changes that may result in moderate, site-specific, and reversible impacts, such as water discharge, air emissions, chemical and waste handling, energy use, and occupational health and safety concerns. These impacts must be carefully assessed and managed through structured mitigation planning or involve technology

or process where risks and impacts are considered limited, and the magnitude is expected to be low to moderate. The risks and impacts are few in number, contained within the footprint of the activities, largely reversible, and readily mitigated through generally accepted mitigation measures and good international industry practices.

- **Category C projects** involve low-risk efficiency improvements or equipment upgrades that do not alter manufacturing chemistry or increase pollution loads and therefore present minimal potential for adverse environmental or social effects or Category C activities are typically those that have no physical elements or defined footprints. However, in certain contexts, activities that have physical elements or a footprint may also be considered as low risk, particularly where the activities are small-scale, undertaken within an already built environment, do not involve physical and economic displacement of people or have minimal or no adverse impacts on indigenous peoples.

By providing a structured assessment framework, this ESIA enables the FMAP Programme to evaluate Category B interventions - identifying, analyzing, and mitigating potential environmental and social impacts - while also validating the low-risk nature of Category C projects. This ensures full alignment with SIDBI's ESMS (aligned with IFC Performance Standards), and the GCF Environmental and Social standards.

This ESIA and ESMP are applicable across diverse industrial activities and processes within the **foundry sector, covering various MSME clusters in India**. These frameworks define pathways for classifying risks, evaluating the implications of mitigation technologies and adaptation investments, and establishing a transparent, standardized basis for environmental and social risk management under the FMAP.

Linkage with GCF

The **FMAP Programme** supports projects that reduce greenhouse gas emissions and enhance climate resilience. MSMEs in the foundry industry can avail assistance under GCF-FMAP Programme for any of the following project types:

A. Mitigation

- **Energy Efficiency Projects:** Example- Retrofitting / replacing / upgrading EE machinery / interventions / process optimization, and waste heat recovery to reduce energy consumption.
- **Renewable Energy Integration:** Example- Installation of solar panels / solar water heater in manufacturing units for captive use / Renewable Energy Service sector enterprises that sell solar / wind power to the manufacturing enterprises.
- **Green Mobility & Logistics:** Example- 2 Wheelers, 3 Wheelers, 4 Wheelers, E-buses, E-trucks, charging infrastructure and battery swap.
- **Waste to Energy:** Example- Setting up Waste to Energy projects for generation of Biogas/ BioCNG/ Power/ producer or syngas from urban, industrial and agricultural wastes/residues.

B. Adaptation:

- **Water-efficient technologies:** Example- Wastewater / Effluent treatment / ZLD/ Rainwater harvesting systems, surface water storage units, stormwater management equipment and aquifer recharge solutions for drought-prone areas.
- **Climate-resilient materials:** Example-Green Buildings using locally suited, durable materials for housing and infrastructure to withstand extreme weather.

- **Manufacturing Climate innovation related products:** Example- Innovative and locally suited technologies aimed increasing climate adaptation.
- **Supplying alternative raw materials for those that are at risk from climate change:** Example- Aiding MSMEs who are the suppliers to bigger industries manufacturing technologies to enhance adaptive capacity of end beneficiaries.

1.1.4 Objectives of the ESIA:

The key objectives of this ESIA are to:

- Provide a programme-level framework for environmental and social risk assessment of MSME sub-projects under FMAP Programme.
- Ensure compliance with SIDBI's ESMS, IFC Performance Standards, and GCF Environmental and Social Standards.
- Identify and categorize potential risks associated with Category B and Category C projects.
- Establish mitigation measures and safeguard requirements for Category B interventions.
- Validate the low-risk nature of Category C projects to streamline approval and implementation.
- Promote transparency and accountability in environmental and social risk management across MSME sectors.

1.1.5 Scope of the ESIA:

The scope of this ESIA covers:

- MSME sub-projects financed under the FMAP Programme in India viz., (i) Brownfield projects set up by an existing enterprise within its existing industrial premises, (ii) Brownfield enterprises going for expansion and modernization of their existing operations in a new location / premises; and (iii) Greenfield projects i.e., setting up of new enterprises.
- Environmental risks such as emissions, effluents, waste management, energy use, and resource efficiency.
- Social risks including occupational health and safety, community impacts, and labor practices.
- Screening, categorization, and appraisal processes consistent with SIDBI's ESMS and GCF ESS requirements.
- Programme-level analysis to guide project-specific assessments and safeguard planning.

1.1.6 Summary of key Environmental and Social Risks.

The foundry sector is a critical part of India's manufacturing value chain, supplying essential cast components to multiple industries. However, it is also associated with significant environmental and social risks, particularly due to energy-intensive operations, material handling, and occupational exposure.

Foundry processes such as metal melting, pouring, molding, and heat treatment require substantial energy inputs, largely sourced from fossil fuels, contributing to greenhouse gas emissions and air pollution. Emissions of particulate matter, silica dust, metal fumes, and combustion gases can adversely affect ambient air quality, especially where pollution control systems are inadequate. The sector also generates large quantities of solid waste, including used foundry sand, slag, and refractory waste, which pose risks to land and groundwater if not properly managed. Water used for cooling, quenching, and process control may become contaminated with oil, grease, and suspended solids, and improper treatment or disposal can affect local water resources.

On the social side, foundry workers are exposed to high temperatures, molten metal, dust, fumes, and noise, leading to risks such as respiratory illnesses, burns, heat stress, hearing loss, and musculoskeletal disorders. Manual handling of heavy materials, physically demanding tasks, and machinery operation increase the likelihood of workplace injuries, particularly in smaller MSME units with limited safety infrastructure. Use of personal protective equipment (PPE) and access to occupational health monitoring remain inconsistent. Indirect impacts on surrounding communities may also arise from air emissions, waste disposal, and noise, extending the sector's footprint beyond factory premises.

1.1.7 Key mitigation measures and recommendations:

To address these challenges, the foundry sector can adopt a more balanced and forward-looking approach that safeguards both the environment and people:

- **Energy Efficiency & Cleaner Fuels:** Promote adoption of energy-efficient furnaces (e.g., induction furnaces), waste heat recovery systems, and gradual transition to cleaner fuels and renewable energy sources to reduce emissions.
- **Air Pollution Control:** Install and maintain appropriate air pollution control devices such as bag filters, wet scrubbers, and dust extraction systems to control particulate matter, fumes, and gaseous emissions.
- **Water & Waste Management:** Encourage water recycling and closed-loop cooling systems, proper treatment of wastewater, and safe handling and reuse or disposal of used foundry sand, slag, and refractory waste.
- **Occupational Health & Safety:** Strengthen use of personal protective equipment (PPE), improve ventilation and shop-floor layout, and provide regular training on safe handling of molten metal, machinery, and hazardous materials.
- **Community Safeguards:** Monitor and manage noise, emissions, and waste disposal, and maintain robust fire safety and emergency preparedness measures to protect surrounding communities.
- **Technology Upgradation & Capacity Building:** Support modernization through improved process controls, mechanization, and capacity-building programs for MSMEs to enhance compliance, productivity, and worker safety.

Note: (large list is described in the process wise section 1.3)

1.2 Risk categorization Methodology

The methodology adopted for the ESIA is based on a systematic and participatory approach, ensuring the involvement of all relevant stakeholders and partners associated with the FMAP Programme. With the support of administrative bodies, local authorities, industry associations, and MSME representatives, the study was conducted in a consultative manner to promote transparency and broad dissemination of information regarding the programme's objectives and potential impacts.

Risk categorization methodology tailored for SIDBI–GCF ESIA/ESMP screening of foundry MSMEs in India.

- **Low:** Limited, site-specific impacts; easily mitigated; compliant is categorized as C.
- **Moderate:** Manageable with standard measures; no significant legacy issues are categorized as B.

- **High:** Significant, diverse, or irreversible impacts; cumulative cluster impacts; resettlement/land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance; major legal non-compliance; sensitive receptors affected is categorized as A. **Under the programme, Category A projects are not covered.**

Key steps in the methodology include:

- **Stakeholder Consultations:** Structured discussions were held with MSME owners, workers, local communities, and sectoral experts to capture diverse perspectives on environmental and social risks, benefits, and concerns.
- **Documentary Review:** Existing policies, regulatory frameworks, sectoral studies, and SIDBI's ESMS procedures were reviewed to ensure alignment with national standards, IFC Performance Standards, and GCF Environmental and Social Standards.
- **Portfolio Data Review:** Technical, financial, and environmental data from SIDBI's previous portfolio assets (earlier loan cases) were analyzed to identify patterns of risk, performance outcomes, and mitigation effectiveness. This evidence base provided valuable insights into sector-specific challenges, compliance trends, and the practical feasibility of proposed interventions.
- **Site Assessments:** Field visits and site-level assessments were conducted to validate information provided in the Environmental and Social Due Diligence (ESDD) forms and the ESG Screening Sheets, ensuring accurate categorization and safeguard planning.
- **Risk Analysis and Mitigation Planning:** Environmental and social risks were analyzed for Category B interventions, focusing on emissions, effluents, waste management, energy use, and occupational health and safety. Mitigation measures were identified to ensure impacts remain moderate, site-specific, and reversible.
- **Screening and Categorization:** Sub-projects were systematically screened against the ESMS Exclusion List, followed by categorization into Category B or Category C based on potential risk pathways. Screening of sub-projects follows a joint interpretation framework, where SIDBI applies its internal ESMS processes while ensuring full alignment with GCF's safeguards
- **Validation of Low-Risk Projects:** Category C projects were reviewed to confirm their low-risk nature, particularly efficiency improvements and equipment upgrade that do not alter manufacturing chemistry or increase pollution loads.

This participatory and evidence-based methodology ensures a common understanding of the issues, benefits, and concerns associated with MSME sub-projects under FMAP Programme. By integrating historical portfolio data with forward-looking risk analysis, the ESIA provides a transparent and standardized framework for environmental and social risk management, strengthening compliance with SIDBI's ESMS and the GCF Environmental and Social Policy.

1.3 Environmental and Social Due Diligence and Assessment

As the Accredited Entity (AE), SIDBI is responsible for ensuring that all subprojects under the Program adhere to the Green Climate Fund (GCF) Environmental and Social Safeguards (ESS) and follow a proportionate, risk-based due diligence process.

Fit-for-Purpose ESIA (Environmental and Social Impact Assessment): For subprojects categorized as Moderate risk (B), the review a sector-specific ESIA that:

- Identifies environmental impacts such as high energy demand, air emissions (particulate matter, silica dust, metal fumes, combustion gases), solid and hazardous waste generation (used foundry sand, slag, refractory waste), wastewater from cooling and quenching processes, and risks associated with fuel and material handling—critical in foundry melting and casting operations.
- Assesses social risks such as labor conditions, occupational health and safety (exposure to extreme heat, molten metal, dust, fumes, noise, machinery-related and confined-space risks), migrant and contract worker conditions, and community-level impacts, especially in foundry clusters.
- Evaluates contextual sensitivities (e.g., proximity to drainage channels, rivers, or groundwater sources).
- GCF guidelines state that the ESIA must be proportional to the risk category and designed to address the specific impacts of the activity.
- For sub-projects where Brownfield enterprises going for expansion and modernization of their existing operations in a new location / premises; and (ii) Greenfield projects i.e., setting up of new enterprises, the scope of land is limited to industrial area, industrial estate, notified industrial zone, special economic zones, Land parcels already designated by the Government for non-agricultural use, solar / wind farms etc. where all the necessary statutory permission / infrastructure are available.
- Such projects are eligible under this ESIA only where Environmental and Social Due Diligence (ESDD) and legal/site screening confirm that there is no compulsory land acquisition with physical or economic displacement, no Indigenous Peoples impacts, no critical habitat/protected ecosystem impacts, no cultural heritage impacts, and no other material PS5–PS8 consequence in line with SIDBI's ESMS and GCF Environmental and Social Standards.
- Any sub-project for which screening identifies impacts falling under exclusion criteria or PS5–PS8 requirements shall be deemed ineligible and excluded from financing under the GCF-FMAP Programme.

Following are the detailed E&S Risk Assessment associated with Foundry Process & Technologies.

1.3.1 Raw Material Preparation

- **Working:** Base metals and alloy metals provide required mechanical and chemical properties.
- **Process:** Iron ore (pig iron/steel); recycled steel/aluminum scrap; cathodes/ingots; Foundry casting utilizing metal alloys and recyclable scraps sourced from forging operations, foundries, and steel re-rolling processes, subject to requirements.
 - o **Preparation:** Raw materials are inspected and segregated to remove impurities. Chemical analysis is to ensure the correct composition. Preheating and alloy additions are carried out to achieve the desired mechanical and chemical properties, before melting operations.
 - o **Core Making:** Cores are made from sand and binders to create internal cavities in castings. They are baked for strength and placed inside moulds before pouring.

(a) Key Environmental Risks:

- **Energy Consumption:** Preheating and alloy preparation require electricity or combustible fuel, contributing indirectly to greenhouse gas emissions.
- **Dust Emissions:** Sorting and cutting of scrap metal release fine particulates, affecting indoor and ambient air quality.

- **Soil and Water Contamination:** Improper storage of oily scrap, fluxes, or alloying chemicals can leach contaminants into soil and groundwater.

(b) Key Social Risks:

- **Worker Health:** Exposure to dust and fumes can cause respiratory irritation; ergonomic strain from manual handling of heavy scrap.
- **Occupational Safety:** Risks of accidents due to moving parts and machinery if safety protocols are not followed.

Categorization of activities in Raw Material Preparation Process- Category: C (Low Risk)

Raw material preparation activities involve dry, controlled processes with no wastewater generation or hazardous chemical use, and only minimal, localized occupational risks. Therefore, these activities are categorized as Category C (Low Risk).

Rationale for the categorization of Raw Material Preparation Process:

Raw material preparation in foundries comprises inspection, segregation, chemical analysis, preheating, alloy additions, and core making using sand and binders. These activities are dry and controlled processes that do not involve wet processing, wastewater generation, or hazardous chemical handling. Environmental impacts are limited and localized, mainly associated with minor dust and heat generation during material handling and core baking, which can be effectively managed within the facility through standard practices.

Social risks are confined to routine occupational health and safety aspects, such as material handling, heat exposure, and use of equipment, and can be adequately addressed through the use of personal protective equipment (PPE), proper ventilation, and good housekeeping measures. Given the absence of significant environmental emissions, hazardous effluents, or community-level impacts, the Raw Material Preparation process is appropriately classified as Category C (Low Risk).

Applicable IFC Performance Standards in Raw Material Preparation process

- **PS 1- Assessment and Management of Environmental and Social Risks and Impacts:** **Applicable** in a limited manner to ensure basic screening, documentation, and monitoring of environmental and social risks. Given the low-risk nature of preparation and core-making activities, reliance on standard operating procedures and regulatory compliance is considered adequate.
- **PS2 – Labor & Working Conditions:** Addresses routine occupational health and safety (OHS) risks such as manual material handling, exposure to heat during preheating and core baking, machinery operation, and use of personal protective equipment (PPE).
- **PS3 – Resource Efficiency & Pollution Prevention:** Relevant for efficient use of raw materials, control of minor dust generation during handling and core making, and promotion of good housekeeping practices.
- **PS4 – Community Health & Safety:** Ensures that minor dust, noise, and onsite activities do not adversely affect surrounding communities and that basic emergency preparedness measures are in place.

- **PS5 to PS8** are conditional because they apply only if projects involve land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance.

SIDBI's ESMS and GCF ESS require these checks during screening and due diligence.

Risk Mitigation / Adaptation Technologies in Raw Material Preparation Process

SIDBI has identified energy efficient technologies under the above process category for foundry sector.

Sl. No.	Technology / Machine Name	Process Category	Project Category
1	Automatic Cold Box Core Shooter	Core Preparation	Category - C
2	Automatic Core blowing machine	Core Preparation	Category - C
3	Electrically Heated Die- Heating Furnace	Core Preparation	Category - C
4	Exothermic / Insulating Sleeves (Oven for Baking Sleeves, Molding Machines, Vacuum System)	Core Preparation	Category - C
5	Oil Fired Core Drying Oven	Core Preparation	Category - C
6	Mechanical Pneumatic Clutch Operated Crank Type Billet Shearing Press (Stock Cutting)	Raw Material and Processing	Category - C
7	CNC Milling (Pattern Shop)	Pattern Making	Category - C
8	CNC Wire Cut Machine (Tool Room)	Pattern Making	Category - C
9	Solar Photo Voltaic power projects for captive use within the existing operating / manufacturing premises	Renewable Energy Tech	Category - C
10	Electric mobility - 2 Wheelers, 3 Wheelers, 4 Wheelers, E-buses, E-trucks etc for transit of passengers / industry staffs / transport of consumer goods & finished products etc.	Green Mobility & Logistics	Category - C
11	Charging infrastructure and Battery swap set up within the existing operating / manufacturing premises	Green Mobility & Logistics	Category - C
12	Rainwater harvesting systems, surface water storage units, stormwater management equipment and aquifer recharge solutions	Water-efficient technologies	Category - C
13	Green Buildings using locally suited, durable materials for housing and infrastructure to withstand extreme weather	Climate-resilient materials	Category - C

Note-

(i) The above list is indicative and not exhaustive; additional technologies/machines may be considered by the AE for funding only where they fall within the approved scope and eligibility criteria of FMAP, are screened and categorized in accordance with the ESMS, and comply with applicable E&S standards.

(ii) The category indicated in the table reflects the typical risk profile of the technology/process itself. Where the same technology is proposed as part of (a) a brownfield enterprise expanding/modernizing in a new location, (b) a greenfield enterprise, or (c) an off-site RE/EE project, the final categorization of the overall subproject shall be determined through ESDD and site/legal screening. In such cases, the sub-

project may be classified as Category B where land-related, siting, community health and safety, or other site-specific risks are assessed as moderate, site-specific, and manageable.

1.3.2 Metal Melting

Metal melting is a critical stage in foundry operations where base metals and alloys are heated to a molten state for casting. This process ensures precise control over temperature and chemical composition to achieve desired mechanical properties.

Process:

- A. **Charging:** Prepared raw materials (pig iron, steel scrap, alloying elements) are charged into furnaces.
- B. **Melting:**
 - i. **Cupola Furnace:** Uses coke and flux with pig iron/scrap for continuous melting.
 - ii. **Induction Furnace:** Provides precise temperature and chemistry control for steel and non-ferrous alloys.
- C. **Refining:** Degassing, slag removal, and deoxidation are performed to improve metal quality.
- D. **Superheating:** Molten metal is heated to the required pouring temperature for proper mold filling.

(a) Key Environmental Risks:

- **Energy Consumption:** High electricity or fuel use in induction and cupola furnaces which contribute to greenhouse gas emissions.
- **Air Pollution:** Cupola furnaces emit SO_x, NO_x, and particulate matter, impacting local air quality.
- **Solid Waste:** Slag and refractory lining waste require safe disposal to prevent soil and water contamination.

(b) Key Social Risks:

- **Heat Exposure:** Workers face extreme heat and risk burns from molten metal splashes.
- **Explosion Risk:** Moisture in scrap or improper charging can cause violent explosions, endangering workers' safety.

Categorization of activities in Metal Melting process - Category: B (Moderate Risk)

Metal melting involves high-temperature furnace operations with air emissions and occupational heat exposure. These site-specific and manageable risks justify classification as Category B (Moderate Risk).

Rationale for the categorization of Metal Melting process:

Metal melting involves high-temperature furnace operations that are energy-intensive and generate air emissions and solid by-products such as slag. Occupational risks include exposure to heat, fumes, and molten metal, which are site-specific and manageable through standard controls. Hence, the process is categorized as Category B (Moderate Risk).

Applicable IFC Performance Standards in the Metal Melting process

- **PS1:** Applicable to ensure identification, monitoring, and management of moderate environmental and social risks associated with furnace operations, air emissions, and occupational exposure through appropriate management systems.

- **PS2:** Highly relevant due to occupational health and safety risks such as exposure to high temperatures, molten metal, fumes, noise, and manual handling during charging and tapping operations.
- **PS3:** Applicable for improving energy efficiency of furnaces, reducing air emissions, managing slag and refractory waste, and promoting cleaner production practices.
- **PS4:** Applicable to ensure that air emissions, noise, and emergency risks (fire, explosions) from furnace operations do not adversely affect surrounding communities.
- **PS5 to PS8** are conditional because they apply only if projects involve land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance.

SIDBI's ESMS and GCF ESS require these checks during screening and due diligence.

Risk Mitigation / Adaptation Technologies in the Metal Melting process

Sr. No.	Technology Name	Process Category	Project Category
1	Divided Blast Cupola	Metal Charging & Melting	Category - B
2	Gas fired Aluminum Melting Furnace (replace Oil Fired Furnace)	Metal Charging & Melting	Category - B
3	Gas Fired Cupola	Metal Charging & Melting	Category - B
4	High Efficiency Industrial Furnace in Aluminum Factory	Metal Charging & Melting	Category - B
5	Hot Blast Cupola	Metal Charging & Melting	Category - B
6	Induction Billet Heater	Metal Charging & Melting	Category - B
7	Induction Furnace with Cooling Tower & Water Treatment Plant	Metal Charging & Melting	Category - B
8	Induction Melting Furnace for Aluminum	Metal Charging & Melting	Category - B
9	Oil Fired Rotary Furnace	Metal Charging & Melting	Category - B
10	Removable Hearth Type Chamber (F/C upto 1200 deg C with Computer Compatible Temperature Controller)	Metal Charging & Melting	Category - B
11	kWh Indicator for Induction Furnace	Metal Charging & Melting	Category - C
12	Liquid Metal Supply	Metal Charging & Melting	Category - C
13	Veneering for Industrial furnaces	Metal Charging & Melting	Category - C
14	Solar Photo Voltaic power projects for captive use within the existing operating / manufacturing premises	Renewable Energy Tech	Category - C
15	Electric mobility - 2 Wheelers, 3 Wheelers, 4 Wheelers, E-buses, E-trucks etc for transit of passengers / industry staffs / transport of consumer goods & finished products etc.	Green Mobility & Logistics	Category - C
16	Charging infrastructure and Battery swap set up within the existing operating / manufacturing premises	Green Mobility & Logistics	Category - C
17	Wastewater / Effluent treatment / ZLD/	Water-efficient technologies	Category - C

18	Rainwater harvesting systems, surface water storage units, stormwater management equipment and aquifer recharge solutions	Water-efficient technologies	Category - C
19	Green Buildings using locally suited, durable materials for housing and infrastructure to withstand extreme weather	Climate-resilient materials	Category - C

Note-

(i) The above list is indicative and not exhaustive; additional technologies/machines may be considered by the AE for funding only where they fall within the approved scope and eligibility criteria of FMAP, are screened and categorized in accordance with the ESMS, and comply with applicable E&S standards.

(ii) The category indicated in the table reflects the typical risk profile of the technology/process itself. Where the same technology is proposed as part of (a) a brownfield enterprise expanding/modernizing in a new location, (b) a greenfield enterprise, or (c) an off-site RE/EE project, the final categorization of the overall subproject shall be determined through ESDD and site/legal screening. In such cases, the sub-project may be classified as Category B where land-related, siting, community health and safety, or other site-specific risks are assessed as moderate, site-specific, and manageable.

1.3.3 Moulding & Casting

Working:

Moulding and casting involve creating sand moulds and cores to replicate the geometry of the final product and pouring hot molten metal into these cavities to form castings.

Process:

- A. **Sand Preparation:** Silica sand is blended with binders (bentonite), water, and additives to achieve strength, permeability, Flowability and moisture control. Reclaimed sand is processed and reused to maintain consistency.
- B. **Moulding:** Prepared sand is packed around patterns to form mould cavities. Mould halves are assembled with gating systems for proper metal flow during pouring.
- C. **Casting:** Molten metal is poured into moulds through sprues and runners, filling cavities and forming the desired shape. After solidification, moulds are broken to retrieve castings.

(a) Environmental Risks

- **Dust Emissions:** Sand preparation and moulding generate silica dust, deteriorating air quality.
- **Noise Pollution:** High-speed moulding machines produce significant noise levels.
- **Waste Sand:** Large volumes of spent moulding sand require reclamation or safe disposal.

(b) Social Risks

- **Ergonomic Stress:** Manual handling of heavy mould halves can cause musculoskeletal disorders.
- **Occupational Safety:** Risks of crush injuries during mould assembly and accidents from moving machinery.

Categorization of activities in Moulding & Casting process - Category: B (Moderate Risk)

Moulding and casting involve direct pouring and handling of molten metal, resulting in moderate occupational health and safety and localized emission risks. These risks are site-specific and manageable through standard safety and pollution-control measures.

Rationale for the categorization of Moulding & Casting process:

Moulding and casting involve preparation of moulds and direct pouring of molten metal, which presents moderate occupational health and safety risks such as exposure to high temperatures, molten metal splashes, and fumes. Environmental impacts are localized, mainly comprising dust, emissions during pouring, and waste sand generation, all of which are manageable with standard controls.

Applicable IFC Performance Standards in Moulding & Casting process

- **PS1:** Applicable for identifying, assessing, and managing environmental and social risks associated with moulding and casting operations, including molten-metal handling, dust and emissions, and occupational health and safety risks through site-specific ESIA and ESMP.
- **PS2:** Relevant for managing worker health and safety risks during moulding, pouring, and shake-out operations.
- **PS3:** Applicable for controlling dust, emissions, and efficient reuse of moulding sand.
- **PS4:** Applicable to ensure emissions and emergency risks are managed within the facility.
- **PS5 to PS8** are conditional because they apply only if projects involve land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance.

SIDBI's ESMS and GCF ESS require these checks during screening and due diligence.

Risk Mitigation / Adaptation Technologies in Moulding & Casting process

Sr. No.	Technology Name	Process Category	Project Category
1	Automatic Flaskless Molding Machine	Moulding	Category - B
2	Compact Vertical Moulding Machine	Moulding	Category - B
3	Core Setter and Automatic Mold Conveyor	Moulding	Category - B
4	Fully Automatic CNC Injection Moulding Machine (Tool Room)	Moulding	Category - B
5	High Pressure Moulding Line in Moulding Area	Moulding	Category - B
6	Mechanized Moulding Machines (with PLC control)	Moulding	Category - B
7	Simultaneous Jolt/ Squeeze Moulding Machine	Moulding	Category - B
8	Automatic On-line Sand Controller	Sand Preparation	Category - B
9	Computer Controlled Sand Cooler-Mixer	Sand Preparation	Category - B
10	Energy Efficient Thermal Reclamation Plant	Sand Preparation	Category - B
11	Intensive Mixers (Molding/ Core)	Sand Preparation	Category - B
12	Mechanical Sand Reclamation (PLC controlled)	Sand Preparation	Category - B
13	Variable Speed Sand Mixer	Sand Preparation	Category - B
14	Automatic Centrifugal Casting Machine	Pouring & Solidification	Category - B

15	Automatic Pouring System	Pouring & Solidification	Category - B
16	Hot Top Casting Machines (Continuous Casting)	Pouring & Solidification	Category - B
17	Induction Ladle Refining Furnace	Pouring & Solidification	Category - B
18	Lost foam casting technology	Pouring & Solidification	Category - B
19	Spun Pipe Casting Machine	Pouring & Solidification	Category - B
20	Solar Photo Voltaic power projects for captive use within the existing operating / manufacturing premises	Renewable Energy Tech	Category - C
21	Electric mobility - 2 Wheelers, 3 Wheelers, 4 Wheelers, E-buses, E-trucks etc for transit of passengers / industry staff / transport of consumer goods & finished products etc.	Green Mobility & Logistics	Category - C
22	Charging infrastructure and Battery swap set up within the existing operating / manufacturing premises	Green Mobility & Logistics	Category - C
23	Rainwater harvesting systems, surface water storage units, stormwater management equipment and aquifer recharge solutions	Water-efficient technologies	Category - C
24	Green Buildings using locally suited, durable materials for housing and infrastructure to withstand extreme weather	Climate-resilient materials	Category - C

Note-

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(ii) The category indicated in the table reflects the typical risk profile of the technology/process itself. Where the same technology is proposed as part of (a) a brownfield enterprise expanding/modernizing in a new location, (b) a greenfield enterprise, or (c) an off-site RE/EE project, the final categorization of the overall subproject shall be determined through ESDD and site/legal screening. In such cases, the sub-project may be classified as Category B where land-related, siting, community health and safety, or other site-specific risks are assessed as moderate, site-specific, and manageable.

1.3.4 Metal Cooling

Metal cooling is the stage after casting where molten metal solidifies inside the mould. Controlled cooling ensures dimensional accuracy, prevents defects such as cracks or porosity, and stabilizes mechanical properties.

Process:

- A. Solidification:** Molten metal cools gradually within the mould cavity to form the desired shape.

B. Cooling Methods:

- ❖ **Natural Cooling:** Allowing the mould to cool at ambient conditions.
- ❖ **Accelerated Cooling:** Using forced air or water sprays for faster cooling in specific applications.

C. Post-Cooling: Castings are removed from moulds for knock-out and finishing operations.

(a) Environmental Risks

- **Energy Use:** Accelerated cooling systems (fans, water sprays) can consume electricity and water.
- **Water Contamination:** Improper disposal of cooling water can lead to contamination if mixed with metal residues or chemicals.
- **Heat Release:** Large-scale cooling can increase ambient temperature in confined spaces, affecting workplace conditions.

(b) Social Risks

- **Worker Safety:** Handling hot moulds and castings poses burn hazards.
- **Ergonomic Stress:** Manual removal of heavy moulds and castings can cause occupational injuries.

Categorization of activities in Metal Cooling processes - Category: B (Moderate Risk)

Metal cooling may use natural cooling, air cooling, or water spray/ quenching. The use of water with hot castings can generate steam, splashing, and heat exposure risks; therefore, overall cooling operations fall under Category B (Moderate Risk).

Rationale for the categorization of Metal Cooling processes:

Although natural and air cooling are low-risk, water-assisted cooling introduces moderate occupational and safety risks due to heat–water interaction and steam generation. These impacts remain site-specific and manageable through standard controls, which justifies classification as Category B (Moderate Risk).

Applicable IFC Performance Standards in Metal Cooling processes

- **PS1:** Applicable to identify and manage moderate risks associated with cooling operations, particularly where water-based cooling is used.
- **PS2:** Relevant due to occupational health and safety risks from heat exposure, steam generation, and handling of hot castings during cooling and knock-out.
- **PS3:** Applicable where water-assisted cooling is used, to promote efficient water use and proper management of heated water discharges.
- **PS4:** Limited applicability to ensure steam, water discharge, and noise from cooling operations do not affect surrounding areas.
- **PS 5 to PS 8** are conditional because they apply only if projects involve land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance.

SIDBI's ESMS and GCF ESS require these checks during screening and due diligence.

Risk Mitigation / Adaptation Technologies in Metal Cooling processes

Sr. No.	Technology Name	Process Category	Project Category
1	Natural / Ambient Cooling (Cooling in mould at shop floor)	Metal Cooling	Category - B
2	Cooling in Open Cooling Yard / Cooling Beds	Metal Cooling	Category - B
3	Forced Air Cooling using Industrial Fans	Metal Cooling	Category - B
4	Water Spray Cooling using hose/spray system	Metal Cooling	Category - B
5	Water Quenching Tanks (manual or semi-automatic)	Metal Cooling	Category - B
6	Closed-loop Cooling Water System (small MSME scale)	Metal Cooling	Category - B
7	Solar Photo Voltaic power projects for captive use within the existing operating / manufacturing premises	Renewable Energy Tech	Category - C
8	Electric mobility - 2 Wheelers, 3 Wheelers, 4 Wheelers, E-buses, E-trucks etc. for transit of passengers / industry staff / transport of consumer goods & finished products etc.	Green Mobility & Logistics	Category - C
9	Charging infrastructure and Battery swap set up within the existing operating / manufacturing premises	Green Mobility & Logistics	Category - C
10	Rainwater harvesting systems, surface water storage units, stormwater management equipment and aquifer recharge solutions	Water-efficient technologies	Category - C
11	Green Buildings using locally suited, durable materials for housing and infrastructure to withstand extreme weather	Climate-resilient materials	Category - C

Note-

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(ii) The category indicated in the table reflects the typical risk profile of the technology/process itself. Where the same technology is proposed as part of (a) a brownfield enterprise expanding/modernizing in a new location, (b) a greenfield enterprise, or (c) an off-site RE/EE project, the final categorization of the overall subproject shall be determined through ESDD and site/legal screening. In such cases, the subproject may be classified as Category B where land-related, siting, community health and safety, or other site-specific risks are assessed as moderate, site-specific, and manageable.

1.3.5 Finishing

Finishing is the final stage in foundry operations where castings are cleaned, heat-treated, machined, and prepared for dispatch. This step ensures dimensional accuracy, surface quality, and mechanical properties as per customer specifications.

Process:

- A. Knock-Out & Shot-Blasting:** Knock-out removes bulk sand. Castings are separated from moulds, cleaned using shotblasting or sandblasting to remove adhered sand and oxide scale.
- B. Grinding & Fettling:** Risers and gates are cut off; fins and flashes are removed to achieve smooth surfaces.
- C. Heat Treatment:** Processes like normalizing, annealing, quenching, and tempering (for ferrous alloys) or solutioning and aging (for non-ferrous alloys) are applied to tailor mechanical properties.
- D. Machining & Surface Treatment:** CNC machining, drilling, grinding, deburring, and lapping bring the casting to final dimensional accuracy. Surface treatments such as painting, powder coating, galvanizing, or anodizing are applied for protection and aesthetics.
- E. Inspection & Packaging:** Final inspection ensures quality compliance before packaging and dispatch.

(a) Environmental Risks

- **Energy Consumption:** Heat treatment furnaces require significant fuel or electricity, adding to emissions.
- **Air Emissions:** Combustion during heat treatment releases gases and particulates that affect air quality.
- **Waste Generation:** Machining processes produce metal chips and cutting fluid waste, which must be safely managed.
- **Noise Pollution:** Machining and grinding generate high noise levels that can negatively impact worker health

(b) Social Risks

- **Heat & Fume Exposure:** Workers face risks from furnace heat and fumes during treatment operations.
- **Accidents/Fatalities:** CNC machines, grinders, and drills can cause injuries if safety measures are not followed.

Categorization of activities in Finishing process -Category: B (Moderate Risk)

Finishing operations involve cleaning, grinding, heat treatment, machining, and surface treatment of castings, which present moderate occupational and localized environmental risks. These risks are manageable through standard safety and pollution-control measures, justifying classification as Category B (Moderate Risk).

Rationale for the categorization of Finishing process:

Finishing operations include knock-out, shot-blasting, grinding, fettling, heat treatment, machining, and surface coating. These activities generate dust, noise, metal fumes, heat, and surface-treatment waste,

and involve equipment such as grinders, furnaces, and CNC machines. Occupational health and safety risks include exposure to dust, sparks, noise, hot surfaces, and moving machinery. Environmental impacts are generally localized and manageable with dust collection systems, proper waste handling, ventilation, and safe operating procedures. Given the moderate, site-specific, and reversible nature of these impacts, finishing processes are appropriately classified as Category B (Moderate Risk).

Applicable IFC Performance Standards in Finishing process

- **PS1:** Applicable to identify and manage moderate risks from finishing, heat treatment, and surface-treatment operations.
- **PS2:** Highly relevant due to occupational health and safety risks related to dust, noise, hot surfaces, sparks, machinery operation, and manual handling.
- **PS3:** Applicable for control of dust and emissions, management of metal waste, spent abrasives, surface-treatment residues, and efficient energy use in heat treatment.
- **PS4:** Limited applicability to ensure that dust, noise, and waste handling do not adversely affect surrounding communities.
- **PS5 to PS8** are conditional because they apply only if projects involve land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance.

SIDBI's ESMS and GCF ESS require these checks during screening and due diligence.

Risk Mitigation / Adaptation Technologies in Finishing process

Sr. No.	Technology Name	Process Category	Project Category
1	Energy Efficient Shot Blasting Machine	Knock-Out, Fettling & Shot-Blasting	Category - B
2	Friction Drop Hammer	Knock-Out, Fettling & Shot-Blasting	Category - B
3	Hydraulic Double Acting Hammer (Forge Shop)	Knock-Out, Fettling & Shot-Blasting	Category - B
4	Hydraulic Hammer	Knock-Out, Fettling & Shot-Blasting	Category - B
5	Online Shot Blasting Machine (for Cleaning the Returns)	Knock-Out, Fettling & Shot-Blasting	Category - B
6	Automatic Manganese Phosphating Plant	Surface Treatment & Coating	Category - B
7	Dual Layer Aluminium Colour Coating and Baking Line	Surface Treatment & Coating	Category - B
8	Multi Station Horizontal Formers	Machining & Finishing	Category - B
9	CNC Lathe Machine	Machining & Finishing	Category - B
10	CNC Milling Machine	Machining & Finishing	Category - B
11	CNC Milling Machine (Tool Room)	Machining & Finishing	Category - B
12	CNC Turning Center (Tool Room)	Machining & Finishing	Category - B
13	Cold Forging Bolt Former	Machining & Finishing	Category - B
14	Electro Discharge Machine (Tool Room)	Machining & Finishing	Category - B
15	Knuckle-Joint press	Machining & Finishing	Category - B
16	Metal Gathering Machine	Machining & Finishing	Category - B

17	Microprocessor Based Energy Controlled, Pneumatic Clutch Operated, Screw Friction Presses (Forge Shop)	Machining & Finishing	Category - B
18	Reduce Rolling Machine (Forge Shop)	Machining & Finishing	Category - B
19	Bell Annealing Furnace	Heat Treatment	Category - B
20	Electrical Resistance Heat Treatment Furnace	Heat Treatment	Category - B
21	Fluidized Bed Heat Treatment Line with Controlled Atmosphere & Recuperators (Heat Treatment)	Heat Treatment	Category - B
22	Gas Fired High Temperature Furnace with Automatic Temperature Controller & Recorder (Heat Treatment)	Heat Treatment	Category - B
23	Heat Recovery System for Stress Relieving Furnaces	Heat Treatment	Category - B
24	Hi Chrome Grinding Media Oil Fired Heat Treatment Furnace with Recuperator	Heat Treatment	Category – B
25	Induction Hardening Equipment (100KW, 500Hz to 3KHz)	Heat Treatment	Category – B
26	Manganese Steel Heat Treatment Furnace with Recuperator	Heat Treatment	Category – B
27	Medium Frequency Induction Heaters (Heat Treatment)	Heat Treatment	Category - B
28	Solar Photo Voltaic power projects for captive use within the existing operating / manufacturing premises	Renewable Energy Tech	Category - C
29	Electric mobility - 2 Wheelers, 3 Wheelers, 4 Wheelers, E-buses, E-trucks etc for transit of passengers / industry staff / transport of consumer goods & finished products etc.	Green Mobility & Logistics	Category - C
30	Charging infrastructure and Battery swap set up within the existing operating / manufacturing premises	Green Mobility & Logistics	Category - C
31	Rainwater harvesting systems, surface water storage units, stormwater management equipment and aquifer recharge solutions	Water-efficient technologies	Category - C
32	Green Buildings using locally suited, durable materials for housing and infrastructure to withstand extreme weather	Climate-resilient materials	Category - C

Note-

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(ii) The category indicated in the table reflects the typical risk profile of the technology/process itself. Where the same technology is proposed as part of (a) a brownfield enterprise expanding/modernizing in

a new location, (b) a greenfield enterprise, or (c) an off-site RE/EE project, the final categorization of the overall subproject shall be determined through ESDD and site/legal screening. In such cases, the subproject may be classified as Category B where land-related, siting, community health and safety, or other site-specific risks are assessed as moderate, site-specific, and manageable.

1.3.6 Metal Recycling after Finishing

Working:

After finishing operations (knock-out, shot-blasting, grinding, heat treatment, and machining), metal scraps such as risers, gates, fins, and machining chips are collected for recycling. This process ensures resource efficiency and reduces waste disposal requirements.

Process:

- **Collection:** Segregate metallic residues (iron, steel, aluminum) from sand and non-metallic waste during finishing and fettling operations.
- **Sorting & Cleaning:** Remove contaminants like sand, paint, and cutting fluids using magnetic separators, washing systems, or shot blasting.
- **Storage:** Store cleaned scrap in designated, covered areas to prevent soil and water contamination.
- **Recycling:** Reintroduce scraps into melting operations or send them to authorized recyclers for secondary processing.

(a) Environmental Risks

- **Dust & Particulate Emissions:** During cleaning and segregation of scrap.
- **Water Contamination:** From washing operations if cutting fluids or oils are not treated.
- **Energy Use:** Additional energy for cleaning and processing scrap.

(b) Social Risks

- **Occupational Safety:** Risks of cuts, crush injuries, and exposure to dust and fumes during handling.
- **Ergonomic Stress:** Manual lifting of heavy scrap pieces.

Categorization of activities in Metal Recycling after Finishing- Category: C (Low Risk)

Metal recycling after finishing involves collection, segregation, cleaning, and storage of scrap metal without any melting or hazardous processing, resulting in minimal and localized environmental and social risks. Accordingly, the activity is classified as **Category C (Low Risk)**.

Rationale for the categorization of Metal Recycling after Finishing:

Metal recycling after finishing involves systematic collection, segregation, cleaning, and temporary storage of scrap metals such as risers, gates, and machining chips. The process does not involve melting, hazardous chemicals, or significant emissions, and environmental impacts are limited to basic material handling and storage practices. Occupational risks are routine and manageable through standard safety measures, justifying classification as Category C (Low Risk).

Applicable IFC Performance Standards in Metal Recycling after Finishing:

- **PS1:** Applicable in a limited manner for basic screening and monitoring, as the activity involves low and manageable risks.

- **PS2:** Relevant to address basic occupational health and safety aspects related to material handling, segregation, and storage of scrap.
- **PS3:** Highly relevant, as the activity promotes material reuse, waste minimization, and circular economy practices.
- **PS4:** Limited applicability, as impacts are localized within the facility and pose no significant risk to surrounding communities.
- **PS5 to PS8** are conditional because they apply only if projects involve land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance.

SIDBI's ESMS and GCF ESS require these checks during screening and due diligence.

1.3.7 Sand Recovery & Recycling after Finishing

Working:

After finishing operations, spent moulding sand is collected, cleaned, and reclaimed for reuse in moulding and core-making processes. This reduces raw material consumption and minimizes waste disposal.

Process:

- Collection:** Spent sand from knock-out and fettling operations is gathered and separated from metallic residues.
- Cleaning:** Removal of binders, dust, and contaminants using mechanical reclamation systems or thermal reclamation units.
- Recycling:** Reclaimed sand is blended with fresh sand and additives for reuse in mould preparation, ensuring quality standards.

(a) Environmental Risks

- **Dust Emissions:** During sand handling and reclamation.
- **Energy Use:** Thermal reclamation systems consume significant energy.
- **Waste Disposal:** Improper disposal of unusable sand can lead to soil contamination.

(b) Social Risks

- **Worker Health:** Exposure to silica dust during handling and reclamation.
- **Ergonomic Stress:** Manual lifting of heavy sandbags or operating machinery without proper training.

Categorization of activities in Sand Recovery & Recycling after Finishing-Category: B (Moderate Risk)

Sand recovery and recycling processes involving mechanical reclamation are classified as **Category B (Moderate Risk)**. Thermal sand reclamation units are eligible under FMAP only where such units are of MSME appropriate scale, fitted with effective air pollution control systems, and demonstrated through ESDD to generate site specific, reversible, and fully mitigable impacts.

Industrial scale or centralized thermal reclamation facilities, or any thermal reclamation activities resulting in offsite air quality impacts, significant cumulative emissions, or non-compliance with applicable statutory norms, shall be considered ineligible and excluded as falling outside the scope of Category B activities under FMAP.

Rationale for the categorization of Sand Recovery & Recycling after Finishing Process:

Sand recovery and recycling involve collection and reclamation of spent moulding sand through mechanical and, in some cases, thermal processes. While the activity supports resource efficiency and waste reduction, it can generate dust and, where thermal reclamation is used, controlled emissions and heat exposure, resulting in moderate, site-specific occupational and environmental risks that justify classification as Category B (Moderate Risk).

Industrial-scale thermal reclamation units with potential off-site air dispersion impacts are excluded from financing unless the subproject demonstrates full compliance with applicable air quality standards, including:

- Installation of appropriate emission control technologies
- Air dispersion modelling (where relevant) showing no significant off-site impacts
- Adequate monitoring and regulatory compliance

Applicable IFC Performance Standards in Sand Recovery & Recycling after Finishing Process

- **PS1:** Applicable to identify and manage moderate risks associated with sand reclamation operations, particularly where thermal treatment is involved.
- **PS2:** Relevant due to occupational health and safety risks from dust exposure, equipment operation, heat, and material handling.
- **PS3:** Highly relevant, as sand recovery promotes material efficiency, waste reduction, and reuse, while requiring controls for dust and emissions.
- **PS4:** Limited applicability to ensure dust, emissions, and noise from reclamation systems do not affect surrounding communities.
- **PS5 to PS8** are conditional because they apply only if projects involve land acquisition affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage without regulatory compliance.

SIDBI's ESMS and GCF ESS require these checks during screening and due diligence.

Other Utility Risk Mitigation Technologies

Sr. No.	Technology Name	Process Category	Project Category
1	Heat Reclaim Ventilation / Air Conditioning System	General Utility/Electrical	Category - B
2	High Efficiency Centrifugal Fans	General Utility/Electrical	Category - B
3	High Efficiency Power Generating Set	General Utility/Electrical	Category - B
4	Natural Gas Based Power Generating Set	General Utility/Thermal	Category - B
5	Natural Gas fired Boiler	General Utility/Thermal	Category - B
6	Natural Gas Fired Power Generating Set (Utility)	General Utility/Thermal	Category - B
7	Waste Heat Recovery System for Exhaust Gases	General Utility/Thermal	Category - B
8	Solar Photo Voltaic power projects for captive use within the existing operating / manufacturing premises	Renewable Energy Tech	Category - C

9	Electric mobility - 2 Wheelers, 3 Wheelers, 4 Wheelers, E-buses, E-trucks etc for transit of passengers / industry staffs / transport of consumer goods & finished products etc.	Green Mobility & Logistics	Category - C
10	Charging infrastructure and Battery swap set up within the existing operating / manufacturing premises	Green Mobility & Logistics	Category - C
11	Wastewater / Effluent treatment / ZLD/	Water-efficient technologies	Category - C
12	Rainwater harvesting systems, surface water storage units, stormwater management equipment and aquifer recharge solutions	Water-efficient technologies	Category - C
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(ii) The category indicated in the table reflects the typical risk profile of the technology/process itself. Where the same technology is proposed as part of (a) a brownfield enterprise expanding/modernizing in a new location, (b) a greenfield enterprise, or (c) an off-site RE/EE project, the final categorization of the overall subproject shall be determined through ESDD and site/legal screening. In such cases, the subproject may be classified as Category B where land-related, siting, community health and safety, or other site-specific risks are assessed as moderate, site-specific, and manageable.

Currently, **74 technologies/machines are documented under Foundry processes**, along with an additional indicative **351 cross-functional technologies listed** which are not exhaustive and can be used by MSMEs in the foundry segment is considered under **Annexure 3**.

In addition to it, SIDBI highlights that MSME is required to prepare and maintain the minimum mandatory documentation. These documents collectively demonstrate compliance with GCF ESS, IFC PS, and SIDBI's ESMS. Each MSME must prepare the ESDD Checklist (Annexure 2) as part of screening and categorization under FMAP Programme.

Cumulative cluster level impacts including wastewater generation, air emissions, solid and hazardous waste, fuel use, and reliance on Common Effluent Treatment Plants (CETPs) shall be explicitly assessed during ESDD. Where ESDD determines that incremental impacts from a proposed sub project, together with existing cluster level loads, exceed available treatment capacity, regulatory limits, or the environmental carrying capacity of the cluster, such sub projects shall be classified as ineligible and excluded from financing under the FMAP Exclusion List, irrespective of the individual technology type or scale of the MSME unit.

This assessment will also consider the use of furnace oil, coke, sand coke, and other fuels commonly used in foundry melting and heat-treatment operations, due to their implications for effluents, air emissions, and waste generation.

During ESDD (Annexure 2), and through the ESG Rating Tool (Annexure 7 of ESMS), SIDBI's loan officer/relationship manager and E&S expert will:

- Verify the operational status and regulatory compliance of the inhouse ETP and/or CETP, where applicable, particularly for cooling water, quenching water, surface-treatment effluents, and routine wash water, in line with applicable norms.
- Assess whether any incremental wastewater or process-related loads from the proposed sub-project including those associated with fuel use (furnace oil, coke/sand coke), oil & grease, heat, or solids are within the available treatment capacity of the inhouse system, CETP, or receiving environment.
- Require adoption of practical, proportionate measures such as good housekeeping, water reuse/recycling, basic pre-treatment (where needed), oil & grease separation, safe fuel storage, spill prevention, and proper ash/slag handling, as part of the site-specific ESMP.

Incremental discharges from individual subprojects may collectively result in significant cumulative impacts. To address this, an “accumulation threshold” is defined as the point at which the combined (existing + proposed) environmental load within subproject approach or exceeds any of the following:

- Regulatory discharge limits (e.g., effluent standards, air emission standards, ambient quality norms)
- Design or operational capacity of shared infrastructure, such as CETPs, STPs, or common air pollution control systems

During inspection, if the assessment indicates that process wastewater or fuel-related discharges are non-compliant, or that projected incremental loads (including those associated with furnace oil or coke use) would exceed available treatment or disposal capacity, or where environmental compliance cannot be assured even after mitigation measures as mentioned above, then the sub-project will be:

(a) excluded from FMAP financing, or

(b) phased/deferred until adequate treatment capacity and regulatory compliance are demonstrably ensured.

This approach is fully consistent with SIDBI's ESMS and ESIA framework, which already screens out non-compliant proposals, excludes higher-risk activities, and requires risk-based appraisal and verification before approval. For all Category B MSMEs need to have prescribed Wastewater within the limit, site-specific ESMP conditions will include effluent minimization, pre-treatment, monitoring, and compliance reporting of Environmental parameters.

1.4 Regulatory compliance analysis (Indian environmental laws + GCF standards)

1.4.1 Central Pollution Control Board (CPCB) of India: Classification of Sectors into Red, Orange, Green, White and Blue Categories, 2025⁵

Based on Pollution Index (PI) derived from water emissions, air emissions, hazardous waste generation, and resource consumption, CPCB categorizes 419 industrial sectors into four color-coded groups. CPCB has classified total 419 sectors and sub-sectors under Red (125), Orange (137), Green (94), White (54) and Blue (9) categories.

Table 1: List of Industrial Sectors Classified Under Red, Orange, Green, And White Category

Sl. No	CPCB Sl. No.	Foundry Industry	Industry Category (Based Upon the Pollution Index – PI)
1	104.1	Cupola furnace	ORANGE
2	104.2	Induction furnace/arc furnace	ORANGE

Whereas,

- 1) Red Category industries are High pollution requires frequent monitoring.
- 2) Orange Category industries are Moderate pollution is less frequent, but regulated control.
- 3) Green Category industries are Low pollution—minimal regulatory oversight.
- 4) White Category industries are Practically non-polluting—often exempt from routine consent procedure
- 5) Blue Category industries are essential Environmental Services e.g. Waste Management.

Pollution Index (PI) Ranges & Categories: methodology with equal weighting of **Air pollutant Score** (PI_A), **Water pollutant Score** (PI_W), **Waste Pollutant Score** (PI_H). Each pollutant group is scored out of 100, and the Cumulative Pollution Index is calculated.

- **$PI \geq 80$:** Red
- **$55 \leq PI < 80$:** Orange
- **$25 \leq PI < 55$:** Green
- **$PI < 25$:** White.

Additionally, State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) were authorized to categorize any new or leftover sectors according to the CPCB's 2016 methodology.

⁵ CPCB, 2025, “Report on Classification of Sectors into Red, Orange, Green, White and Blue Categories (A tool for progressive environmental management)” - 2025
<https://cpcb.nic.in/openpdf.php?id=TGF0ZXN0RmlsZS9fMTczNzYxMzk2OV9tZWRRpYXBob3RvMTEzODMucGRm>

1.4.2 IFC Performance Standard (PS) will be checked by Third-party and SIDBI

For Environmental & Social Risk, assessment by Third Party and SIDBI need to be considered the IFC Principles Standard for throughout the process which has been stated above in each process of the foundry segment (Section 2.2).

PS1- Assessment and Management of Environmental and Social Risks and Impacts: Verified through ESDD, ESG Screening Sheets, and ESMP documentation.
PS2 - Labor & Working Conditions: Checked via OHS audits, PPE, gender safeguards in ESMP.
PS3 - Resource Efficiency & Pollution Prevention: Confirmed through energy/water efficiency measures, Environmental performance reports.
PS4 - Community Health & Safety: Linked to GRM, community disclosure, and effluent/air emission compliance.
PS 5 to PS 8 - The details for applicability and requirements are given as under: IFC Performance Standard 5 – Land Acquisition and Involuntary Resettlement • Applicability: - o Not applicable where Greenfield or expansion projects are undertaken within industrial area, industrial estate, notified industrial zone, special economic zones, Land parcels already designated by the Government for non-agricultural use, or privately purchased land through willing buyer–willing seller transactions with clear title or solar / wind farms etc where all the necessary statutory permission / infrastructure are available. - o May be triggered if land acquisition results in economic displacement (loss of livelihoods, access restrictions) or physical displacement, even in the absence of formal resettlement. • Requirements: - o Screening to confirm no involuntary land acquisition; projects involving resettlement or displacement of households are excluded.
IFC Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources • Applicability: - o Not applicable where Greenfield or expansion projects are undertaken within industrial area, industrial estate, notified industrial zone, special economic zones, Land parcels already designated by the Government for non-agricultural use, or privately purchased land through willing buyer–willing seller transactions with clear title or solar / wind farms etc. where all the necessary statutory permission / infrastructure are available. - o Screening is required to ensure no conversion or degradation of natural habitats, wetlands, forests, or protected areas. • Requirements: - o Any project with potential impacts on critical habitats is ineligible under the programme.

IFC Performance Standard 7 – Indigenous People

- **Applicability:**

- o Not applicable where Greenfield or expansion projects are undertaken within industrial area, industrial estate, notified industrial zone, special economic zones, Land parcels already designated by the Government for non-agricultural use, or privately purchased land through willing buyer–willing seller transactions with clear title or solar / wind farms etc. where all the necessary statutory permission / infrastructure are available.
- o Screening is required to confirm absence of Indigenous People / communities are not affected by the project.

- **Requirements:**

- o Any project with potential impacts on Indigenous People / communities are ineligible under the programme.

IFC Performance Standard 8 – Cultural Heritage

- **Applicability:**

- o Not applicable where Greenfield or expansion projects are undertaken within industrial area, industrial estate, notified industrial zone, special economic zones, Land parcels already designated by the Government for non-agricultural use, or privately purchased land through willing buyer–willing seller transactions with clear title or solar / wind farms etc. where all the necessary statutory permission / infrastructure are available.
- o Screening is required to ensure that there is no known impact on sites of cultural, archaeological, or religious significance.

- **Requirements:**

No financing of projects involving significant impacts on cultural heritage.

For Brownfield projects set up by an existing enterprise within its existing industrial premises, the Environmental and Social Impact Assessment (ESIA) confirms that IFC Performance Standards PS 5 to PS 8 that is relating to land acquisition and involuntary resettlement; Indigenous Peoples; biodiversity and critical habitats; and cultural heritage are not applicable, as these activities do not involve land acquisition, displacement, impacts on sensitive ecosystems, or disturbance of cultural assets.

However, in case of brownfield enterprises going in for expansion or modernization in a new location and for setting up of a Greenfield enterprise, land is generally acquired. SIDBI ensures that in the above scenario, the E&S risks are adequately identified, assessed, and mitigated within the scope of this ESIA & ESMP, ensuring no adverse environmental or social impacts i.e., land acquisition for the project does not affect biodiversity-sensitive areas, indigenous communities, or cultural heritage. If the land acquisition affects any of the PS 5-8 triggers, SIDBI will not assist the project under GCF-FMAP Programme.

Accredited Entity (SIDBI) clarifies that any subproject that triggers PS5–PS8 requirements will be automatically deemed ineligible under the FMAP programme as currently structured. This aligns with SIDBI's existing ESMS, which already: screens out high-risk proposals and all Category A / I-1 activities during initial screening and due diligence.

Detailed ESDD, ESG risk rating, and site verification to confirm safeguard compliance prior to sanction of project. Rejects any project that fails to meet E&S compliance or falls under the exclusion list.

Under FMAP Programme, SIDBI will not finance any MSME subproject that involves land acquisition with physical/economic displacement of people, impacts on Indigenous Peoples, activities located

within or adversely affecting critical habitats or legally protected ecosystems, any kind of risks to cultural heritage or archaeological resources.
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Social Risks & Safeguards

Social risks in the foundry sector are primarily associated with workplace health and safety, including exposure to heat, dust, noise, and physically demanding tasks. Additional considerations include the presence of contract or migrant workers and the adequacy of basic welfare facilities. Safeguards will focus on compliance with labour laws, provision and use of appropriate PPE, and availability of basic sanitation and welfare facilities to support worker safety and well-being.

1.5 Stakeholder Engagement & Monitoring

Stakeholder engagement begins at the appraisal stage for all the sub-projects. Engagement activities include: -

- Consultations with MSME owners, workers, machinery supplier and other stakeholders (if necessary) about the project
- Awareness sessions on Energy conservation, Emission reduction, OHS, chemical safety, E&S risk assessment & mitigation, and social, labour & Gender rights etc.;
- Disclosure of applicable safeguard requirements, ESMP obligations, and mitigation responsibilities.
- SIDBI shall ensure continuous stakeholder engagement throughout implementation, including periodic site visits, safety meetings, and environmental monitoring interactions.

Stakeholder engagement will focus on transparency and inclusivity throughout project implementation. Key actions include community disclosure on environmental management practices, establishment of a worker grievance redressal mechanism, and regular safety briefings for all operational staff and workers.

Monitoring will be guided by measurable indicators such as compliance with applicable discharge norms (where relevant), personal protective equipment (PPE) usage, and adherence to occupational health and safety requirements related to heat, dust, noise, and machine operations (Refer section number 6). These indicators will ensure accountability and continuous improvement in environmental and social performance.

The FMAP programme integrates stakeholder engagement, public disclosure, and grievance redressal as core elements of its Environmental & Social Management System. MSME subprojects are embedded within densely populated industrial clusters. Therefore, meaningful engagement with workers, nearby communities, and institutional stakeholders is critical to ensure transparency, risk communication, and participatory monitoring.

1.6 Impact Category & GCF Linkages

The overall impact of foundry operations is assessed as moderate, site-specific, and reversible with the implementation of appropriate environmental and social controls. Based on GCF categorization, core foundry processes such as Metal Melting, Moulding & Casting, Metal Cooling, Finishing (Knock-out, Fettling, Machining), and Sand Recovery & Recycling after Finishing are classified as **Category B** due to associated high-temperature operations, air emissions, dust generation, waste handling, and occupational health and safety risks.

Lower-risk foundry activities such as Raw Material Preparation and Metal Recycling after Finishing are classified as **Category C**, as these activities primarily involve mechanical handling, segregation, and storage operations with minimal environmental emissions and localized, manageable social risks.

The rationale for this classification lies in the fact that Category B foundry processes involve molten-metal handling, thermal operations, air emissions, dust, and solid waste generation, which require structured pollution-control systems and occupational safety measures, but remain manageable and reversible with standard controls. Category C activities, by contrast, involve low-impact, non-thermal, and mainly dry or resource-recovery operations, resulting in minimal environmental and social impacts.

1.7 Community Health and Safety

In line with Community Health & Safety, the ESIA recognizes that MSME foundry operations require appropriate arrangements for emergency preparedness, fire and explosion prevention, and safe handling of fuels, molten metal, and process materials. Key risks in foundry operations are associated with high-temperature furnace and heat-treatment processes, dust and air emissions, noise, fuel storage and handling (furnace oil, gas, coke), and movement of materials within the premises.

Potential impacts on surrounding communities may arise from fire or emergency incidents, emissions from furnaces and auxiliary equipment, noise from operations, and transport of raw materials and finished castings. As most MSME foundries operate within designated industrial parks or foundry clusters with planned infrastructure, these risks are generally localized and manageable through standard engineering controls, safe operating practices, and compliance with applicable regulations.

Foundry MSMEs will maintain site-specific emergency response arrangements, adopt measures to manage vehicle movement and material handling safely, and implement practices to minimize off-site impacts. Where relevant, local authorities and nearby communities will be informed of applicable safety measures and emergency procedures, consistent with the stakeholder engagement and disclosure provisions outlined in the ESIA.

1.8 Disclosure Requirements & GCF linkages

- **Category B:** Requires ESIA & ESMP and 30-day advance disclosure before GCF Board consideration.
- **GCF Linkages**
 - Applies to Metal Melting, Moulding & Casting, Metal Cooling (where water-based cooling is used), Finishing, and Sand Recovery & Recycling after Finishing processes / operations due to high-temperature operations, air emissions, dust generation, waste handling, and occupational health and safety risks.
 - Requires ESIA & ESMP and 30-day advance disclosure under GCF Information Disclosure Policy.
- **Category C :** No advance disclosure required under GCF Information Disclosure Policy.

GCF Linkages

- Applies to Raw Material Preparation and Metal Recycling after Finishing processes, which involve controlled, mainly mechanical operations with minimal or no adverse environmental and social impacts.
- For this, no advanced disclosure is required.

1.9 Foundry Sector: Environmental Risks, Mitigation, and GCF Classification

Table 2: E&S Risk Assessment with Mitigation Measures Across Foundry Manufacturing Processes

Process	Key Environmental & Social Risks	Mitigation Measures	Indicative risk level	Rationale	Applicable IFC PS
Raw Material Preparation	Environmental: Dust and noise from handling and cutting operations. Social: Manual material-handling injuries; minor traffic movement within premises.	Good housekeeping; dust suppression; use of PPE; safe material handling and storage practices.	C	Risks are low, localized, and largely mechanical with no significant emissions or community impacts.	PS1, PS2, PS3, PS4
Metal Melting	Environmental: Air emissions (PM, fumes), high energy consumption, slag generation. Social: Heat stress, burn risk, molten-metal exposure, furnace-related accidents.	Energy-efficient furnaces; air pollution control devices (APCDs); proper slag handling; PPE; standard operating procedures (SOPs); safety interlocks.	B	High-temperature operations and occupational risks require structured E&S management.	PS 1, PS2, PS3, PS4
Moulding & Casting	Environmental: Dust and fumes from sand and binders; waste sand generation. Social: Molten-metal splashes, heat exposure, and high noise levels.	Ventilation and dust-control systems; sand management and reuse; mechanization of operations; PPE.	B	Molten metal handling and emissions pose moderate, site-specific E&S risks.	PS1, PS2, PS3, PS4
Metal Cooling	Environmental: Heat vapor/steam (where water cooling is used); limited wastewater generation. Social: Burns and splash hazards during	Controlled cooling methods; water recirculation systems; PPE; safe operating procedures.	B	Water-assisted cooling introduces heat–water interaction and worker safety risks.	PS1, PS2, PS3, PS4

Process	Key Environmental & Social Risks	Mitigation Measures	Indicative risk level	Rationale	Applicable IFC PS
	cooling operations.				
Finishing (Knock-out, Fettling, Machining)	Environmental: Dust, noise, sparks, and waste oils. Social: Hand injuries, exposure to vibration, prolonged noise exposure.	Dust collectors; noise-control measures; machine guarding; PPE; segregation and safe handling of waste.	B	Multiple mechanical and thermal operations create moderate, manageable E&S risks.	PS1, PS2, PS3, PS4
Metal Recycling after Finishing	Environmental: Minor oil and grease contamination from scrap. Social: Scrap-handling injuries.	Segregation of scrap; orderly storage; PPE; good housekeeping practices.	C	Resource-recovery activity with minimal environmental and social risks.	PS1, PS2, PS3, PS4
Sand Recovery & Recycling after Finishing	Environmental: Dust and emissions; thermal reclamation impacts where applicable. Social: Heat exposure during reclamation operations.	Enclosures; dust extraction systems; energy-efficient reclamation technologies; PPE.	B	Mechanical/thermal reclamation has moderate, localized environmental and worker safety risks.	PS1, PS2, PS3, PS4

Through the Exclusion list (attached as annexure 1) screening, Environmental and Social Due Diligence (ESDD) process, supported by SIDBI's ESG risk rating tools, and site-level verification visits, the Environmental and Social Impact Assessment (ESIA) has been done for the foundry sector. Risks have been considered and aligned with GCF standards.

Notwithstanding the indicative classification of individual technologies or processes as Category B, the final environmental and social risk categorization of each sub-project shall be determined on a case-by-case basis through Environmental and Social Due Diligence (ESDD), site verification, and application of the FMAP Exclusion List under SIDBI's ESMS.

Any sub-project that, based on ESDD and site-specific conditions, exhibits characteristics consistent with Category A/I-1 activities under the GCF Environmental and Social Policy including impacts that are

diverse, irreversible, unprecedented, or otherwise non-mitigable shall be deemed ineligible and excluded from financing under the FMAP Program.”

Further, Category B classification shall also apply in the following scenarios:

- (a) Brownfield enterprises undertaking expansion, modernization, or capacity augmentation within existing or appropriately designated sites; and
- (b) Greenfield enterprises or new locations where land is procured through willing buyer-seller arrangements, located in non-sensitive areas, and where screening confirms absence of impacts related to involuntary resettlement, biodiversity, Indigenous Peoples, or cultural heritage.

Any subproject where screening identifies material impacts under PS5–PS8 shall be deemed ineligible and excluded from financing under the FMAP Programme.

In addition to the EE projects set up / to be established in a new location or any RE Projects (solar, wind, hybrid, etc.) established by MSME units for captive or own consumption and located outside the borrower's operating premises may trigger IFC Performance Standards (PS) 5–8, primarily due to land-related considerations. These projects are typically developed on land classified as barren or dry land under applicable national land-use regulations, with no existing residential or commercial usage. The project site is generally selected based on technical considerations viz., systematic process balancing high resource availability (wind/solar) with proximity to grid infrastructure for power evacuation, no adverse environmental impact, and favorable topography.

Similarly, a Greenfield or brownfield enterprise setting up a standalone offsite RE project (solar, wind, hybrid, etc.) for non-captive purpose under GCF-FMAP Programme, shall be classified as “Category-B” as these projects involves land acquisition. In such cases, the PS 5–8 may be triggered due to land acquisition, SIDBI ensures that these risks are adequately identified, assessed, and mitigated within the scope of this ESIA & ESMP, ensuring no adverse environmental or social impacts i.e., land acquisition for the project does not affect biodiversity-sensitive areas, indigenous communities, or cultural heritage. If the land acquisition affects any of the PS 5-8 triggers, SIDBI will not assist the project under GCF-FMAP Programme.

Prior to sanction and disbursement, SIDBI ensures that all statutory approvals and clearances related to land and project development are in place, including valid land registration or lease documentation and approvals from relevant authorities such as State Electricity Boards and local Distribution Companies (DISCOMs).

Land acquisition for such projects is undertaken strictly on a willing buyer-willing seller basis in compliance with applicable Indian laws. SIDBI verifies the reasonableness of land costs through third-party valuation by bank-empaneled valuers and validates title and ownership through legal due diligence conducted by empaneled advocates to identify any encumbrances, disputes, or litigation risks. Review of land records and plot maps forms part of the appraisal process stage.

Accordingly, while PS 5–8 may be triggered in these cases due to land acquisition and land-use aspects, SIDBI ensures that these risks are adequately identified, assessed, and mitigated within the scope of this ESIA& ESMP, ensuring no adverse environmental or social impacts i.e., land acquisition for the

project does not affect biodiversity-sensitive areas, indigenous communities, or cultural heritage. If the land acquisition affects any of the PS 5-8 triggers, SIDBI will not assist the project under GCF-FMAP Programme.

Moving forward, the focus shifts to the documentation and implementation of the Environmental and Social Management Plan (ESMP). ESMP will operationalize the ESIA findings by translating them into actionable safeguards, including specific mitigation measures, monitoring indicators, and clear responsibilities for each Category B subproject under the foundry sector.

Below are the tailored ESMPs for all Category B subprojects based on the outcomes of ESDD and site inspections. This ESMP plan will then be formally shared with the borrowers, accompanied by structured training sessions to build their capacity in implementing the safeguards. MSMEs will be required to provide a formal undertaking, committing to applicable compliance with the ESMP, including adherence to pollution control measures, occupational health and safety standards, gender and inclusion safeguards, and grievance redressal mechanisms.

This integrated approach ensures that risks remain site-specific, reversible, and effectively mitigated, while embedding ESG principles and inclusive practices into every financed project by the Accredited Entity.

Section 2:

2.Environmental and Social Management Plan (ESMP): Implementation Framework for Category B Sub-projects of Foundry Sector

Under direct financing SIDBI is responsible for ensuring that all subprojects under the Program adhere to the Green Climate Fund (GCF) Environmental and Social Safeguards (ESS) and follow a proportionate, risk-based due diligence process. This responsibility is rooted in the GCF revised Environmental and Social Policy.

SIDBI shall ensure that every financed sub-project; regardless of scale or sector, meets the GCF Environmental & Social Policy requirements. This includes:

- Applying GCF's risk screening and categorization system (A/B/C) to each subproject.
- Ensuring that the GCF ESS (aligned with IFC Performance Standards) are triggered, assessed, and managed based on the potential environmental and social impacts.
- Ensuring alignment with national regulatory requirements and ongoing compliance monitoring. GCF explicitly requires accredited entities to integrate the GCF ESP and safeguards into their due-diligence and project-approval processes.

SIDBI's own ESMS further strengthens this responsibility by requiring systematic identification, appraisal, risk classification, and monitoring of E&S risks across all financed MSME subprojects. SIDBI ensures that E&S assessments are proportionate to the level of risk and appropriately tailored to the specific attributes, scale, and sensitivities of the foundry sector. This includes Fit-for-Purpose ESIA for the sub-projects mentioned in the Section 1.2.

2.1 Objective of the ESMP

- Identify potential Environmental and Social issues or threats associated with the proposed project activities and suggest procedures and measures to avoid, prevent, mitigate or compensate for them in line with the standard mitigation hierarchy.
- Integrate environmental and social safeguards into MSME financing as a mandatory standard for all Category B subprojects.
- Ensure that the ESMP is made available in public domain and data for ESDD are obtained from MSME borrowers.
- Create awareness and encourage MSMEs to adopt E&S framework and to build capacity to implement the same.
- Align MSME's operations with National Environmental legislation and GCF Environmental and Social Policy, ensuring risks remain site-specific, reversible, and fully mitigated.

2.2 Screening and Categorization of Activities

- **Initial Screening:** All MSME proposals are screened against SIDBI's Exclusion List; Category A projects are rejected outright.
- **ESDD Process:** Category B projects undergo detailed due diligence using SIDBI's checklist, ESG risk rating tool, and site verification.

- **ESMP Preparation:** Based on ESDD findings, this project-specific ESMPs outlining mitigation measures, monitoring indicators, responsibilities, and timelines.
- **Sharing with MSMEs:** ESMPs are formally shared with borrowers, ensuring clarity on obligations.

2.3 Risk Identification and Assessment

- Risks identified during ESDD (wastewater discharge, hazardous waste, air emissions, OHS concerns, gender risks) are mapped into the ESMP.
- Each ESMP specifies:
 - o **Mitigation measures** (APCDs, dust control, PPE, safe furnace operation, fuel-handling precautions, wastewater/solid-waste management).
 - o **Monitoring indicators** (emission compliance, particulate levels, PPE usage, safe operating practices, waste-handling records).
 - o **Responsible people** within the MSME.
 - o **Timelines** for implementation.
- MSMEs are trained to understand risk categories and mitigation pathways, ensuring ownership of safeguards.
- SIDBI stipulates that MSMEs must ensure standard working conditions and requisite worker amenities, consistent with the availability and operational requirements of all Category B MSMEs. These expectations are aligned with India's National Labour Code, which consolidates 29 existing labour laws into four comprehensive codes (1) Wages, (2) Social Security, (3) Industrial Relations, and (4) Occupational Safety—effective from 21 November 2025.
- These obligations are already embedded within several Environmental & Social (E&S) risk sections under Performance Standard 2 (PS 2), which mandates compliance with national regulations on fair wages, working hours, employee benefits, non-discrimination, and occupational health and safety.

2.4 ESMP Implementation

- **Training Workshops:** SIDBI organizes training sessions for MSMEs covering Environmental & Social Risk like pollution control, OHS, gender equality, SEAH prevention, stakeholder engagement, and grievance redressal.
- **Undertaking from MSMEs:** Borrowers sign a formal undertaking committing to implement ESMP measures, comply with national laws and GCF safeguards, and submit monitoring reports.
- **Suitable covenants:** Undertakings for ESMP implementation become part of loan sanction conditions, making compliance enforceable.

2.5 Mitigation Plan for Category B Subprojects for stakeholders understanding to adopt process specific mitigation plan

Category B processes in foundries (e.g., Metal Melting, Moulding & Casting, Metal Colling, Finishing, Sand Recovery) involve moderate, site-specific, and reversible impacts. Below is the process-specific plan:

1. Metal Melting

Risks:

- High energy consumption (induction/cupola furnaces).
- Air emissions (SO_x, NO_x, PM).
- Slag and refractory waste.
- Heat stress and explosion hazards.

Mitigation:

- Switch to energy-efficient induction/gas-fired furnaces.
- Install air pollution control systems (bag filters, scrubbers).
- Authorized slag disposal and charge drying.
- OHS measures: PPE, barricading, SOPs for charging.

Validation:

- Stack emission monitoring (PM, SO₂, NO_x).
- Energy audit reports.
- Slag disposal manifests.
- OHS compliance checks (heat-stress logs, PPE usage).

2. Moulding & Casting

Risks:

- Silica dust from sand preparation.
- Noise from moulding machines.
- Spent sand disposal.
- Crush injuries and ergonomic strain.

Mitigation:

- Dust extraction systems with HEPA filters.
- Noise control (enclosures, silencers).
- Sand reclamation units.
- Mechanical aids and guarded conveyors.

Validation:

- Air quality monitoring (dust levels).
- Noise level checks.
- Sand reclamation efficiency reports.
- OHS audits and training records.

3. Metal Cooling Process

Risks:

- Heat exposure from hot castings.
- Steam and splash hazards during water cooling.
- Limited wastewater generation.

Mitigation:

- Controlled cooling practices.
- Water recirculation where applicable.
- PPE and restricted access to hot zones.

Validation:

- Cooling-water management records.

- Wastewater compliance checks.
- PPE and OHS inspection records.

4. Finishing

Risks:

- Energy use in heat treatment.
- Combustion emissions.
- Noise and metal chip waste.
- Machine-related injuries.

Mitigation:

- Energy-efficient furnaces with recuperators.
- Emission compliance (stack monitoring).
- Waste segregation and cutting fluid treatment.
- Machine guarding and lockout/tagout protocols.

Validation:

- Furnace energy performance reports.
- Hazardous waste disposal records.
- OHS compliance audits.

5. Sand Recovery & Recycling

Risks:

- Dust during reclamation.
- Energy use in thermal units.
- Improper disposal of unusable sand.

Mitigation:

- Mechanical/thermal reclamation with dust control.
- Energy-efficient reclamation units.
- Authorized disposal of unusable fractions.

Validation:

- Dust monitoring reports.
- Energy audit of reclamation units.
- Disposal manifests and compliance certificates.

In addition to the subprojects assisted under the above-mentioned activities which are already classified as “Category-B”, the subprojects which falls under activities such as Raw Material Preparation and Metal Recycling after Finishing would also be classified as Category B when an MSME undertakes a Greenfield project / expansion project by a brownfield enterprise in a new location. Accordingly, the following process shall be followed w.r.t risks mitigation and validation.

1. Raw Material Preparation

- **Risks:** Dust generation during handling and cutting; noise from material handling equipment; manual lifting and movement injuries.
- **Mitigation:** Good housekeeping and dust suppression; use of PPE; mechanized handling where feasible; safe material storage and clear movement pathways.
- **Validation:** Dust and noise levels within statutory limits; adherence to workplace safety norms and proper material storage practices.

2. Metal Recycling after Finishing

- **Risks:** Scrap-handling injuries; minor oil and grease contamination; localized noise during sorting and cutting.
- **Mitigation:** Segregation of scrap; orderly and labeled storage; PPE for workers; proper collection and disposal of oil and grease residues.
- **Validation:** Safe scrap handling practices in place; compliant waste management and housekeeping maintained.

2.5.1 Asset-based Environmental & Social Mitigation measures

SIDBI has adopted an asset-anchored, risk-cluster approach, which aligns with FMAP's asset-specific financing model and SIDBI's experience under previous green-lending programme(s). This approach ensures consistent, practical and uniform application of mitigation requirements across all Category B MSMEs, regardless of location.

To operationalize this approach, risk clusters aligned with international foundry E&S standards like IFC Performance Standards for pollution control, OHS, CHS, labour & GRM, gender & SEAH/POSH.

Detailed asset-based mitigation tables, summarizing:

- (I) key E&S risk drivers linked to FMAP-financed assets, and
- (II) mandatory mitigation and O&M measures to be included in sub-project ESMPs.

This structure reflects good international practice, ensures compliance feasibility for MSMEs, and provides a clear and scalable framework that can be uniformly implemented across India's diverse foundry sector.

To ensure asset-specific environmental and social risk management across foundry sub-projects, a consolidated asset-anchored mitigation has been added in table 3 down below. The table summarizes, for each key asset or technology, the associated process step, principal E&S risk pathways identified in the ESIA, and the minimum mitigation and O&M requirements to be included in sub-project ESMPs. This format aligns with internationally recognized good practice. The credit officers during sub-project appraisal and evaluation shall customize and expand the listed measures based on the actual technologies, scale, and site conditions.

Table 3: Asset Based Environmental & Social Mitigation measures

Assets / Technology	Process Step	Key E&S Risks	Mitigation Measures (to include in ESMPs)	O&M Requirements	Responsible Parties [#]
Melting Furnaces (Induction / Cupola / Gas-Fired)	Metal Melting	• Smoke, fumes, and dust released into air • Very high heat causing	• Use chimney/stack to release smoke safely • Install dust/fume filters	• Regular inspection of stack and filters • Furnace lining and safety interlock checks • Maintain furnace	MSME Owners / Promoters / Technician or Operation Supervisor

Assets / Technology	Process Step	Key E&S Risks	Mitigation Measures (to include in ESMPs)	O&M Requirements	Responsible Parties [#]
		burn and heat-stress risk • Molten metal splash during charging and tapping • Small risk of fuel or oil leakage	or scrubbers • Provide PPE (helmet, gloves, safety shoes, face shield) • Follow safe charging and tapping procedures	operation and safety records	
Core Making Machines	Core Preparation	• Dust during sand handling • Chemical smell/fumes from binders • Heat exposure during drying or baking	• Local exhaust or chimney to remove fumes • Proper storage and handling of binders • Use masks, gloves, and protective clothing	• Cleaning of exhaust/ventilation system • Regular check of chemical storage area • Housekeeping in core shop	MSME Owners / Promoters / Technician or Operation Supervisor
Moulding Machines	Moulding	• Sand dust affecting breathing • High noise from machines • Risk of hand or finger injury	• Dust collectors and enclosures • Machine guards on moving parts • Use ear plugs, gloves, and safety shoes	• Periodic cleaning of dust filters • Inspection of machine guards and safety switches • Noise level checks	MSME Owners / Promoters / Technician or Operation Supervisor
Pouring Area & Ladles	Casting	• Splashing of molten metal • Severe burn and heat injury risk • Unsafe movement near hot zones	• Heat-resistant PPE and face shields • Clearly marked hot zones and barriers • Safe ladle handling procedures	• Daily ladle condition inspection • Checking ladle lining and handles • Incident/near-miss log review	MSME Owners / Promoters / Technician or Operation Supervisor
Cooling Area (Water / Air)	Metal Cooling	• Steam and hot water	• Controlled water spraying	• Drain cleaning and water flow checks	MSME Owners / Promoters /

Assets / Technology	Process Step	Key E&S Risks	Mitigation Measures (to include in ESMPs)	O&M Requirements	Responsible Parties [#]
		splash during cooling • Slippery floor conditions • Burns from hot castings	or cooling • Non-slip flooring and proper drainage • PPE such as gloves and face shield	• Monitoring cooling water reuse • Floor safety inspections	Technician or Operation Supervisor
Shot Blasting / Fettling	Finishing	• Heavy dust generation • Loud noise affecting hearing • Sparks and flying metal particles	• Dust collection system with enclosure • Ear plugs, goggles, face shield • Restricted access during operation	• Cleaning and maintenance of dust system • Checking nozzles and liners • Noise monitoring	MSME Owners / Promoters / Technician or Operation Supervisor / Production Manager / Maintenance Team
Machining (CNC, Cutting, Grinding)	Finishing	• Cuts and hand injuries • Metal chips hitting eyes • Noise and vibration exposure	• Machine guarding and covers • Goggles, gloves, and ear protection • Proper work positioning	• Daily checking of guards and tools • Coolant and oil level checks • Housekeeping around machines	MSME Owners / Promoters / Technician or Operation Supervisor / Production Supervisor
Heat Treatment Furnaces	Heat Treatment	• Very high temperature exposure • Fire or thermal accident risk • Heat stress to workers	• Temperature control systems • Proper insulation and PPE • Fire safety equipment nearby	• Temperature and cycle recording • Routine furnace inspection • Preventive maintenance	MSME Owners / Promoters / Technician or Operation Supervisor
Sand Reclamation Unit	Sand Recovery	• Dust during sand processing • Heat exposure (thermal units)	• Enclosures and dust collection • PPE such as masks and gloves	• Cleaning of filters and ducts • Monitoring sand quality and reuse	MSME Owners / Promoters / Technician or Operation Supervisor

Assets / Technology	Process Step	Key E&S Risks	Mitigation Measures (to include in ESMPs)	O&M Requirements	Responsible Parties [#]
Fuel Storage (Oil / Gas / Coke)	Utilities	• Fire risk from fuel storage • Fuel spills and slips • Worker exposure to fumes	• Proper marked storage area • Spill trays and kits • Fire extinguishers nearby	• Daily visual inspection • Stock and spill log maintenance	MSME Owners / Promoters / Technician or Operation Supervisor / Chemical Storekeeper
DG Set	Utilities	• Smoke emissions • Noise disturbance	• Stack/chimney for exhaust • Noise enclosure for DG set	• Emission and oil checks • Routine servicing records	MSME Owners / Promoters / Technician or Operation Supervisor
Air Compressor	Utilities	• High noise level • Pressure build-up risk	• Safety valve and noise enclosure	• Pressure gauge and leak checks	MSME Owners / Promoters / Technician or Operation Supervisor
Material Handling (Forklift / Crane)	Handling	• Collision with workers • Lifting and ergonomic injuries	• Clear pathways and markings • Trained operator only	• Daily equipment inspection	MSME Owners / Promoters / Technician or Operation Supervisor / Warehouse Manager
Worker Facilities	All Areas	• Poor hygiene affecting health	• Clean toilets and drinking water	• Daily cleaning and inspection	MSME Owners / Promoters / Technician or Operation Supervisor
Fire Safety System	Entire Unit	• Fire accidents and injury risk	• Fire extinguishers, alarms, exits	• Monthly fire equipment checks	MSME Owners / Promoters / Technician or Operation Supervisor / EHS Officer

[#] Responsible parties might not have Technical Environmental expert at Micro and Small -MSME. In such case, they may consider the unit head, and capable individuals may be assigned as the responsible person.

MSMEs in India are generally small and EHS personnel / service provider would be required appropriate to the scale and risk profile of operations to perform ESS-related tasks. MSMEs may assign staff with

defined EHS responsibilities and train them through capacity-building and training initiatives facilitated by SIDBI under the programme or can train the staffs on their own.

Compliance will be ensured through ESDD screening and periodic monitoring, including site visits to verify that staffing arrangements remain proportionate to risk levels and effective in implementing ESS requirements.

Residual risks that remain after technology adoption include chemical exposure, heat stress, noise, emergency preparedness gaps, labour welfare considerations, Gender-Responsive Infrastructure designed to ensure the safety, privacy and dignity of female worker, and SEAH/harassment risks. These are addressed through unit-specific ESMP measures described in Section 2.5.2 and Section 4.

2.5.2 SIDBI's Activity-Wise Environmental & Social Management Plan (ESMP)

Section 2.5.1 outlines SIDBI's internal environmental and social management procedures for FMAP direct-lending operations. These steps form part of SIDBI's institutional ESMS and run parallel to the MSME-level ESMP requirements presented in Section 2.5.3.

Table 4: SIDBI's Activity Wise ESMP

Sl. No.	Activity	Description	Responsibility	Frequency
1	Project Screening / E&S Risk Categorization	Ensure projects listed in the FMAP Exclusion List are not taken up. Initial risk categorization is applied to screen out high-risk (Category A/I-1) proposals.	SIDBI	At project evaluation and loan application stage
2a	Environmental and Social Due Diligence (ESDD)	Evaluation of E&S risks, compliance gaps and identification of applicable mitigation measures. Projects not meeting E&S requirements will either be rejected or asked to strengthen compliance before appraisal.	Borrower (MSME)	With each loan application
2b	Review of ESDD Report	Examination and verification of ESDD documents and evidence for completeness, adequacy, and alignment with FMAP requirements.	SIDBI	At loan application review
3	Technical Assessment	Assessment of energy/resource savings, pollution reduction, OHS improvements, and other E&S benefits of the proposed assets.	SIDBI	During loan appraisal
4	E&S Rating	Scoring of environmental and social performance using SIDBI's ESG/Green Rating Tool to support decision-making.	SIDBI	During loan appraisal
5a	Environmental & Social Management Plan (ESMP) Review	Based on ESDD findings, SIDBI reviews the MSME's ESMP or ESHS strengthening plan, ensuring inclusion of: (i) mitigation measures, (ii) monitoring indicators, (iii) responsibilities, (iv) timelines, and (v) residual-risk actions. ESMPs are	SIDBI + MSME	During loan appraisal

Sl. No.	Activity	Description	Responsibility	Frequency
		shared with MSMEs during the lending process.		
5b	Training & Undertaking	MSMEs receive guidance/training on ESMP implementation and submit undertakings committing to compliance with FMAP E&S requirements.	SIDBI / MSME	Need Based
6a	E&S Supervision	Site visits, document reviews and verification of ESMP implementation using M&V protocols, ESDD formats and the ESG Rating Tool.	SIDBI	Periodical visit during tenure of loan [generally once in a year]
6b	Monitoring & Reporting	Independent third-party monitoring (sample-based) may be undertaken to assess ESMP implementation, including checks on SEAH safeguards, labour and gender measures, and asset-specific mitigation. Findings will be integrated into FMAP programme-level reporting.	SIDBI / Third-Party Agency (if appointed)	As per program requirement

2.5.3 MSME Stage-wise for Assets based monitoring under Environmental & Social Management Plan (ESMP)

This MSME stage-wise ESMP sets minimum E&S actions and responsibilities for each stage of the sub-project cycle screening/appraisal, installation, commissioning, routine operation, monitoring & reporting, and decommissioning.

Actions are explicitly linked to the risk clusters in Section 2.5 (Pollution & Resource Efficiency; OHS & Workplace Safety; Community Health & Safety; Labour & GRM; Gender, SEAH/ POSH & Inclusion) and anchored to FMAP-financed asset types (e.g., Melting Furnaces, Core Making Machines, Moulding Machines, Heat Treatment Furnaces, Rooftop PV, Mobility).

SIDBI will apply its standard procedures for internal review, including onsite verification by Relationship Manager (RM), and use of structured tools (ESG Rating Tool, ESDD formats, and M&V protocols). Technical Assistance (TA) will support MSMEs to implement unit-level ESMPs, and sample-based third-party verification will provide independent checks at portfolio level.

Table 5: E&S Actions and Responsibilities by Project Stage

A. Screening / Appraisal Stage				
E&S Actions (Asset-anchored)	Asset-Specific Conditions	Responsibilities	Evidence Records / to Maintain	Verification & Frequency
Apply exclusion list; map applicable risk clusters; preliminary ESDD	Confirm the project is not on the exclusion list and all the Environmental & Social compliances are in place as per ESDD document.	MSME & RM	ESDD checklist; legal permits status; site layout; utility list	Pre-Sanction visit to the project site and during project appraisal

Legal and regulatory screening (SPCB consents, factory license);	Confirm Consent to Establish timelines;	MSME & RM	Copies of consents/ applications	Pre-Sanction visit to the project site and during project appraisal
Baseline OHS & HR due diligence: PPE, fire & emergency, labour contracts, women facilities & GRM	Verify (POSH), toilets/lighting, workers sanitation; contractor controls	MSME & RM	HR policies, GRM note, POSH constitution, floorplans	Pre-Sanction visit to the project site and during project appraisal
Residual-risk planning requirement listed in term sheet, as appropriate	Require unit-specific actions in ESMP for OHS, emergency, labour, women's safety/SEAH	MSME, RM and E&S Expert	Draft unit-specific ESMP outline	Project Appraisal stage
B. Installation Stage				
E&S Actions	Asset-Specific Conditions	Responsibilities	Evidence Records /	Verification & Frequency
Contractor OHS plan (LOTO, work at height, hot work, confined space, electrical safety); site induction & PPE	Green Technologies, furnace installation and foundations; moulding and finishing equipment placement; dust extraction systems; DG sets and utilities; hot work protection and electrical isolators	Vendor/Installer; MSME oversight	Method statements: toolbox talk registers; Permit To Work (PTW) logs	Check at MSME end
Nuisance control dust, noise, traffic; safe receipt and storage of fuels and consumables	Temporary storage for fuels, oils, binders and consumables; spill kits; forklift/crane movement plan	Vendor; MSME	Housekeeping & traffic plan; spill logs	Check at MSME end
Compliance with layout and clearances (fire lanes, exits, extinguishers, hydrants)	Fire detection, alarm and suppression system compatibility with foundry layout and furnaces	MSME; Vendor	Layout as-built; fire system handover	Check at MSME end
C. Commissioning Stage				
E&S Actions	Asset-Specific Conditions	Responsibilities	Evidence Records /	Verification & Frequency
Functional testing: air emission stacks (furnaces, heat-treatment units), dust collection systems, DG sets/compressors acoustics, cooling systems	Calibrate monitoring instruments where applicable; verify stack/chimney height and dispersion arrangements	Vendor (tests); MSME (witness)	Commissioning reports; calibration certificates	Technical Official spot-check

Emergency preparedness drill; verify routes, alarms,	Simulate fire, molten-metal splash, or fuel spill incident; evacuation timing; assembly area	MSME; E&S Expert support	Drill records; emergency plan	Post commissioning
Operator training & SOPs (furnace operation, casting, finishing, sand handling, utilities)	Vendor manuals translated; shift-wise SOPs	Vendor; MSME	Training attendance; SOPs; shift handover sheets	Post-commissioning at MSME end
D. Routine Operation Stage				
E&S Actions	Asset-Specific Conditions	Responsibilities	Evidence Records /	Verification & Frequency
Air emissions and waste compliance; disposal of slag, sand, spent refractories, and other wastes to authorized vendors	Stack emissions from furnaces and heat-treatment units; dust collection systems; waste handling as per SPCB norms	MSME (Ops)	Emission monitoring reports; waste manifests; calibration and inspection logs	By the concerned Regulators
OHS controls: PPE, machine guarding, LOTO, hot-surface insulation; periodic fire checks	Furnace safety interlocks; guarding of machining and moulding equipment; hot-work controls; confined space permits (where applicable)	MSME	PPE logs; PTW; incident/NMIS reports	Need based periodical review
Community safeguards: traffic management; noise timing; stack dispersion	Vehicle routing; acoustic enclosures maintained, adequate stack height	MSME	Traffic plan; noise checks	Need based periodical review
Labour & GRM: contracts, wages, hours, GRM functionality; POSH functioning; facilities for women	GRM register; POSH training; toilets/lighting	MSME; HR/Welfare	GRM logs; POSH minutes	Need based periodical review
Residual-risk actions: unit-specific SOPs and corrective actions	Upset furnace conditions; abnormal emissions; dust escape; fuel handling	MSME	CAR (Corrective Action Register)	Need based periodical review
E. Monitoring & Reporting Stage				
E&S Actions	Asset-Specific Conditions	Responsibilities	Evidence Records /	Verification & Frequency
Maintain M&V logs (air emissions, energy use, water), OHS incidents, drills, training	Stack emission data from furnaces, fuel/energy consumption records, cooling water data (if used), DG set operation	MSME	M&V sheets; training registers; drills	MSME shall maintain data which may be available for verification to regulatory bodies
Internal audits against cluster	Short, MSME-friendly checklists	MSME; RM support	Audit checklists; photos	MSME to keep audit

measures & asset conditions				data and make available for verification
Third-party verification (sample-based) across	Evidence review; site checks; Corrective Action Plan	Independent agency; SIDBI PMU	Verification reports; CAPs	Verification on sample basis as per requirement
Reporting to SIDBI/PMU; update MIS; track CAP closure	Align with FMAP reporting cadence	MSME; RM/ PMU	Periodic reports	As per loan conditions
F. Decommissioning Stage (recognising loan-tenure constraint)				
E&S Actions	Asset-Specific Conditions	Responsibilities	Evidence Records /	Verification & Frequency
Plan for end-of-life pathways at	Furnace dismantling; disposal of refractories, oils, electrical panels, DG sets and fuel storage tanks	MSME (when End of Life arises); Vendor/EPR channels	Disposal certificates; handover to authorised recyclers	Verification feasible only if within loan tenure; otherwise, documented commitment at appraisal
Residual risks during dismantling: OHS, spills, traffic control	Dismantling method statements; PTW/LOTO	MSME; Contractor	PTW; spill & incident logs	At time of dismantling

This section outlines the minimum, stage-wise environmental and social (E&S) actions and responsibilities that MSME sub-projects are required to follow under FMAP. These actions are designed to be practical, asset-anchored, and implementation-oriented, helping MSME units translate FMAP safeguards into day-to-day operational practices.

This whole section, which describes SIDBI's internal ESMS procedures for appraisal, supervision, and portfolio-level reporting under FMAP's direct-lending modality.

Structure and Linkages

The stage-wise ESMP covers the full cycle of MSME sub-projects, including: screening/appraisal, installation, commissioning, routine operation, monitoring & reporting, and decommissioning.

Each action item is explicitly linked to the risk clusters identified in Section 2.5—

- Pollution & Resource Efficiency
- Occupational Health & Safety
- Community Health & Safety
- Labour & GRM
- Gender, SEAH/POSH & Inclusion

These requirements are aligned with the specific asset types financed under FMAP, such as furnaces (induction/cupola), moulding and core-making systems, heat-treatment units, rooftop solar PV systems and mobility solutions. This ensures that MSMEs can clearly understand the E&S expectations related to the particular technologies they adopt.

Implementation and Verification

To support consistent and reliable implementation, SIDBI will apply its standard internal review processes, including onsite verification by the Relationship Manager and Technical Officials. SIDBI will

also use structured assessment tools such as the ESG/Green Rating Tool, ESDD formats, and Measurement & Verification (M&V) protocols to ensure transparency and uniformity in evaluations.

MSMEs will receive Technical Training and Capacity Building (as TA workshop) to prepare and implement unit-level ESMPs or E&S strengthening plans. In addition, sample-based third-party verification will provide independent oversight across the programme, helping validate ESMP implementation and strengthen portfolio-level monitoring.

The responsibilities and actions described in this section apply to MSMEs, SIDBI, technology vendors/contractors, third-party verifiers, and Technical Assistance providers only.

2.6 Management and Monitoring Requirements

Effective E&S management requires the SIDBI to implement continuous monitoring, reporting, supervision, and corrective-action mechanisms. These obligations are established under the GCF Environmental and Social Policy, the GCF Screening & Categorization Guidance, and SIDBI's own ESMS.

Environmental & Social (E&S) performance and compliance with the ESMP:

- Monitoring the implementation of ESMP measures for each subproject throughout the project lifecycle.
- Ensuring compliance with GCF Environmental and Social Safeguards (ESS), host-country regulations, and approved subproject-specific ESMPs.
- Maintaining systematic E&S performance records, including effluent monitoring, waste management, occupational health and safety (OHS) indicators, grievance redress data, and stakeholder engagement logs.
- Reporting to the GCF on the project's E&S performance through periodic progress reports.

The GCF Environmental & Social Policy explicitly requires accredited entities to ensure implementation, monitoring, and compliance with mitigation measures identified in ESIA/ESMP. SIDBI's ESMS additionally requires ongoing E&S risk management, including monitoring and reporting across subprojects through the entire project cycle.

Conduct periodic site audits, inspections, and impact assessments:

Regular site visits/audits at a frequency proportionate to risk category are conducted and the details are as under:

- High-risk and Moderate-risk - semi-annual or annual monitoring
- Low-risk - annual or desk-based compliance checks.
- Track actual impacts versus predicted impacts identified in ESIA, adjusting mitigation measures as needed (adaptive management).
- Document non-compliances and ensure corrective action plans (CAPs) are implemented within agreed timelines.

SIDBI's ESMF and project cycle framework specify monitoring frequency, site audits, incident reviews, and corrective-action tracking as core components of E&S supervision.

The World Bank/IFC ESF and GCF guidance emphasize adaptive monitoring, disclosure, and ongoing reassessment of risks throughout implementation, requiring borrowers/accredited entities to adjust measures whenever impacts deviate from predictions.

At the varying levels of E&S capacity across MSMEs, technical assistance (TA), capacity-building and independent verification mechanisms form an integral part of FMAP's implementation strategy. SIDBI

already applies similar models across its green financing lines, including external technical partners, third-party auditors, and structured reporting formats.

Technical Assistance (TA) providers will help MSMEs prepare site-specific ESMPs strengthening plans, aligned with the risk clusters and asset-specific mitigation requirements in Section 2.5.

Under the Technical Assistance (TA) plan, dedicated workshops will be organized to build the capacity of MSMEs, PFIs, and NBFCs on the application of environmental and social safeguards (the number of workshops can be increased as per requirement and size of participants). These workshops will provide structured knowledge on how E&S aspects are integrated during project screening, implementation, and monitoring & verification (M&V). A specialized agency will be engaged (as per the TA plan submitted during proposal) to design and deliver the workshops, preparing training materials and guidance aligned with GCF's E&S standards and the FMAP programme. SIDBI EE team will be actively involved in the preparation, review, and finalization of these materials to ensure their relevance and quality. This initiative will strengthen institutional understanding and practice of E&S compliance, thereby supporting the effective adoption of low-carbon technologies within the MSME sector.

- MSMEs will receive guidance on documentation and residual-risk management, emergency preparedness, and labour/women-safety safeguards.
- ESG Rating Tool, ESDD checklists and M&V protocols will be used to standardise assessment and strengthen implementation.

Regarding Third-Party Monitoring and Sample Based Verification, SIDBI will engage independent agencies for sample-based verification across the MSME portfolio. Third party verifiers will review implementation of ESMP actions, conduct site visits, and check evidence records like pollutant load, effluent logs, OHS training, emergency systems, GRM functioning, POSH/SEAH. Verification findings will serve into portfolio level reporting, corrective actions, and capacity-building needs.

SIDBI's Technical Officials (E&S and Climate Expert) and Relationship Managers will monitor progress at key applicable ESMP stages. TA workshop and third-party findings will be integrated into SIDBI's internal supervision, tracking, and periodic reporting to GCF as per FAA. This will strengthen alignment between implementation and program-level accountability. This combined approach ensures that MSMEs receive hands-on support to meet ESMP requirements, while SIDBI maintains a robust oversight framework consistent with FMAP safeguards and SIDBI's green lending standards.

3. Loan Processing Framework for direct lending operations⁶

3.1 Loan Screening and Approval Process (for direct loans)

The Loan Approval Process is a comprehensive three-stage procedure designed to rigorously evaluate loan applications and ensure adherence to the stringent criteria.

The first stage, Application and Initial Screening, is conducted at the branch level by the Relationship Manager of SIDBI. During this phase, applications are meticulously screened for completeness, including the submission of mandatory documentation such as climate-related, environmental, and social safeguards documents. Incomplete applications are promptly rejected/ hand held to be completed, as the case may be, while only those deemed complete undergo initial screening against the exclusion list criteria. Further, at this stage, the individual proposals would be assessed for the following to ensure that they do not fall under the Cat. A/ I-1 activities of GCF:

1. Project outlay (if more than USD 60 million per project)
2. Whether the potential impact (environmental and/or social risks) are diverse, irreversible, or unprecedented
3. Whether the impact of the project be addressed through adequate policy implementation and workplace standards and suitable norms?

Based on the above assessment, if the project is found to be in the category Cat. A/ I-1 of, then the project will be screened out and will not be considered for financing.

Applications that meet the criteria are forwarded to the second stage, Due Diligence, while those that fall under the exclusion list (which includes the Category A/I1 projects) are rejected. The Due Diligence stage is executed in parallel at the branch level and involves several crucial assessments. The second level of screening will be done by means of the ESG rating tool (attached as Annexure 7 of ESMS). The Processing Officer conducts evaluations related to Know Your Customer (KYC) requirements, financial viability, credit due diligence and checking of ESDD checklist information (Annexure- 4 of ESMS). Concurrently, the Climate Expert, Technical Expert and E&S expert at the Project Management Unit (PMU) will perform climate-related, technical due diligence and will check the projects for ESS compliance (using the ESG rating tool) to ensure the soundness of the proposed project from a technical, E&S and climate perspective.

In the third stage, technically sound and financially viable applications proceed to the Credit Appraisal Memorandum preparation phase. The Processing team comprising Maker and Checker compiles a comprehensive Credit Appraisal Memorandum, which is then presented to the Loan Sanctioning Committee for final evaluation and decision-making. To maintain transparency and impartiality, no member involved in the Initial Application Screening and Due Diligence processes is permitted to be part of the Loan Sanctioning Committee.

⁶ SIDBI, "Environment and Social Management System (ESMS) 'Financing Mitigation & Adaptation Projects (FMAP) in Indian MSMEs", Page 27-29, <https://www.sidbi.in/assets/front/pdf/ESMS-FMAP-E.pdf>

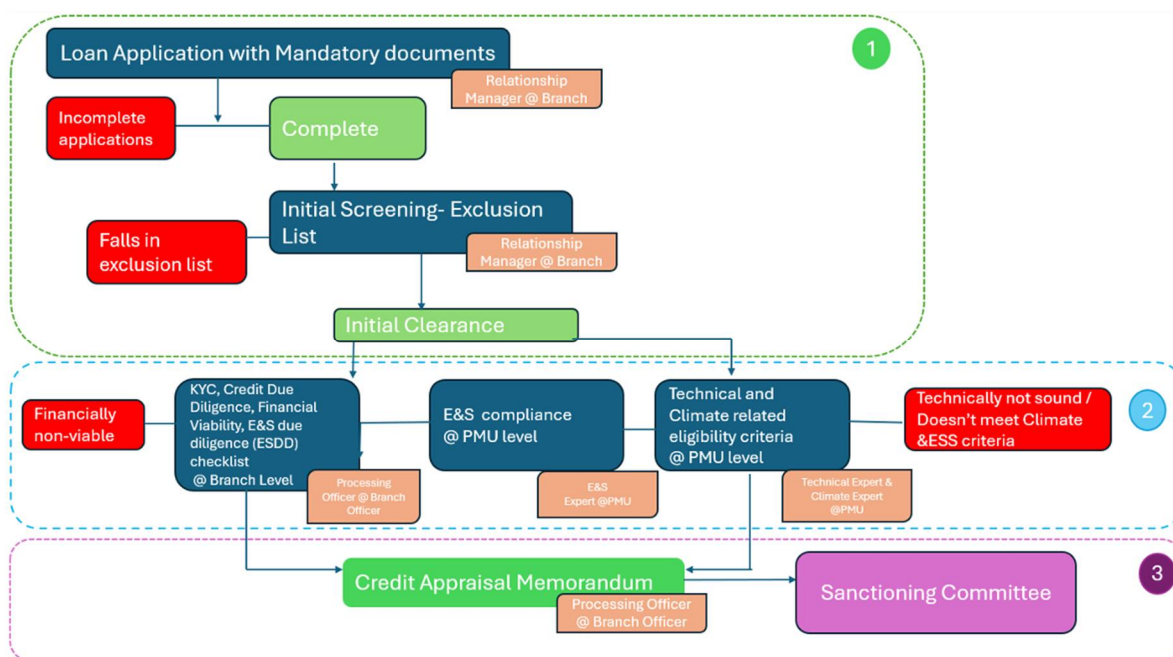


Figure 1: Loan Application Process

For direct loans, risk screening is carried out by SIDBI at the individual project level before financial approval. Each MSME proposal undergoes detailed checks against the exclusion list and Category A/I-1 criteria. Environmental and Social Due Diligence (ESDD) is performed, supported by the ESG rating tool, and project-specific ESMPs are prepared to ensure compliance with environmental and social safeguards. This ensures that only technically sound and compliant projects are financed directly by SIDBI.

Risk management for the direct loans is focused on the individual project level. Each MSME borrower must demonstrate compliance with the sectoral ESIA/ESMP and ESMS, which outlines impacts / mitigation measures, monitoring indicators, and responsibilities. SIDBI, as the Accredited Entity (AE), directly screens proposals, by ensuring that MSME's submit a holistic Environment Social Due Diligence (ESDD) and ESG rating tool which encompasses environment and social risks like (Pollution control, Labour issues, Occupational health and safety, SEAH, Grievance Redressal, Gender), and ensures that every project meets environmental and social safeguards before financial approval.

3.2 Risk Identification & Mitigation Strategy

Table 6: Identification risk and its mitigation strategy

Type	Risks Identified	Mitigation Measures
Environmental	Toxic discharges, hazardous emissions, noise fury, waste chaos	Advanced pollution control (air, water & noise whatever applicable), Waste management, wherever applicable, clean tech retrofits, real-time monitoring, Statutory and regulatory clearances, climate-smart innovation, proper hands-on training be given to the operators before operation, regular inspections, Operation & Maintenance of machinery / equipment, Fire safety guidelines /manuals, Do's & Don'ts in the facility etc.
Social	Unsafe labour conditions, gender	Institutional safeguards, Personal protective Equipment (PPE) like Masks, Goggles, Gloves, Harness must be provided, Display boards

	inequity, SEAH, underpayment	with danger signs placed at electrical and hazardous areas, Wage enforcement, GRMs, Gender Action Plans. Integration of Labor management procedures like contractual compliance, payroll audits, transparent wage scales, direct payment system into the bank accounts (as applicable) shall be taken care by borrower MSMEs and their management.
Community	Health deterioration, land stress, exclusion	Community consultations, inclusive benefits, shared infrastructure
Technological	Digital illiteracy, surveillance misuse, e-waste from sensors	Literacy drives, ethical tech use, green IoT design, traceable recycling chains

4. Grievance Redress Mechanism

The sectoral ESMP clearly outlines MSME-level expectations for grievance redressal. At the MSME/site level, each unit must prominently display the internal grievance focal point's details (name/phone/email) at entrances, shop floors, canteens, and dormitories. Worker induction and refresher toolbox talks will include a short briefing on internal grievance channels, escalation options to the Grievance Redressal Committee/Body, and access to the SIDBI GRM as described in SIDBI's ESMS-FMAP (Section 9.5 Awareness and Capacity Building) and GCF IRM.

Each MSME must maintain simple, accessible grievance channels such as a name of grievance officer as point of contact, complaint register/box and ensure basic logging, tracking, and timely resolution of labour / gender based, OHS, SEAH/POSH, and Environmental & Social grievances. SIDBI will verify MSME-level GRM performance during annual ESS Monitoring & Verification (ESS M&V) visits and through any third-party verification done under the Programme. MSMEs will also submit periodic reports to SIDBI summarizing grievance categories, acknowledgements, resolutions, open cases, and corrective actions taken.

In 2013, the Government of India notified the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act (POSH Act). The Act aspires to ensure women's right to workplace equality, free from sexual harassment through compliance with the above mentioned three elements. It is important to note that the Act provides a civil remedy to women and is in addition to other laws that are currently in force. Consequently, any woman who wishes to report instances of sexual harassment at the workplace has the right to take recourse of both civil and criminal proceedings. As a public financial institution, SIDBI has adopted the POSH policy of the Government of India (Refer Attachment 2 of ESMS in page no 125 -135).

Grievance Redressal Policy (Refer Attachment 3 of ESMS) is based on the principles of customer service and customer satisfaction which would in turn broaden its customer base. SIDBI's policy on grievance redressal follows broadly the following principles:

- Customers are always treated fairly
- Grievances raised by customers are dealt with courtesy and on time
- SIDBI will treat all grievances efficiently and fairly as they can damage the Bank's reputation and business if handled otherwise
- SIDBI's employees must work in good faith and without prejudice to the interests of the customer
- Customers are fully informed of avenues to escalate their complaints/ grievances within the organization and their rights to alternative remedy if they are not fully satisfied with the response of the Bank to their complaints in keeping with the above policy, the GRM has the following provisions:

(a) Registration of complaint: Customer can lodge / register his grievance through any of the following channels:

- Complaint in Person
- Complaints through post / mail / email
- Online Registration of Complaints and
- Grievances lodged through the Public Grievance Portal such as Centralized Public Grievances Redress and Monitoring System (CPGRAMS) (www.pgportal.gov.in)

(b) Mandatory display/ disclosure requirements at SIDBI Offices: The following are displayed/ disclosed at the SIDBI offices for easy filing of grievances.

- Complaint Book/Register
- Complaints/Suggestion Box
- Complaint form at SIDBI website homepage
- Notice Board displaying contact details of Nodal Officers for grievances, escalation of unresolved grievances within 8 working days, and details of Chief Grievance Officer to be approached when not satisfied with the redress.

(c) Resolution of grievances / complaints: The process includes

- acknowledgement after receipt of complaint
- escalation matrix
- referring unsatisfied complaints to higher levels, etc.

Anonymous complaints are not entertained. All efforts are made to resolve each complaint received by the Bank generally within stipulated time as per the following escalation matrix:

Table 7: Escalation matrix at SIDBI

Level	SIDBI Office	Official In-charge
First	Branch Office	Nodal Officer at Branch level
Second	Regional Office	Nodal Officer at Regional level
Third	Head Office	Chief Grievance Officer

There may be some complaints which require deeper analyses from all possible angles. In such cases, the Bank will try to resolve the grievance within one month from the receipt of complaint. In case of unsatisfactory resolution, the resolution can be escalated to the higher level.

4.1 SIDBI's 3-Tier GRM

SIDBI has a three-tier grievance/ complaint redressal system which can be accessed @ <https://www.sidbi.in/complaints> The details are given below:

Level 1 – Branch Office Level

At the Branch Office, a complaint can be filed in person, post/ email to SIDBI and register online. When a complaint is registered, a unique Complaint ID will be generated/issued. The following complete details to be furnished while registering the complaints, enabling them to address the concern(s) in a holistic and timely manner:

- Full name of Complainant
- Customer ID if an existing Customer
- Complainant's Contact details (address, telephone number and e-mail)
- Reference number of Transaction/Complaint ID, depending on purpose

In case of non-receipt of reply within 8 working days of registering the complaint or unsatisfactory reply, it can be escalated to Level 2, using Complaint ID.

Level 2 – Regional Office Level

In case of non-receipt of reply within 8 working days of registering the complaint or unsatisfactory reply, the complaint can escalate it to Level 2 (Regional In-charge), using Complaint ID.

Level 3 – Head Office Level

If registered complaint is not resolved satisfactorily within 5 working days from date of escalation at regional level (Level 2), the complainant can contact Chief Grievance Officer/ Alternate Chief

SIDBI has a functional and well-structured three-tier GRM in place. The existing GRM will be utilized for the bilateral / multilateral supported programs /project. SIDBI will ensure that its GRM is adequately advertised at the levels of all stakeholders.

Additionally, a focal point for the programme will be appointed or nominated who can be contacted to obtain any project-related information or for registering suggestions/grievances. Details of the focal point for each case shall be made available on the SIDBI/project website.

To assess the overall effectiveness and efficiency of the project GRM, an evaluation will be conducted on an annual basis. Results will be shared with all concerned stakeholders to facilitate improvement in the performance of the GRM and provide necessary feedback. The following points may be assessed during such evaluations:

- Number of complaints/ queries received,
- Category of complainants (Type of stakeholder),
- Status of the complaints (rejected, closed, reopened, ongoing),
- Response time involved in the resolution of complaints,
- Feedback from the aggrieved/ complainants, if any

Further, GCF Independent Redressal Mechanism (IRM) can be accessed on the following link (<https://irm.greenclimate.fund/>), wherein affected parties/person can directly file a complaint if they are negatively affected by the projects/programmes funded by Green Climate Fund (GCF).

4.2 Grievance Redressal for Customers & Stakeholders

SIDBI ensures grievance redressal through continuous stakeholder engagement. For non-customers, awareness of mechanisms under Govt. of India/SIDBI/GCF is created via consultations. Citizens may lodge grievances 24x7 through the **Centralised Public Grievance Redress and Monitoring System (CPGRAMS)**⁷, accessible via web and mobile (UMANG/Google Play). Complaints can be tracked with a unique ID, and appeals filed if resolution is unsatisfactory.

4.3 Gender-Based Violence & SEAH risk identification and management

While section 4 covers about the labour vulnerabilities including gender safeguards and compliance with India's Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal) Act, 2013 commonly known as the POSH Act and provides for SEAH/gender assessment under independent monitoring. Accordingly, SIDBI follows the POSH Act, ensuring zero tolerance for GBV/SEAH⁸. The Act mandates:

- Broad definition of workplace (including organized/unorganized sectors).
- Internal & Local Complaints Committees.
- Defined complaint filing and inquiry process.

⁷ <https://pgportal.gov.in/>

⁸ SIDBI, "Environment and Social Management System (ESMS) 'Financing Mitigation & Adaptation Projects (FMAP) in Indian MSMEs", Page 71, <https://www.sidbi.in/assets/front/pdf/ESMS-FMAP-E.pdf>

- Employer duties: safe environment, awareness programs, support to complainants, treating harassment as misconduct, and timely reporting.

MSMEs must comply with institutional arrangements and report under programme mechanisms. As a Grievance/SEAH/POSH risk screening step, SIDBI ensures MSMEs undertake that Grievance/SEAH/POSH related information i.e., whether the unit has Internal Complaint Committee with respect to Grievance/SEAH/POSH and any cases registered / resolved. Further, Survivor-Centered Handling i.e., (confidentiality, non-retaliation, referral pathways) are followed as per POSH Act.

It is essential for MSMEs to institutionalize grievance redressal processes to enhance their accountability and stakeholder's trust. Accordingly, MSMEs shall maintain register/records covering the following details: -

- i. Total number of grievances received
- ii. Summary of grievances received
- iii. Details of grievances resolved, pending, reasons for delay in addressing the pending grievances, etc.
- iv. Details of number of sexual harassment complaints received and action undertaken to address such complaints.

In addition, Gender Assessment and Gender Action Plan under FMAP in GCF FMAP 241 has been captured in accordance with GCF requirement on Gender and Grievance. Reference Link:- [fp241-gender-assessment-cover.pdf](#) and [fp241-gender-action-plan-cover.pdf](#)

SIDBI explicitly stipulates that all Category B MSMEs must adhere to minimum labour and working-condition standards aligned with IFC Performance Standard 2, the GCF Environmental and Social Safeguards (ESS), and India's National Labour Code. The Labour Code—effective from 21 November 2025—consolidates 29 existing labour laws into four integrated codes covering:

1. **Wages,**
2. **Social Security,**
3. **Industrial Relations,** and
4. **Occupational Safety, Health and Working Conditions.**

These requirements are designed to identify and manage worker-related risks while ensuring that enterprises maintain safe, fair, and legally compliant workplaces.

In addition, SIDBI mandates that all MSMEs comply with India's statutory prohibitions on child labour and forced or bonded labour. Enterprises must also ensure the protection and fair treatment of vulnerable worker groups, including contract workers, migrant workers, and women workers, along with providing all necessary workplace amenities and welfare facilities in line with national regulations and international good practice.

At MSME site, Workers can access to Nodal officer (name/phone/email) regarding the POSH/SEAH through Prominent display board at entrances, shopfloors, canteens and dormitories/restroom for their Grievance Redressal Issues. Subsequently, worker induction & refresher toolbox talks are included with a short briefing on Internal Grievance Mechanism options, escalation to Grievance Redressal Management Committee/Body and under SIDBI's report on ESMS- FMAP in Indian MSMEs - section 9.5 Awareness and Capacity building ESMP training already committed which covers ESMP implementation.

Verification will be carried out during follow-up visits by SIDBI officers or by third party verification done under the programme, which the ESMP already prescribes. Periodic MSME submission to SIDBI covers various categories like Labour/Gender/OHS/SEAH/environment and resolved within the given timeline with corrective actions taken etc.

4.4 Conflict Sensitivity Assessment⁹

- **Community Health & Safety:** OHS safeguards are checked via ESDD/ESG tools before lending. Annual audits ensure compliance. Borrowers must provide medical care, redress, and compensation in case of incidents.
- **Land Acquisition:** Projects are screened to avoid acquisition/resettlement affecting biodiversity-sensitive areas, indigenous communities, or cultural heritage.
- **Indigenous Peoples:** Projects will not be assisted affecting people in voluntary isolation.

⁹ SIDBI, “Environment and Social Management System (ESMS) ‘Financing Mitigation & Adaptation Projects (FMAP) in Indian MSMEs”, Page 73- & 74, <https://www.sidbi.in/assets/front/pdf/ESMS-FMAP-E.pdf>

5. Monitoring, Evaluation & Reporting Requirements

The FMAP programme adopts a **comprehensive, multilayered Monitoring and Evaluation (M&E) system** that integrates subproject-level ESMP implementation, programme-level oversight, and reporting to the Green Climate Fund (GCF). Monitoring responsibilities are shared across SIDBI, MSME borrowers, third-party agencies, and SIDBI's Programme Management Unit (PMU). The approach ensures continuous oversight of environmental and social performance, GHG emission reductions, and compliance throughout the project lifecycle.

5.1 Continuous Monitoring and Reporting Obligations

1. Monitoring Level (SIDBI)

SIDBI conducts **end-to-end monitoring** from project appraisal through implementation and closure. This includes:

- **Pre-Sanction visits** before loan sanction, where SIDBI verifies actual site conditions through:
 - o On-site walkthrough inspections
 - o Stakeholder interviews (workers, supervisors, management)
 - o Photographic verification and geo-tagged evidence
 - o Cross-checking compliance with the exclusion list
 - o ESDD and ESG scoring
- **Verification of mitigation measures** listed in the project-specific ESMPs, including:
 - o Pollution control infrastructure (ETP, APCD, caustic recovery, sludge handling)
 - o PPE availability and OHS practices
 - o Chemical management and hazardous waste disposal
 - o Gender, SEAH, and labor compliance (aligned with new National Labor Codes, effective 21 Nov 2025)
- **Annual supervision missions**, including site audits, documentation checks, and follow-ups on corrective actions. **Ensuring submission** by MSMEs, tied to undertakings signed during ESMP rollout (Section 3.4).

2. Third-Party Monitoring

During the initial six years of the programme:

- A **third-party M&E agency** develops monitoring tools, reporting formats, and conducts verification audits.
- From years **7–13**, SIDBI's PMU technical/M&E officer conducts field-level monitoring using the validated tools.
- Independent sample-based evaluations assess:
 - o ESMP implementation on the ground
 - o Gender and SEAH Action Plan compliance
 - o E&S risk mitigation effectiveness
 - o Climate benefits (GHG reductions, energy savings, water efficiency)

3. Programme-Level Monitoring by SIDBI

SIDBI monitors:

- Sub-loan performance and disbursements
- Co-financing mobilization
- Climate results (GHG reductions, energy savings)
- Progress towards outputs (beneficiaries, women-led MSMEs, EVs financed, solar projects, etc.)

- Institutional strengthening indicators

All findings feed into Performance Reports and the Annual Performance Report (APR).

5.2 Integration with GCF's Annual Performance Report (APR)

The APR consolidates monitoring results from all financing channels and fulfils SIDBI's obligations. Key elements include:

1. Subproject Disclosure & Reporting

- All directly financed subprojects are disclosed and included in APR submissions.
- APR includes:
 - o Summaries of ESIA/ESDD/ESMP implementation
 - o Significant changes or material variances post-disclosure
 - o Portfolio-level corrective actions
 - o Updates on safeguards, gender, SEAH, OHS, climate resilience, and pollution control compliance.

2. Climate & Results Reporting

SIDBI submits:

- **Traceable Excel-based GHG reduction calculations** annually, using:
 - o Energy savings data from MSMEs
 - o Internationally recognized methodologies (CDM, ISO standards)
- **Programme-level indicators**, including:
 - o Core indicator 1 (GHG emission reductions)
 - o Core indicator 2 (beneficiaries)
 - o Core indicator 3 (value of climate-resilient assets)
 - o Core indicators 5–8 (institutional strengthening, innovation, knowledge creation)

3. Compliance Confirmation

Every APR confirms that:

- Sub-loans comply with eligibility criteria
- Sectoral ESMP guidelines are met
- Co-financing ratios are maintained
- All monitoring data meets Evaluation Policy requirements
- Programme-level progress aligns with climate impacts, results framework, and ESMS commitments.

6. Conclusion

The ESIA and ESMP under FMAP is a commitment to responsible industrial transformation for Category B subprojects under direct lending component. These measures would safeguard our environment, uphold workers' dignity and safety, protect community health, and anchor our path toward a sustainable future.

Annexure 1- Negative / Exclusion List

SIDBI does not finance the following (Negative/Exclusionary List of projects) out of the GCF Proceeds:

- i. Production or trade in any product or activity deemed illegal under Indian laws or regulations or international conventions and agreements.
- ii. Production or trade in weapons and munitions.
- iii. Production or trade in alcoholic beverages (excluding beer and wine).
- iv. Production or trade in tobacco.
- v. Gambling, casinos, and equivalent enterprises.
- vi. Trade in wildlife or wildlife products regulated under CITES.
- vii. Production or trade in radioactive materials.
- viii. Production or trade in or use of unbounded asbestos fibers.
- ix. Commercial logging operations or the purchase of logging equipment for use in primary tropical moist forest (prohibited by the Forestry policy).
- x. Production or trade in products containing PCBs.
- xi. Production or trade in pharmaceuticals subject to international phase outs or bans.
- xii. Drift net fishing in the marine environment using nets in excess of 2.5 km. in length.
- xiii. Production or trade in ozone depleting substances (ODS) subject to international phase out.
- xiv. Production or trade in pesticides/herbicides subject to international phase outs or bans as agreed by GOI based on Stockholm convention.
- xv. Production or activities involving harmful or exploitative forms of child labour or forced labour.
- xvi. Projects/ activities requiring land acquisition and/ or causing Loss of Land / loss of source of income / loss of livelihoods, impacts on community/ displacement of people or communities from private or public lands or any negative impacts on livelihoods.
- xvii. Projects located in areas of significant settlement or impacting the natural and cultural resources of tribal people and adversely affecting the land, culture, livelihood, and way of life of tribal and indigenous people.
- xviii. Projects located in sensitive ecological areas and natural/ cultural heritage locations. If any activities are proposed in these areas, then the beneficiaries must obtain the requisite permissions. These permissions are required if the activities are taken up within one km from the sensitive ecological areas or heritage locations.
- xix. Category A Projects with potentially significant adverse environmental and/or social risks and impacts that, individually or cumulatively, are diverse, irreversible, or unprecedented and I1 i.e. when an intermediary's existing or proposed portfolio includes or is expected to include financial exposure to activities with potentially significant adverse environmental and social.
- xx. Projects that affect in any way Indigenous Peoples with limited external contact, also known as peoples "in voluntary isolation", "isolated peoples" or "remote groups".
- xxi. Production and distribution of racist, anti-democratic and/or neo-Nazi media.
- xxii. Projects that involve the conversion or degradation of Critical Natural Habitats
- xxiii. Large agricultural or forestry enterprises (>5,000 ha) producing palm oil or wood that do not comply with recognised international certification systems (e.g. RSPO or FSC) or equivalent regulations.
- xxiv. Practices which prevent employees from lawfully exercising their rights of association and collective bargaining
- xxv. Nuclear power plants (apart from measures that reduce environmental hazards of existing assets) and mines with uranium as an essential source of extraction.
- xxvi. Prospection, exploration and mining of coal; land-based means of transport and related infrastructure essentially used for coal; power plants, heating stations and cogeneration facilities essentially fired with coal, as well as associated stub lines.
- xxvii. Non-conventional prospection, exploration and extraction of oil from bituminous shale, tar sands or oil sands.
- xxviii. Cross-border trade in waste products unless compliant with the Basel Convention and the underlying regulations.
- xxix. Production or trade of persistent organic pollutants (POPs)
- xxx. Prohibited transboundary trade in waste (under the Basel Convention)
- xxxi. Investments which could be associated with the destruction or significant impairment of areas particularly worthy of protection (without adequate compensation in accordance with international standards).
- xxxii. Production or trade in wood or other forestry products other than from sustainably managed forests.
- xxxiii. Production, trade, storage, or transport of significant volumes of hazardous chemicals, or commercial scale usage of hazardous chemicals. Hazardous chemicals include gasoline, kerosene, and other petroleum products.
- xxxiv. Production or activities that impinge on the lands owned, or claimed under adjudication, by Indigenous Peoples, without full documented consent of such peoples.

Annexure 2 - Environmental & Social Due Diligence (ESDD) Checklist

Name of the MSME enterprise:

Project Location with address:

S.No.	Particulars	Response	Remarks
<u>A. Environmental Aspects</u>			
1	Environmental Clearance from MoEFCC* / SEIAA**	Yes / No / Not Applicable / Applied For	- If 'Yes', attach copy of the same. - If 'Applied For', attach copy of the application submitted by the MSME unit to the concerned SPCB or the receipt copy of the fee paid to the SPCB.
2	Valid Consent(s) / Clearances from SPCB/CPCB	Yes / No / Not Applicable / Applied For	- If 'Yes', attach copy of Consent to Establish (CTE) / Consent to Operate (CTO). - If 'Applied For', then attach copy of the application submitted by the MSME unit to the concerned SPCB or the receipt copy of the fee paid to the SPCB.
3	Whether the unit has received any notice for regulatory non-compliance or violation of norms or consent conditions or faced any litigation or material settlement of convictions in court	Yes/No	If 'Yes', state reasons, which led to industry being notified as 'non-compliant' and actions undertaken to become compliant. State clearly whether the issue has been resolved or not. If not, state reasons clearly.
4	Compliance of consent - for eg. Installation of pollution control measure suggested as per consent	Yes / No / Not Applicable	list out deviations if any
<u>B. Social Aspects</u>			
5	Does the unit employ child and / or forced labor for its operations	Yes/No	
6	Does the unit follow minimum wages act / No discrimination on the grounds of	Yes/No	

S.No.	Particulars	Response	Remarks
	religion/ethnicity/colour/ race/ gender and caste.		
7	Does the unit employ Occupational, Health and Safety related measures for its operations <i>[For example: Workers wearing Gloves, helmet, mask during operations (especially during welding operations), installation of fire safety measures (e.g. workable / usable fire extinguishers having pressure gauge needle in green zone), etc.]</i>	Yes/No	
8	Does the unit comply with labour welfare requirements like ESI /EPF etc	Yes / No	
9	Does the unit have occupational facilities such as canteen / restroom / toilet for the worker	Yes/ No	
10	Does the unit employ women? If yes, whether separate facilities such as toilet / rest room provided to them	Yes / No	
11	Does the unit have a Grievance Redressal Mechanism (GRM) and Grievance Register to lodge complaints.	Yes / No / Not Applicable	
12	Does the unit have Internal Complaint Committee with respect to The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) POSH Act / Sexual Exploitation, Abuse, and Harassment (SEAH)	Yes / No / Not Applicable	
13	Do the unit received any complaint or any cases registered under POSH Act / SEAH till date	Yes / No	

S.No.	Particulars	Response	Remarks
14	Is there any provision for Physically handicapped/ Challenged person in the workforce despite of gender.	Yes / No / Not Applicable	
15	Does the unit have prominent display boards indicating GRM(MSME) contact person details / SIDBI Grievance redressal contact details/ GCF independent redressal mechanism details.	Yes / No / Not Applicable	
16	Does the unit have Emergency Preparedness Response Plan (EPRP).	Yes / No / Not Applicable	
17	Is there availability of First Aid at the site and tie up with the local hospital in case of emergency?	Yes / No / Not Applicable	
<i>C. General Land Related Aspects – Common for all types of projects</i>			
18	Does the project / unit is located in the notified industrial area & park / cluster / Special Economic Zone etc	Yes / No	<i>If no, the following questions are to be answered (Question 19, 20, 21 & 22)</i>
19	Does the project require compulsory land acquisition causing displacement of the resident / Involuntary resettlement	Yes / No / Not Applicable	
20	Does the unit / project is located in, areas of significant settlement and / or collective attachment of tribal people / Indigenous People.	Yes / No / Not Applicable	
21	Does the project involves signification alteration / damage / removal of any critical cultural heritage	Yes / No / Not Applicable	
22	Is the project / unit located closer (within 10 KM) to any eco sensitive zone such as national parks / reserved forests	Yes / No / Not Applicable	
<i>D. Land-related Aspects</i> (Only for Brownfield enterprises going for expansion and modernization of their existing operations in a new location / premises; and (ii) Greenfield projects i.e., setting up of new enterprises)			

S.No.	Particulars	Response	Remarks
23	Land Status / use classification	• industrial area, industrial estate notified industrial zone, • special economic zones, • Land parcels already designated by the Government for non-agricultural use, • solar / wind farms etc where all the necessary statutory permission / infrastructure are available	
24	Transaction Status - Mode of Land Access / Acquisition	• Purchased from Govt (outright / lease) • Privately purchased land through willing buyer-willing seller transactions with clear title • Private Lease • Owned / inherited - Others (please specify)	

(Promoters Signature)

It is hereby certified that the information provided in the above ESDD report by the project proponent has been duly checked/ verified by the undersigned and is found to have sufficient environment and social safeguard measures in place and therefore may be considered for providing loan.

Signature :
Name of Person :
Designation :
Name of the SIDBI Branch :

For the use of SIDBI Branch

- ☐ Approved
- ☐ Conditional Approval (Specify the conditions)
- ☐ Not Approved, Reason(s) thereof

Annexure 3- List of Cross Functional Technology

The technologies mentioned below are used across all the industrial sectors which improves Energy Efficiency, results in cleaner production, enhances resource efficiency and would also result in reduction of GHG emissions which are aligned with the FMAP Programme objective. The E&S Risk Categorization of these technologies would depend on the industrial process as mentioned in this document.

Further, it is to be mentioned that these technologies are also used for projects with backward and forward integration within the eligible industrial sectors identified under the FMAP Programme.

In addition to the above, if the project includes both mitigation and adaptation measures, suitable bifurcation and tagging would be done for the purpose of inclusion in the project and reporting to GCF under the FMAP Programme.

The following cross-sectoral technologies would be funded under the FMAP Programme including the sector under reference.

Sr. No.	Technology Name
1	Variable Frequency Drives
2	Energy Efficient Transformers
3	Energy Efficient Fluorescent Lamps
4	Compact Fluorescent Lamps
5	Metal Halides Lamps
6	High Pressure Sodium Vapor Lamps
7	Light Emitting Diode
8	Microprocessor Based Intelligent Control
9	Exclusive Transformer for Lighting
10	Servo Stabilizer
11	Electronic Ballast
12	Energy Efficient Air Compressors & Blowers
13	Energy Efficient Fans & Pumps
14	Capacitors
15	Automatic Power factor Controller
16	Soft Starter for Motors
17	Maximum Demand Controller
18	Automatic Temperature Controller
19	High-frequency Induction Irradiation
20	High-frequency Melting Furnace
21	Highly Sensitive and Responsive Arc Furnace
22	High-performance Electrolytic Furnace
23	Electromagnetic Irradiation
24	Common Incinerator Alongwith Power Generation Facilities
25	Screw Compressor
26	Computer Desktop Virtual Machine
27	Cooling Towers (Fills with PVC Honey Comb)

28	Wide Belt Sander
29	Spindle Moulder
30	Multi-boring machine
31	Visi cooler
32	Robot Arms
33	Enginator based on Natural Gas
34	CNC Router
35	Vacuum forming machine with thermostat control
36	Edge Bander Sprint with Power- PC Control
37	Enterprise Resource Planning (ERP) (with PPG module)
38	Automatic Book Sewing Machine
39	Tunnel Dryer for mosquito coil industry
40	Induction Lighting
41	SCADA system
42	Energy Management System
43	Water-tube Boiler (by replacing conventional Smoke-tube Boiler)
44	Condensate Recovery & Recycle System
45	Energy Efficient Boilers
46	Recuperators
47	Cogeneration
48	Heat Pumps
49	Energy Efficient Refrigeration System
50	Automatic Combustion Control for Boilers / Furnaces
51	Regenerative Burners for Furnace
52	Heat Recovery Systems for Boilers (Economizer, Air Pre- heater)
53	Outdoor Intake Control / Variable Air Volume / Heat exchanger
54	High Efficiency DG Set for Power Generation (Low Fuel Consumption with Pollution Control & Canopy)
55	Waste Heat Recovery Boiler
56	Thermal Insulation for Hot & Cold Systems
57	Dehumidification Dryer
58	Building Energy Management System
59	Municipal Solid Waste Based Power Generation
60	Building Energy Management System (BEMS) & Concentrated Solar Thermal Power (CSP)
61	Bioreactor with PLC
62	Batching Plant with Microprocessor Control
63	Wire Condenser Welding Machine equipped with PLC
64	2 Stations Auto Balancing Machine equipped with PLC
65	Standing Seam Roofing and Curving
66	Energy Efficient Air Compressors
67	Variable Frequency Drive for Screw Compressors
68	Heat of Compression Air Dryers (Replacing Desiccant Air Dryer)
69	Variable Frequency Drive for Oil Pump in Hydraulic Power Packs
70	Energy Efficient Exhaust Fans
71	Variable Frequency Drive for Hot Air Circulation Fan for Preheating Furnace

72	Air Preheater (for Furnace Flue Gas Waste Heat Recovery)
73	CNC Cutting Machine with End Former
74	Fully Automatic CNC Return Bender
75	Automatic Ring Sizing and Loading Machine
76	CNC Vertical Machining Centre
77	Vacuum Holding for Non-Ferrous Components for High-Speed Milling
78	CNC Co-ordinate Measuring Machine
79	CNC Sharpening and Profile Grinding, Automatic Broach Sharpening Machine
80	Turning Machine with Variable Frequency Drive with Regenerative Braking System
81	Servo Electric Turret Punch Machine
82	Abrasive Assisted High Pressure Water Jet Cutting
83	Inverter Based Welding Machine
84	CNC Plasma Cutting Machine
85	Double Polishing Machine (with Inverter Control)
86	Pressure Die Casting Machine
87	Semi-Automatic Pillar Type Hydraulic Hot Moulding Press (with PLC Control)
88	CNC Electronic Spring Control Machine
89	Fully Automatic Hydraulic Hot Chamber with Diesel Burner
90	Rotary Table Machine for Surface Finishing and Polishing (with Inverter Speed Regulation)
91	CNC Punching Forming Machine
92	Open Back Double Point Press - PLC Controlled
93	Automatic Transfer Unit
94	CNC Garter Spring Former
95	Electro-Hydraulic CNC Punching Machine
96	Automatic NC Control Bending Machine
97	Sensor Oxy- Height Control (OHC) and Sensor Plasma Height Control (PHC)
98	Gasifier Based Heat Treatment Furnace
99	Insulated Gate Bipolar Transistor Based Inverter
100	Cylinder Block Boring and Milling Machine (with Variable Speed and Cycle Control)
101	Duplex Roller Polishing Machine
102	Nut Former Machine
103	Double End Chamfering Machine for Pipes
104	Heavy Duty Plano Milling Machine (using AC Variable Drive)
105	Heavy Duty Multi- Coil Electromagnetic Rectangular Chuck (with Variable Control Unit)
106	NC Hydraulic Shearing Machine
107	NC Flame Cutting Machine
108	CNC Spring Making Machine
109	CNC Wire Bending Machine
110	Plano Miller with 3 Cutting Head
111	Electro Permanent Magnetic - Plate Handling System
112	Electro Permanent Magnetic - Telescopic Spreader Beam
113	Electro Permanent Magnetic - Tilting Plate Handling
114	Electro Permanent Magnetic - Billet Handling Machine
115	Modular Electro Permanent Magnets

116	Battery Operated Electro Permanent Magnetic Lifter
117	Heavy Duty EPM Systems for Rail Machining
118	EPM Modules for Fast Mould Clamping
119	Electro Permanent Magnetic Chucks (MAGNASLOT)
120	CMM Machine (Coordinate Measuring Machine)
121	High Speed Circular Sawing Machine 2, 3 & 4 Hole drilling SPM
122	15 Hole drilling SPM
123	4 Way U drilling & fine boring SPM
124	Multi spindle drilling head SPM
125	Three pillar types drilling SPM
126	2Way fine boring SPM
127	CNC Rotary Draw tube bender
128	Electronic Servo
129	CNC Straightening and cutting machine
130	Single Axis NC Tube bender with linear and rotary indexing arrangement
131	Marine engine
132	Corner cleaning machine equipped with PLC control
133	Automatic end milling machine
134	Two Glazing Bead Saw with automatic control
135	High Alumina Brick Refractories
136	Servo Driven Spring Coiling Lathe Machine
137	Cold Heading Machine
138	CNC Engraving Machine
139	Pick and Place Machine
140	NC Cutter and Rotary
141	Radial CNC Multi Spindle Drilling Machine
142	Electrically heated Nitriding Furnace
143	CAM Machine
144	Travelling head clicking machine
145	Aluminum Profiling Extrusion Machines (Hydraulic using Variable Pumps with PLC Controlled)
146	Single Spindle Vertical Honing Machine with VFD control
147	Slant Bed CNC Lathe
148	Panel Cutter machine (PLC controlled)
149	CNC machining centre with Inverter controlled
150	Laser Cutting machine
151	Cylindrical Grinding Machine (with Inverter control)
152	CNC Tool and Cutter Grinder
153	CNC Column Moving Horizontal Machining Centre
154	Automatic end cutter
155	Intermix (with water cooled rotors)
156	Hydraulic Cone Crusher
157	5 axis CNC Tool and Cutter Grinding Machine
158	Flat Bed CNC Chucker
159	Vertical Sliding Head Machine

160	Turn Auto Loading and Unloading CNC Machine
161	Impregnating Plant with VFD controls
162	Automatic Vacuum Press
163	Fully Automatic Polishing Machine (with Frequency Converter)
164	Pilger Machine
165	Hydraulic Puller (with electronically controlled and brake hydraulic dynamometer)
166	Conveyor System
167	Polishing Machine
168	Hydraulic Deep Draw Press with Die Cushion complete with Hydraulic power pack (With PLC control)
169	Seam Welding Machine (with Microprocessor based weld control)
170	5 Axes Universal Milling Machine
171	Multi-wire Cutting Machine with Automatic control using PC
172	Fiber Laser Marking System
173	Gapframe Mechanical Press with PLC Control
174	Continuous Hardening and Tempering Line Furnace
175	Tube Straightening & Cutting Machine equipped with PLC
176	Serpentine Bending Machine equipped with PLC
177	Wire Flattening Mill
178	CNC/PLC based Sheet Metal Rolling and Forming Machine with VFD
179	Spooling Machines (with Variable Frequency Drive Control)
180	High Speed Metal cutting band saw with PLC and VFD control
181	AI&ML based IoT platform for Energy and Asset management
182	Air Pre Heater & Drying Bed in furnace
183	Automation and Control System
184	Automation of Withering Troughs
185	Back Pressure Turbine
186	BEE 5 Star Rated AC
187	Combustion Control System for Boiler
188	Condensate recovery system in boiler/jet dyeing machine
189	Desiccant-based cooling systems / DeVAP (Desiccant Enhanced Evaporative) HVAC
190	DeSuperheater for Chiller Compressors
191	Economiser in boiler/Thermal Fluid Heater
192	Electric annealing furnace
193	Electric Dry Vacuum Pumps
194	Electric Extrusion Melting
195	Electric Melting Furnace
196	Electrical Servo Drives
197	Energy Efficient Brushless Direct Current (BLDC) Fan
198	Energy Efficient Pumps - 5 Star Rating Pumps
199	Energy efficient Refrigeration Compressor
200	Energy Efficient Screw Compressor
201	Energy Efficient Turbo Blower
202	Energy recovery ventilation (ERV)
203	ETEKINA (Heat pipe technology for thermal energy recovery in industrial applications)

204	Gas Engine based co-generation technology
205	Gas fired Annealing furnace
206	Gas-fired Reheating Furnace with WHR System
207	Gasifier for Electrical Application
208	Ground & Water source Heat Pumps (GSHP)
209	Hanger Shot Blast Machine
210	Heat Exchanger
211	Heat Pump
212	Hot Air Generator from Briquette
213	Hydrogen fired Vapour absorption machine
214	IGBT based Induction furnace
215	IGBT based temperature control
216	Infrared (IR) Heaters
217	Light emitting diode (LED) Lighting
218	Light Pipe
219	Low-Grade Waste Heat Recovery System (LGWHRs)
220	Magnetocaloric Refrigerator
221	Mechanical Vapor Recompression (MVR) Evaporator
222	Micro Turbine
223	Motors (IE3 or IE4 or IE5)
224	Oxy-fuel combustion in reheat furnace
225	PUF insulation
226	Recuperative burner for heat recovery for high medium temperature furnaces
227	Regenerative burners for high temperature furnaces
228	Screw Compressor with Permanent Magnet (PM) motor
229	Static Reactive Power Generator with Harmonics Filter
230	Steam operated pumping traps
231	Temperature controller for cooling tower fan
232	Thermo Compression
233	Tri-generation
234	Variable Frequency Drives (VFD)
235	Variable Refrigerant flow (VRF) in HVAC
236	Waste Heat Recovery for power generation
237	Compact Scan Digitizing System
238	Mechanical Press with PLC and VFD control
239	Electric Overhead Travelling Crane with VFD
240	PLC based Fully Automatic Sawing Machine
241	PLC based Vertical Boring Mill
242	CNC Surface Grinder Machine
243	Harmonic filter
244	Ceramic Fiber Insulation for Batch Furnaces
245	TIG welding machine (using thyristorised control)
246	Infrared Irradiation
247	Hot Water Generator

248	Turbulators (for gas fired boilers)
249	Vertical Roller Mill (VRM)
250	Alternative Fuels & Raw Material (AFR) Utilization
251	Energy efficient impeller
252	Methane Capture technology
253	Replacement of steam turbine drive with high-speed motor drive
254	Electric Vehicles and Charging Infrastructure
255	Nano composite surface treatment for condenser in power plant
256	Torrefaction Technology
257	CNC Bending Machine
258	CNC Gear Hobbing Machine
259	CNC Grinding Machine
260	CNC Horizontal M/c Centre
261	CNC Machine (Special Purpose Machine)
262	CNC Milling M/C
263	CNC Turn –Mill Centre
264	CNC Turret Punch Machine
265	CNC Wire Cut Machine
266	Falling Film Evaporator (Re-refining of Lubricating Oil)
267	Wiped Film Evaporator (Re-refining of Lubricating Oil)
268	Fine Grinding (CBN Surface Grinding Machine)
269	Gas Fired / Oil Crucible Melting Furnace
270	CNC Wire Cut
271	CNC Milling
272	CNC Lathe
273	Gas Based Generator set
274	Computerized Automatic Electroplating / Zinc Plants
275	Heavy Duty Horizontal Machining Center
276	CNC Hydraulic Press Brake
277	Automatic Electrostatic Powder Coating Machine
278	CNC Milling Machine - Vertical Machining Centre
279	PVD (Multi-arc Ion) Coating Machine
280	CNC 3 Axes Hobbing Machine
281	Sealed Quench Furnace (use of Thyristor Power Controller and PLC)
282	Paint Shop with Waste Heat Recovery System
283	CNC Hydraulic Guillotine Shearing Press
284	CNC Turret Punch Press
285	Continuous Gas Carburising Furnace with Endogas Generator
286	Electronic Spring Coiling Machines
287	CNC Gear shaving machine
288	Medium Frequency End- bar Heater
289	Electrical Annealing Bogie Furnaces
290	Gasifier for Melting and Reheating Process

291	Rotoberatory Furnace
292	Aeroseal duct sealing technology
293	Energy Efficient technology for ECBC/Eco-niwas Samhita
294	Radiant Cooling
295	VAM Chillers
296	High Efficiency Automatic Door
297	High Efficiency Automatic Revolving Door
298	Woody Textile Insulator
299	Other Building Material Contributing to Increased Heat Insulation Performance of Building Equipment
300	Hollow Heading Machine
301	Heading Machine with Semi Cover
302	Carbon Fiber Fan
303	Hydraulic Coupling
304	CNC Based Gear Tester
305	Conveyorised Powder Coating Curing Oven
306	Energy Efficient Air Conditioner
307	Energy Efficient Refrigerators (High Efficiency Compressors, Improved Insulation and Precise Temperature and Defrost Mechanisms to Improve Energy Efficiency)
308	Vapour Absorption Refrigeration
309	Fuel Cell Cogeneration System
310	Energy Efficient Elevators
311	Equipment, Machinery and Construction Material Contributing to Increased Energy Savings
312	Heat Reclaim Ventilation / Air Conditioning System
313	High Efficiency Escalator
314	Inorganic Textile Insulator
315	Forming Plastic Insulator
316	Heat insulating opening material
317	Air Sealing Support Material
318	Heat Absorbing Glass / Low Emissivity Glass (Window Panel)
319	Common Effluent Treatment Plant
320	Machine Fixed-film Bio Reactor ETP
321	Membrane Bio Reactor ETP
322	Automatic Coil Winding Machine
323	Vacuum Impregnation plant
324	Semi-Automatic Press
325	Automatic CNC Core Cutting Machine
326	Hi Speed Precision Power Press with Computerized Control
327	Vacuum Impregnated Plant
328	Automatic/CNC Coil Winding Machine
329	Temperature Control Drying Oven
330	Amorphous Metal Core Transformers
331	CNC Core Cutting Machine
332	Natural Gas Based Oven
333	Microprocessor Based Electric Furnace

334	Plasma Cutting Inverter
335	Catalytic Enameling Machine
336	Extruder with Temperature Control, Pre- heating, Speed Control
337	XPLATE on FD Fan to improve boiler combustion efficiency
338	Solar PV Modules and Semi/Automatic Solar PV Module manufacturing Line
339	IGBT based welding machine
340	Windmills
341	Solar Photovoltaic
342	Micro Hydro
343	Biomass / Bagasse (Gasifier or Cogeneration)
344	Solar Water Heater
345	Wind Ventilator (Wind Powered Exhaust Fan)
346	Solar Power Inverters
347	Renewable Energy based Steam Boiler
348	Residual Derived Fuel (RDF) based Power Generation Plant
349	Powerless Ventilators
350	Renewable Energy Projects (Solar, Wind, biomass etc.) for both captive & non-captive purpose
351	Waste to Energy projects including Compressed Biogas Projects

Note-

(i) The above list is indicative and not exhaustive; additional technologies/machines may be considered by the AE for funding only where they fall within the approved scope and eligibility criteria of FMAP, are screened and categorized in accordance with the ESMS, and comply with applicable E&S standards.

(ii) The category indicated in the table reflects the typical risk profile of the technology/process itself. Where the same technology is proposed as part of (a) a brownfield enterprise expanding/modernizing in a new location, (b) a greenfield enterprise, or (c) an off-site RE/EE project, the final categorization of the overall subproject shall be determined through ESDD and site/legal screening. In such cases, the sub-project may be classified as Category B where land-related, siting, community health and safety, or other site-specific risks are assessed as moderate, site-specific, and manageable.
