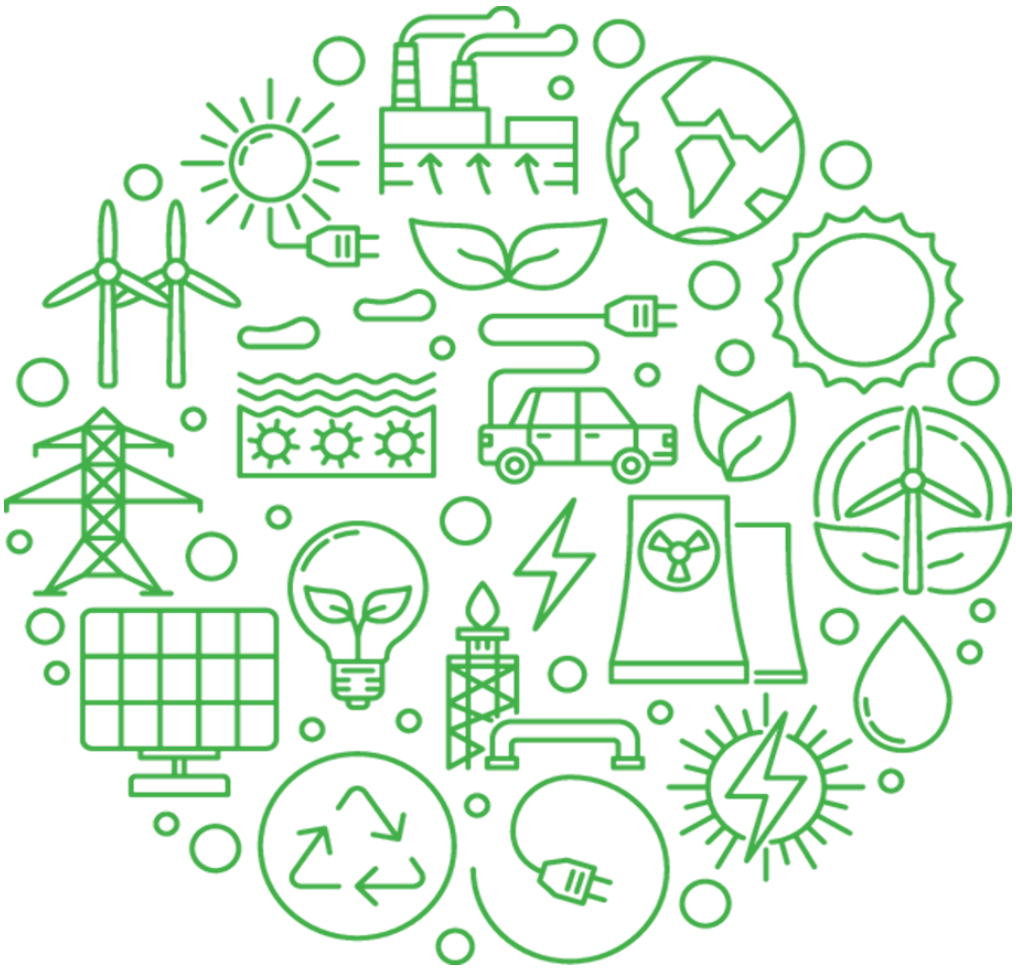

Environmental, Social & Governance (ESG) Management Framework (ESG MF) – Main Volume

planet positive power

Hero Future Energies

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March 2025

Signature Page

ESG Management Framework

The ESG Management Framework (ESG MF) is strictly controlled for any form of circulation. The hard “controlled copies” of either the ESG MF or the procedures as prescribed within the appendix to this document shall be marked as “Controlled Copy”. Only the latest revision number shall be valid for circulation and use. “Controlled copies” may also be accessible through the internal communication link or other electronic media within

The ESG Head shall control all amendments, revisions, issues, and circulation of this document.

Revision	Reviewed By	Approved By	Date

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1 Introduction

Hero Future Energies Pvt. Ltd., (hereinafter referred to as "HFE" or "Company") has developed an Environmental Social and Governance Management Framework (ESG Management Framework) to establish standards, protocols, procedures, and implementation arrangements at both corporate and project levels. This system aims to manage Environmental, Health, Safety and Social (EHSS) and related risks arising from HFE 's operations in the renewable energy sector, encompassing solar energy (including ground mounted, rooftop and fishery or floating solar), wind energy, hybrid projects, battery storage and green hydrogen projects.

The ESG MF underscores HFE's commitment to implementing robust Environmental, Health, Safety, and Social (EHSS) management protocols to mitigate risks associated with its activities and promote sustainability in its business operations. This commitment aligns with HFE's broader corporate objectives outlined in its Occupational Health Safety & Environment (OHSE) policy. Additionally, HFE maintains an Health, Safety & Environment (HSE) Manual to address health and safety concerns across all operations.

In developing the ESG MF, HFE has drawn upon internationally recognized standards such as the International Financial Corporation (IFC) Performance Standards (PS) on Environmental and Social Sustainability (2012), the Asian Development Bank (ADB) Safeguard Policy Statement (SPS) of 2009, Equator Principle IV, and the World Bank Group Environmental, Health, and Safety (EHS) Guidelines.

HFE is dedicated to achieving its business objectives while adhering to local laws, statutory regulations, and international policies and reference frameworks mentioned above. Furthermore, the ESG MF will adapt to future changes in HFE 's business models as required.

This ESG MF applies to all of HFE 's business verticals and operations conducted directly or in collaboration with turnkey contractors and subcontractors throughout the lifecycle of projects.

1.1 Objective of ESG Management Framework

Effective environmental and social management is a fundamental aspect of project preparation and execution. The Environment Social and Governance Management Framework (ESG MF) outlines established policies, guidelines, procedures, and roles for project integration. It delineates the principles, objectives, and strategies for minimizing and mitigating adverse environmental and social impacts resulting from project activities.

The ESG MF serves as a practical aid throughout project phases: formulation, design, implementation, and monitoring. It outlines procedures for recognizing and addressing potential environmental and social impacts of upcoming investment endeavors. This document acknowledges the necessity of adhering to national laws, IFC Performance Standards, the Asian Development Bank (ADB) Safeguard Policy Statement (SPS) of 2009, Equator Principle IV and WB-EHS guidelines applicable to each project.

Development of the ESG MF attempts to respond to the needs of the renewable energy projects and the opportunities provided by it, and seek to:

- Support the integration of environmental, social and governance[1] aspects associated with the numerous projects into the decision making process;
- Enhance positive and sustainable environmental and social outcomes associated with Project implementation;
- Minimize environmental degradation as a result of either individual projects or their cumulative effects;

[1] "Governance: corporate governance structures and processes by which companies are directed and controlled (e.g. board structure and diversity, ethical conduct, risk management, disclosure and transparency), including the governance of key environmental and social policies and procedures."

- Support and assist with the achievement of compliance with applicable laws and regulations and with relevant policies on environment and social development issues.

This ESG MF delineates the corporate and project-level commitments of HFE to manage environmental and social performance and risk across its business verticals and operations. These commitments will be reflected in HFE's project-level implementation guidelines, operating procedures, and work instructions, appended to this document to ensure compliance with the corporate commitments outlined in the ESG MF.

1.2 Applicability of ESG Management Framework and its Implementation

This Environment, Social & Governance Management Framework (ESG MF) establishes HFE's commitment to put in place a framework that guides the Company in managing the Environmental, Social, Health and Safety (ESH&S) and Governance related risks arising from their activities as well as carrying out business in a more sustainable manner. This corporate level ESGMF provides the framework under which HFE will develop further detailed policies and procedures.

Environment, Social & Governance Management Framework (ESG MF) has been developed by HFE and has been approved by Chief Managing Director (CMD). This ESG MF has been benchmarked against all the applicable standards (national and international) as presented in Section 2.

HFE is committed to simultaneously fulfil the business objectives by remaining compliant to applicable local laws, statutory and regulatory requirements as well as the aforementioned international policies and reference frameworks. Furthermore, the ESG MF would be modulated in accordance with requirements arising out of changes in business models intended by HFE in the future.

This Corporate ESG MF is applicable to all assets of HFE solar energy including ground mounted, rooftop and fishery or floating solar, wind energy, hybrid projects, battery storage and green hydrogen projects. This ESG MF is applicable for the entire lifecycle of the HFE's Projects. The coverage of certain aspects may have a mandate for inclusion of contractors, subcontractors, vendors for management of EHS during construction, operation and decommissioning phase of projects.

Implementation of this system will be driven by the Corporate ESG MF committee supported by the corporate ESG Head, as detailed in ***Section 4*** of this manual.

1.3 Update and Modification

HFE is the sole proprietor of this ESG MF and is responsible for its periodic Up-dation or modification as per requirement. Changes may be required in the following situations:

- Changes in any applicable regulations or standards pertaining to the above-mentioned verticals
- Revision in the scope of ESG MF procedures to address emerging environmental, social and governanace risks in projects;
- Any changes in the institutional setup for the implementation, training or monitoring for this ESG MF at HFE; and
- Changes in sector portfolio of HFE.

However, in case of no changes in the above provided situations, this ESG MF will be **reviewed and updated (if required) in every three (3) years** to ensure that it remains relevant and in alignment with the operations of HFE and other external factors such as changes in local policies, lenders' requirements, and community-related obligations. The changes to this ESG MF shall be reviewed by the ESG Manager with the involvement of the ESG MF Committee and will require formal approval from the ESG Head. Relevant parties such as Lenders, Investors and relevant departments engaged in ESG MF implementation, etc. need to be subsequently communicated about the changes and the approach to its implementation within the company will be modified appropriately.

1.4 Overview of ESG Management Framework

The ESG MF takes course through four (4) stages, namely 'Planning', 'Implementation', 'Checking and Review', and 'Initiating Changes Post Checking & Review', for overall EHS and social management, commonly known as the Plan-Do-Check-Act Cycle (PDCA).

A management system is a set of processes and practices to consistently implement company's policies to meet their business objectives. The goal is to make sure that appropriate policies and procedures are in place and that the team responsible consistently follows them. The management system shall help to assess and control the E&S risks associated with their operations. There shall be an ongoing process of reviewing, correcting, and improving the system. The Plan-Do-Check-Act cycle (PDCA) is described below:

Source: Environmental and Social Management System (ESMS) Implementation Handbook

This ESG MF has established the corporate and project level commitments of HFE to manage environmental, social and governance performance and risk management across its business verticals. These commitments will be adequately reflected in HFE's project level implementation guidelines, operating procedures and work instructions that have been prepared as part of this document to remain compliant to the corporate commitments defined in this ESG MF.

The components that define the ESG MF structure have been defined below along with the associated procedures and documents that will have to be maintained as part of the management system.

1.5 Document Control

The ESG MF is strictly controlled for any form of circulation. The hard "controlled copies" of either the ESG MF Main Volume (Part 1) or the management procedures as prescribed within Part 2 of this document shall be marked as "Controlled Copy". Only the latest revision number shall be valid for circulation and use. "Controlled copies" may also be accessible through the internal communication link or other electronic media within HFE. The ESG Head shall control all amendments, revisions, issues, and circulation of this document.

1.6 Structure and Guidance Note

This Environmental Social and Governance Management Framework (ESG MF) covers the Environmental, Health, Safety, Social (EHSS), and Governance related requirements of solar, wind, hybrid project, fishery solar or floating solar, battery storage and green hydrogen projects initiated or implemented by HFE and are based on the international standards and industry good practices as recommended by International Finance Corporation (IFC) and World Bank (WB) EHS Guidelines and applicable local legal requirements.

This ESG MF establishes HFE's commitment to put in place adequate Environmental Social and Governance Management Framework and protocols that will help manage the EHS, Social and related Governance risks arising from their activities as well as carrying out business in a more sustainable manner. This is in conformance with their broader corporate objective as established in their OHSE policy.

There is a broad introduction to the whole ESG MF process, including the purpose, its objectives and coverage, applicability and implementation as well as its limitations.

Section 2 and 3 provide an overview of the Applicable Reference Framework and Corporate ESG Policies. The ESG MF describes Applicable Reference Framework for project implementation, corporate policies for showcasing the company's commitment to ESG, as well as the organizational structure to implement the same.

Sections 4 provides an overview of the Institutional structure for ESG Management Framework Implementation, which includes organisational overview and corporate structure delineating project operations and their project components and activities and the functions of the key teams within HFE. It also discusses the roles and responsibilities of the key personnel and committees/departments that will play a role in the implementation of the ESG MF.

Section 5, 6 and 7 presents ESG MF which is the core of the ESG MF manual. ESG MF highlighting the EHSS and related Governance risk screening and assessment process, risk categorisation and assessment protocol and the inclusion of findings from these processes into the investment decision along with management plans and capacity for ESG MF implementation at the corporate and project levels. It also provides the complete the lifecycle based EHS and Social and related Governance Risk Management process.

Section 8 and 9 discuss the monitoring and reporting aspects of this ESG MF which includes performance monitoring of key indicators as well as reporting mechanisms for internal and external reporting, and auditing and management review requirements and Documentation Management and Control respectively.

2 Applicable Legal and Institutional Framework

The reference framework that guides the development of the Corporate ESG MF takes into consideration the following key standards:

- IFC Performance Standards Framework, with primary focus on IFC PS 1
- Guidance Note on IFC PS Published January 1, 2012 (updated June 14, 2021)
- Asian Development Bank (ADB) Safeguard Policy Statement (SPS) of October 2023,
- Equator Principle IV, 2020
- Environmental and Social Management System (ESMS) Implementation Handbook
- IFC ESMS Self Assessment and Improvement Guide and
- IFC ESMS Toolkit, 2015
- IFC ESG Guidebook, 2021
- IFC General Environmental, Health and Safety Guidelines and Sector Specific Guidelines

2.1.1 Applicable Framework and Regulations

The section provides a brief overview and understanding of the statutory requirements and international standards applicable to HFE's business operations.

2.1.2 National and E&S Framework

The statutory central regulations guiding the corporate level ESG MF have been broadly divided into three broad areas comprising Environmental Regulations, Social Regulations and Health and Safety related Regulations. The details on these are covered in the subsequent sections.

Table 2-1 Summary of E&S Regulations applicable to HFE Business Operations

Sr. No.	Name of Regulation	Pre-Construction/ Construction/ Operation	Solar Projects	Wind Operations	Hybrid Projects	Battery Storage	Green Hydrogen
General Applicability – Energy Production							
1.	The Electricity Act, 2003 and its associated Rules	Operation	√	√	√	√	√
2.	Electricity (Amendment) Act, 2020	Operation	√	√	√	√	√
3.	The National Electricity Policy 2005	Operation	√	√	√	√	√
4.	The National Tariff Policy 2016	Operation	√	√	√	√	√
5.	The National Energy Storage Mission 2019	Operation	√	√	√	√	√
6.	The Energy Obligation 2022	Operation	√	√	√	√	√
General Applicability – Transmission Line							
7.	Approval of the Power & Telecommunication Co-ordination Committee	Operation	√	√	√	√	√
8.	Telegraph Act, 1885	Pre-construction and Construction	√	√	√	√	√
9.	The Indian Electricity (IE) Rules, 1956	Construction	√	√	√	√	√
10.	The Work of Licensees Rules, 2006	Construction	√	√	√	√	√
11.	Ministry of Power issues Guidelines for payment of compensation towards damages in regard to Right of Way for Transmission Line, 2015	Pre-construction and construction	√	√	√	√	√
Environment							
12.	National Green Tribunal Act, 2010	Project Lifecycle	√	√	√	√	√

Sr. No.	Name of Regulation	Pre-Construction/ Construction/ Operation	Solar Projects	Wind Operations	Hybrid Projects	Battery Storage	Green Hydrogen
13.	The Environment Protection Act, 1986	Construction, Operation	√	√	√	√	√
14.	The Water (Prevention & Control of Pollution) Act, 1974	Construction, Operation	×	×	√	×	√
15.	The Air (Prevention & Control of Pollution) Act, 1981	Construction, Operation	×	×	√	×	√
16.	Noise Pollution (Regulation and Control) Rules, 2000 and the Noise Pollution (Regulation and Control) (Amendment) Rules, 2010	Construction, Operation	√	√	√	√	√
17.	The Indian Wildlife (Protection) Act, 1972	Construction, Operation	√	√	√	√	√
18.	The Biological Diversity Act, 2002	Construction, Operation	√	√	√	√	√
19.	The Public Liability Insurance Act, 1991	Construction, Operation	√	√	√	√	√
20.	The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	Construction, Operation	×	×	√	×	√
21.	The Manufacture, Storage & Import of Hazardous Chemicals (MSIHC) Rules, 1989 and Amendment in 2000	Construction, Operation	×	×	√	×	√
22.	Battery Waste Management Rules, 2022	Construction, Operation	√	√	√	×	×
23.	E-Waste (Management) Rules, 2022	Construction, Operation	√	√	√	√	√
24.	Solid Waste Management Rules, 2016	Construction, Operation	√	√	√	√	√
25.	The Plastic Waste Management Rules, 2016	Construction, Operation	×	×	√	×	×

Sr. No.	Name of Regulation	Pre-Construction/ Construction/ Operation	Solar Projects	Wind Operations	Hybrid Projects	Battery Storage	Green Hydrogen
26.	EIA Notification 2006	Pre-Construction	×	×	×	×	√
27.	Permission for extraction of groundwater – Central Groundwater Authority (CGWA), Ministry of Jal Shakti, Notification dated 24 September 2020	Construction, Operation	√	√	√	√	√
28.	Green Hydrogen Standards and Approval Systems in India, 2024	Construction and Operation	×	×	×	×	√
Health and Safety							
29.	Occupational Safety, Health and Working Conditions Code, 2020	Construction, Operation	√	√	√	√	√
30.	The Indian Factories Act, 1948 and State Rules	Construction, Operation	√	√	√	×	√
31.	National Building Code of India, 2005	Pre-Construction and Construction	√	√	√	×	√
32.	Building and Other Construction Workers Act 1996	Construction	√	√	√	√	√
33.	The Petroleum Act, 1934 and the Petroleum Rules	Construction, Operation	×	×	×	×	×
34.	Explosive Act, 1884	Construction & Operation	×	√	√	×	×
35.	Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations, 2010	Construction & Operation	√	√	√	×	√
36.	Gas Cylinder Rules, 2010	Construction, Operation	×	×	×	×	√
37.	The Indian Boiler Act, 1923 and IBR, 1950 (Form II)	Operation	×	×	×	×	√
38.	Motor Vehicle Act, 1988 and Rules	Construction, Operation	√	√	√	√	√

Sr. No.	Name of Regulation	Pre-Construction/ Construction/ Operation	Solar Projects	Wind Operations	Hybrid Projects	Battery Storage	Green Hydrogen
39.	State specific Fire Safety Act and Rules	Construction, Operation	×	×	√	×	√
40.	State specific Lift Acts and Rules	Construction, Operation	×	×	√	×	√
41.	National Disaster Management Act, 2005	Construction, Operation	√	√	√	√	√
42.	The Dangerous Machines (Regulations) Act 1983	Construction, Operation	√	√	√	×	√
43.	Food Safety and Standards Act 2006 and associated Regulations	Construction, Operation	√	√	√	×	√
Social							
44.	The Bonded Labour System (Abolition Act), 1976	Construction, Operation	√	√	√	√	√
45.	Factories Act, 1948 and rules therein	Construction,√ Operation	√	√	√	√	
46.	The Apprentices Act 1961	Construction,√ Operation	√	√	√	√	
47.	The Child Labour (Prohibition and Regulation) Act, 2012	Construction,√ Operation	√	√	√	√	
48.	Contract Labour (Regulation & Abolition) Act, 1970	Construction,√ Operation	√	√	√	√	
49.	The Minimum Wages Act, 1948	Construction,√ Operation	√	√	√	√	
50.	The Building and Other Construction Workers' Act (BoWC), 1991	Construction, Operation	√	√	√	√	√
51.	The Building and Other Construction Workers Welfare Cess Act, 1996.	Construction, Operation	√	√	√	√	√
52.	Employees Compensation Act, (erstwhile Workmen Compensation Act) 1923	Construction, Operation	√	√	√	√	√

Sr. No.	Name of Regulation	Pre-Construction/ Construction/ Operation	Solar Projects	Wind Operations	Hybrid Projects	Battery Storage	Green Hydrogen
53.	Employees Provident Funds and Miscellaneous Act, 1952	Construction, Operation	√	√	√	√	√
54.	Employees State Insurance Act, 1948	Construction, Operation	√	√	√	√	√
55.	The Equal Remuneration Act, 1976	Construction, Operation	√	√	√	√	√
56.	The Industrial Disputes Act, 1947	Construction, Operation	√	√	√	√	√
57.	The Industrial Employment (Standing Orders) Act, 1946	Construction, Operation	√	√	√	√	√
58.	The industries (Development and Regulations) Act, 1951	Construction,√ Operation	√	√	√	√	
59.	The Interstate Migrant Workmen (Regulations of Employment and Conditions of Service) Act, 1979	Construction, Operation	√	√	√	√	√
60.	The Maternity Benefit Act, 1961	Construction, Operation	√	√	√	√	√
61.	The Payment of Bonus Act, 1965	Construction, Operation	√	√	√	√	√
62.	The Payment of Gratuity Act, 1972	Construction, Operation	√	√	√	√	√
63.	The Payment of Wages Act, 1936	Construction, Operation	√	√	√	√	√
64.	Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	Construction, Operation	√	√	√	√	√
65.	The Trade Unions Act, 1926	Construction, Operation	√	√	√	√	√
66.	The Un-organized Workers' Social Security Act, 2008	Construction,√ Operation	√	√	√	√	
67.	The Weekly Holiday Act, 1942	Construction, Operation	√	√	√	√	√
68.	The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 & rules 2007	Construction, Operation	√	√	√	√	√

Sr. No.	Name of Regulation	Pre-Construction/ Construction/ Operation	Solar Projects	Wind Operations	Hybrid Projects	Battery Storage	Green Hydrogen
Land Related Regulations							
69.	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation & Resettlement Act, 2013	Pre-Construction	√	√	√	√	√
70.	Forests Rights Act, 2006	Pre-Construction	√	√	√	√	√
71.	State specific Land Acquisition, Rehabilitation and resettlement Acts and Rules	Pre-Construction	√	√	√	√	√
72.	The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	Pre-Construction √	√	√	√	√	
73.	Panchayats (Extension to Scheduled Areas) Act 1996	Pre-Construction √	√	√	√	√	
74.	Fifth schedule of the Constitution of India	Pre-Construction √	√	√	√	√	
75.	The Ancient Monuments and Archaeological Sites and Remains Act, 1958	Pre-Construction √	√	√	√	√	
76.	The Heritage Conservation and Preservation Act, 2010	Pre-Construction √	√	√	√	√	
77.	State specific land conversation regulation	Pre-Construction √	√	√	√	√	
78.	Land Transfer Regulation, 1970	Pre-Construction √	√	√	√	√	
79.	The Antiquities and Art Treasures Act, 1972	Pre-Construction √	√	√	√	√	
80.	World Heritage Convention 1972	Pre-Construction √	√	√	√	√	

2.1.3 IFC Performance Standards Framework 2012

The International Finance Corporation (IFC) Performance Standards (PS), 2012 are a set of social and environmental safeguards that financial institutions and project developers use to identify, assess, and manage the potential risk and impacts associated with investment projects. These standards aim to promote sustainable development by providing a framework for managing environmental and social considerations in project development.

Table 2-2 IFC Performance Standards objective and Requirements

Performance Standard	Objectives	Requirements of the Aspect
Performance Standard 1: **Assessment and Management of Environmental and Social Risks and Impacts**	**Applicable** Establishing and maintaining an Environmental, Social, and Governance Management Framework (ESG MF) to identify and manage environmental and social risks and impacts throughout the project lifecycle.	• A Social and Environmental Assessment to understand the social and environmental impacts and risks. • A Management Program for mitigating the impacts and minimizing the risks identified in the assessment. • Establishing and ensuring organizational capacity and requisite trainings to the staff to implement the Management Programme • Engagement with the community to ensure free prior informed consultation (FPIC), community grievance redress constructive relationship all through the project life cycle; and • Adequate monitoring and reporting systems to measure and report the effectiveness of the Management Programs.
Performance Standard 2: **Labour and Working Conditions**	**Applicable** This PS is guided by a number of international conventions and instruments on labour and workers' rights. It recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of fundamental rights of workers. The PS covers the following themes: human resource policy and management, workers' organization, non-discrimination and equal opportunity, retrenchment, protecting the workforce and occupational health and safety.	This PS requires: • Establishment of a sound worker-management relationship • Encouraging equal opportunity and fair treatment of workers • Promoting compliance with national labour and employment laws; and • Promoting healthy and safe working conditions for workers. PS 2 requires project proponents to conduct its activities in a manner consistent with the four core labour standards (child labour, forced labour, non-discrimination, and freedom of association and collective bargaining). In addition, PS 2 also addresses other areas such as working conditions and terms of employment, retrenchment, and occupational health and safety issues.
Performance Standard 3: **Resource Efficiency and Pollution Prevention**	**Applicable** PS-3 covers the use of resources and materials as inputs and wastes that could affect human health. The objectives of PS-3 are to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution	• Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from activities. • Promote more sustainable use of resources including energy and water.

Performance Standard	Objectives	Requirements of the Aspect
	from project activities; to promote more sustainable use of resources, including energy and water, and to reduce project related GHG (greenhouse gas) emissions. Key themes covered under PS-3 are pollution prevention, resource conservation and energy efficiency, waste, hazardous materials, emergency preparedness and response, greenhouse emissions, pesticide use and management.	• Promote the reduction of emissions that contribute to climate change. • Pollution Prevention and Abatement (PPA) in line with internationally disseminated technologies and practices. It recognizes the need to implement technically and financially feasible and cost-effective measures in the project to improve efficiency in its consumption of energy, water, and other resources and material inputs. • Measures to consider the potential impact of emissions on the ambient conditions (such as ambient air quality) and seek to avoid or minimize these impacts within the context of the nature and significance of pollutants emitted.
Performance Standard 4: **Community Health, Safety and Security**	**Applicable** This PS-4 requires due diligence to anticipate and avoid adverse impacts on the health and safety of the affected community during the project life from both routine and non-routine circumstances. It also requires ensuring that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected Communities. Key areas of compliance screened under PS-4 includes infrastructure/equipment safety, hazardous material safety, natural resource issues, exposure to disease, emergency preparedness and response, and security personnel requirements.	• To assess benefits to communities including employment, services, and opportunities for economic development. • Assessment of increase in potential for community exposure to risks and impacts arising from equipment accidents, structural failures, and releases of hazardous materials. • To avoid or minimize the possible risks and impacts to community health, safety and security that may arise from project activities.

Performance Standard 5: **Land Acquisition and Involuntary Resettlement**	**Applicability (based on detailed assessment)**
	
	Applicable in context of development of projects with land procured through government acquisition process or through negotiated settlement though not through willing buyer and willing seller process. However, the process of land procurement will need to be clearly documented for all projects of HFE.
	
	PS-5 requires project proponents to anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use. The key themes covered under this are: compensation and benefits for displaced persons, consultation and grievance mechanism, resettlement planning and implementation, physical displacement, economic displacement. The PS-5 also prescribes private sector responsibility to supplement government actions
		• Project to consider various processes and systems to avoid /minimize social and economic impacts related to land acquisition and resettlement.
		• Avoid or at least minimize the involuntary resettlement wherever feasible by exploring alternative project designs.
		• Mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of land by:
		  ○ Providing compensation for loss of assets at replacement cost; and
		  ○ Ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
		  ○ Improve or at least restore the livelihoods and standards of living of displaced persons; and

Performance Standard	Objectives	Requirements of the Aspect
	and bridge the gap between governments assigned entitlements and procedures and the requirements of PS-5. **Note on Scope of Applicability of PS5:** • The applicability of this performance standard is established during the environmental and social risks and impacts identification process. • This performance standards applies to physical and/or economic displacement resulting from the following types of land-related transactions: - Land rights or use rights acquired through expropriation or other compulsory procedures in accordance with the country's legal system. - Land rights or land use rights acquired through negotiated settlements with the property owners or those with legal rights to the land if failure to reach settlement would have resulted in expropriation or other compulsory procedures[2]; - Project situations where involuntary restrictions on land use and access to natural resources cause a community of groups within a community to lose access to resource usage where they have traditional or recognizable usage rights3; - Certain project situations requiring evictions of people occupying land without formal, traditional, or recognizable usage rights4; or Restriction on access to land or use of other resources including communal property and natural resources such as marine and aquatic resources, timber and non-timber forest products, freshwater, medicinal plants, hunting and gathering grounds and grazing and cropping areas	○ Improve living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites. This PS does not apply to resettlement resulting from voluntary land transactions (i.e., market transactions in which the seller is not obliged to sell, and the buyer cannot resort to expropriation or other compulsory procedures if negotiations fail).
Performance Standard 6: **Biodiversity Conservation and Sustainable Management of Living Natural Resources**	**Applicability (based on detailed assessment)** PS 6 aims to protect and conserve biodiversity; to maintain the benefits from ecosystem services; and to promote the sustainable management of living natural resources through the adoption of	• To avoid or mitigate threats to biodiversity arising from their operations and incorporate sustainable management of renewable natural resources. • Recognize that protecting and conserving biodiversity—the variety of life in all its

[2] This also applies to customary or traditional rights recognized or recognizable under the laws of the country. The negotiations may be carried out by the government or by the company (in some circumstances, as an agent of the government).

[3] In such situations, affected persons frequently do not have formal ownership. This may include freshwater marine environments. This Performance Standard may also apply when project-related biodiversity area legally designated buffer zones are established but not acquired by the project.

[4] While some people do not have rights over the land they occupy, this performance standard requires non-land assets by retained, replaced, or compensation for; relocation take place with security of tenure; and livelihood be restored.

Performance Standard	Objectives	Requirements of the Aspect
	practices that integrates conservation needs and development priorities.	forms, including genetic, species and ecosystem diversity—and its ability to change and evolve, is fundamental to sustainable development. • Reflection on the objectives of the Convention on Biological Diversity to conserve biological diversity and promote use of renewable natural resources in a sustainable manner.
Performance Standard 7: **Indigenous Peoples**	**Applicability (based on detailed assessment)** This Performance Standard applies to communities or groups of Indigenous Peoples who maintain a collective attachment, i.e., whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resources therein. PS-7 endeavor to ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. Key themes covered under PS-7 are avoidance of adverse impacts, consultation, and informed participation, impacts on traditional or customary lands under use, relocation of Ips from traditional or customary lands, and cultural resources. **Note on Applicability of PS7:** • The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. • This PS applies to communities or groups of Indigenous people who maintain a collective attachment, i.e., whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resource therein. It may also apply to communities or groups that have lost collective attachment to distinct habitats or ancestral territories in the project area, occurring within the concerned group members' lifetime, because of forced severance, or dispossession of their lands. • Further, provided below key points to consider on the applicability of this PS: - Project with Indigenous Communities: IFC PS7 applies to projects that are in areas inhabited or traditionally used by Indigenous peoples. These projects could include infrastructure development, resource extraction, or any other activities that could impacts	• Requirement of avoiding / minimizing adverse impacts on Indigenous people in a project area, respecting the local culture and customs, fostering good relationship, and ensuring that development benefits are provided to improve their standard of living and livelihoods. • PS 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from dominant groups in national societies, are often among the most marginalized and vulnerable segments of the population. Need to avoid adverse project impacts on Indigenous Peoples' communities living in the project's area of influence, or where avoidance is not feasible, to minimize, mitigate or compensate for such impacts through mechanisms that are tailored to their specific cultural characteristics and expressed needs of the Indigenous Peoples, in a manner commensurate with the scale of project risks and impacts.

Performance Standard	Objectives	Requirements of the Aspect
	the lands, territories, or resources of Indigenous communities. - Impact on Indigenous Rights: If a project has the potential to affect the rights of Indigenous peoples, including their land tenure, access to resources, cultural heritage, and social structures, then the principles outline in IFC PS7 become relevant.	
Performance Standard 8: **Cultural Heritage**	**Applicability (based on detailed assessment)** For the purposes of PS-8, cultural heritage refers to (i) tangible forms of cultural heritage; (ii) unique natural features or tangible objects that embody cultural values; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes. The requirements of PS-8 apply to cultural heritage regardless of whether it has been legally protected or previously disturbed. **Note on Applicability of this PS:** • The Scope of applicability of IFC PS8 is that it applies to any project that may affect cultural heritage, which is defined as, "Cultural heritage encompasses properties and sites of archaeological, historical, cultural, artistic, and religious significance. It also refers to unique environmental features and cultural knowledge, as well as intangible forms of culture embodying traditional lifestyles that should be preserved for current and future generations." • IFC PS8 applies to both tangible and intangible forms of cultural heritage including: - Movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. - Unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and - Certain instances of intangible forms of culture are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.	• Protect cultural heritage from the adverse impacts of project activities. • Support its preservation; and Promote the equitable sharing of benefits from the use of cultural heritage in business activities.

2.1.4 Equator Principles

The Equator Principles (EPs) are a risk management framework adopted by financial institutions for determining, assessing, and managing environmental and social risk in project finance. They serve as a common baseline and risk management framework for financial institutions to identify, assess, and manage environmental and social risks when financing projects. The EPs apply globally and to all industry sectors. Applicability of EPs on HFE's project are provided below:

- **Solar Power Projects (including ground mounted, roof top and fishery solar projects):** The EPs can contribute to delivering on the objectives and outcomes of the United Nations Sustainable Development Goals (SDGs). Specifically, they help ensure that negative impacts on project-affected ecosystems, communities, and the climate are avoided where possible. For solar projects, the EPs can guide the assessment of potential environmental and social impacts, such as land use, biodiversity, and community engagement.
- **Wind Power Project:** Similar to Solar Power projects, Wind power projects can also benefit from the application of the Eps. The principles guide evaluation of potential environmental and social impacts, such as noise pollution, impact on bird migration patterns, and community engagement.
- **Hybrid Projects:** Hybrid projects can also benefit from the application of the Eps. The principles guide evaluation of potential environmental and social impacts, such as noise pollution, impact on bird migration patterns, and community engagement.
- **Battery Storage:** The EPs require project developers to adhere to relevant health and safety standards and regulations to protect workers, communities, and the environment from potential risks associated with battery manufacturing, operation, and disposal. This includes implementing measures to prevent accidents, manage chemical exposure, and respond to emergencies effectively.
- **Green Hydrogen:** Green Hydrogen production involves renewable energy sources to produce hydrogen through electrolysis. The EPs can guide the assessment of potential environmental and social impacts, such as water usage and energy efficiency.

In conclusion, the Equator Principles provide a robust framework for managing environmental and social risks in project finance across various sectors, including renewable energy and infrastructure projects. They help ensure that the projects are developed socially responsible and reflect sound environmental management practices.

2.1.5 World Bank General EHS Guidelines

The World Bank Group General Environmental, Health, and Safety (EHS) Guidelines 2007 are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

The EHS Guidelines contain the performance levels and measures considered achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are considered.

2.1.6 ADB Social Protection Strategy (2001)

The Asian Development Bank's Social Protection Strategy (SPS) of 2001 is a comprehensive policy framework aimed at reducing poverty and vulnerability by enhancing social protection systems in its member countries. The strategy focuses on five key components: labor market policies and programs, social insurance, social assistance, micro and area-based schemes, and child protection. It seeks to ensure that all individuals, particularly the poor

and vulnerable, have access to basic needs and services, such as healthcare, education, and income security. The SPS emphasizes the importance of building inclusive social protection systems that can adapt to changing economic conditions and demographic shifts, thereby promoting equitable and sustainable development. Through this strategy, the ADB aims to support its member countries in creating robust social safety nets and fostering social inclusion and resilience.

2.1.7 ADB Safeguard Policy Statement (October 2023)

The Asian Development Bank (ADB) Safeguard Policy Statement (SPS) updated in October 2023 outlines the requirements for environmental and social assessments to ensure they are sustainable and socially responsible. The updated Safeguard Policy Statement integrates principles from previous policies on environmental protection, involuntary resettlement, and indigenous peoples into a cohesive framework designed to enhance the sustainability of project outcomes.

Key components of the updated policy include:

- **Vision:** Promoting sustainable development outcomes.
- **Environmental and Social Policy (E&S Policy):** Establishing the foundational policy principles.
- **Environmental and Social Standards (ESSs):** Detailed standards to be met during project implementation.
- **Prohibited Investment Activities List:** Activities that are not financed due to potential adverse impacts.

Environmental and Social Standards (ESSs): The ESSs establish mandatory standards applicable, throughout a project cycle. The applicable key components of 10 ESSs includes:

(i) **Environmental and Social Standard 1 (ESS1): Assessment and Management of Environmental and Social Risks and Impacts:** Projects must undergo an environmental & social assessment to identify potential impacts and mitigation measures.
(ii) **Environmental and Social Standard 2 (ESS2): Labor and Working Conditions:** Projects to ensure fair labour practices, safe working conditions and protection of worker's right.
(iii) **Environmental and Social Standard 3 (ESS3): Resource Conservation and Pollution Prevention**: Project are expected to minimize pollution and make efficient use of resources to reduce environmental impacts .
(iv) **Environmental and Social Standard 4 (ESS4): Health, Safety, and Security:** Ensuring the projects do not adversely affect public (workers and community) health & safety is priority.
(v) **Environmental and Social Standard 5 (ESS5): Land Acquisition and Land Use Restriction:** Measures are required to minimize and manage the impacts of land acquisition and involuntary settlement.
(vi) **Environmental and Social Standard 6 (ESS6): Biodiversity and Sustainable Natural Resources Management:** Measures must be taken to protect and conserve biodiversity and manage any impacts on ecosystem.
(vii) **Environmental and Social Standard 7 (ESS7): Indigenous Peoples:** Projects must respect the rights and culture of the indigenous peoples and ensure their meaningful participation in decision making process.
(viii) **Environmental and Social Standard 8 (ESS8): Cultural Heritage:** Protection and preservation of cultural heritage sites and practices are required.
(ix) **Environmental and Social Standard 9 (ESS9): Climate Change:** Projects are assessed for their impacts on climate change and are expected to incorporate measures for climate resilience.
(x) **Environmental and Social Standard 10 (ESS10):** Stakeholder Engagement and Information Disclosure: Effective consultation and engagement with affected communities and stakeholders are necessary throughout the project cycle.

2.1.8 ADB Public Communications Policy (2011)

The Asian Development Bank's Public Communications Policy (PCP) of 2011 emphasizes transparency, accountability, and proactive disclosure of information to stakeholders. This policy aims to enhance public access to information about ADB's operations, ensuring that stakeholders, including affected communities, have timely and meaningful access to project information. Key components of the PCP include the release of project

documents, environmental and social assessments, and evaluation reports. The policy also encourages stakeholder participation through consultations and feedback mechanisms. By promoting openness and engagement, the PCP seeks to build public trust and support for ADB's development initiatives, fostering a more inclusive and informed decision-making process.

2.2 Legal Compliance Procedure

As part of this Procedure, HFE is committed to regularly updating all legal aspects pertaining to environmental, health and safety, and social considerations. This commitment ensures compliance with any modifications prescribed by statutory stakeholders or authorities regarding existing regulatory mandates or the introduction of additional standards or requirements by such authorities. This procedure is applicable to all HFE projects throughout each phase of the project lifecycle, encompassing planning, construction, and operations.

The responsibility for the implementation of all legal compliances rests with the head of the respective department, with support provided by the head of the Legal Department. The head of the Legal Department is tasked with promptly informing all Heads of Departments about any changes in regulatory or legal requirements.

2.2.1 Updating Legal Register and Implementing Appended Standards

Location		**Date**
Date of last meeting for legal update		Aspect being covered
Priority for update (low / medium / high)		Meeting headed by:
Aspects for consideration	**Remarks/ action points**	
New/amended legal requirement/standard brought into force (summarize requirements):	1)	
	2)	
	3)	
Effective date of compliance:		
Previous requirement (if any)	1)	
	2)	

3 Corporate Policies

HFE has formulated internal policies inspired by a range of international best practices and standards. These policies are focused on addressing social and environmental concerns and serve as the cornerstone of the Environmental Social and Governance Management Framework (ESG MF). They embody the client's principles concerning the management of environmental and social risks and impacts, outlining specific objectives and aspirations for enhancing environmental and social performance. Below are summaries of the most pertinent policies.

3.1 Occupational Health and Safety Policy

HFE's OH&S policy commits to protect the environment and occupational health and safety of employees, contractors, clients, stakeholders and the communities in which they operate and continuously work towards improving occupational health & safety performance to achieve sustainable development through following practices:

- Adoption of safe work culture at all our project locations and offices.
- Identification and mitigation of significant occupational health and safety hazards by practising effective H&S management system.
- Preventing employees, contractors, and interested parties from injury and ill health.
- Providing regular HSE training to employees associated with HFE.
- Complying with all relevant legal and other requirements applicable.
- Communicating, involving and consulting employees in its H&S management system.
- Ensuring this policy is communicated and available for employees and other interested parties.
- Ensuring reporting of all relevant incidents and investigating then to prevent recurrence.
- Conducting regular inspection and audits.
- Ensuring minimum Occupational Health & Safety impact on the society in which we operate by complying with National and International standards applicable to us.
- Continuous improvement in the HSE performance at all our offices and project locations is an integral part of our work culture.

3.2 Human Rights Policy

HFE recognises the valuable role that business can play in the sustainable protection of human rights, and we are committed to respecting the human rights of our workforce, communities, contractors and suppliers in line with the International Bill of Human Rights, The International Labour Organization's (ILO) Declaration on Fundamental Principles and Rights at Work and UN Global Compact.

To ensure that no violation of human rights take place, HFE dedicatedly is committed to-.

- Provide equal opportunity and are intolerant of discrimination and harassment. In all aspects of employment, such as recruitment, compensation and benefits, training, promotion, transfer and termination, we will treat individuals justly and in a non-discriminatory manner, solely according to their abilities to meet the requirements and standards of their role.
- Maintain workplace that is free from violence, harassment, intimidation and other unsafe or disruptive conditions due to internal and external threats (to the maximum extent possible).
- Maintain workplaces that are free from discrimination or harassment on the basis of race, religion, caste, sex, colour or social origin, ethnicity, age, disability, sexual orientation and gender.
- Respect employees' right to join, form or not to join a labour union without fear of reprisal, intimidation or harassment, in accordance with applicable law.
- Prohibit interference in any way with the establishment, functioning or administration of employees' representation and collective bargaining process.

- Provide a safe and healthy workplace and comply with applicable safety and health laws and regulations, as well as internal requirements.
- Prohibit the use of all forms of forced labour, including bonded labour, modern forms of slavery and any form of human trafficking.
- Prohibit the hiring of individuals that are under 18 years of age. HFE prohibit all forms of child labour, forced/trafficked labour, discrimination and harassment.
- Respect the privacy of all employees and business partners by taking measures that are prescribed by law to protect and secure personal data. HFE do not disclose anyone's personal, medical, and financial information unless legally mandated.
- Maintain positive legal compliance with applicable constitutional and regulatory human rights requirements.

The monitoring and review of this policy is governed by Human Resource department. Due diligence is undertaken at periodical intervals as and when required to identify and prevent human rights risks to people in HFE business and value chain.

3.3 Code of Condcut

HFE's Code of Conduct prioritizes conducting business with unwavering honesty and ethical integrity, fostering a culture committed to upholding the core values of the organization. The Company maintains a vigilant stance in safeguarding its reputation, recognizing it as a cornerstone of its success. Additionally, HFE emphasizes strict adherence to all relevant statutory laws and regulations, ensuring compliance as a fundamental aspect of its operations. The policies that are integrated in Code of Conduct are as follows:

- Treat Each Other Fairly And Equally
- Equal Opportunity Employer
- Prevention Of Sexual Harassment
- Statutory And Legal Compliances
- Covid Care Protocols
- Health, Safety and Environment (HSE)
- Financial Reporting And Records
- Prevention of Money Laundering
- Anti bribery and anti corruption
- Anti money laundering and terrorist financing
- Whistle blowing
- Anti slavery and human trafficking
- Anti facilitation of tax evasion
- Data Protection
- Whistleblowing
- Gift Register
- Code For Communication
- Code For Sustainability And Society
- Rights of Persons With Disabilities
- Green Code
- Travel Arrangement
- Mobile Expense Reimbursement
- Leave Policy
- Public Holidays
- Employee Referral Guidelines
- Performance Management System
- KRAs Structured In Three Categories
- HFE Values And Behavior

- HFE Behavioral Competencies Will Be Assessed Differently For The Following Groups
- Calculation Method for Variable Pay
- Appraisal Cycle and Variable Pay Guidelines
- Career Aspiration and Training Needs
- Learning & Development

Note: Please refer HFE's detailed policy.

3.4 Human Resource Policy

The HR policy of the company commits to the following:

Treating Each Other Fairly And Equally

HFE is dedicated to establishing and sustaining a work environment where the dignity of employees is upheld. The Company is committed to fostering a healthy workplace that allows employees to work without fear of prejudice, gender bias, or sexual harassment. Victims, if any, should not perceive that their grievances have been disregarded or minimized, nor should they fear reprisals.

Equal Opportunity Employer

HFE operates as an equal opportunity employer, ensuring that no candidate is discouraged or rejected based solely on factors such as caste, gender, religion, nationality, marital status, or disability (within permissible limits for the job). The company prioritizes recruiting individuals with the right attitude who align with and respect HFE values, with employment decisions based purely on merit rather than irrelevant attributes. HFE offers equal opportunities for development and advancement to all employees, safeguarding their privacy and maintaining zero tolerance for any form of harassment or discrimination. However, developmental and promotional opportunities are contingent upon Annual Performance Appraisal, potential to contribute, alignment with future Company objectives, and business needs. Embracing diversity, HFE respects the personal dignity of all individuals associated with the organization. Discrimination based on race, color, religion, creed, sex, sexual orientation, gender identity, national origin, age, disability, veteran status, marital status, domestic partner status, citizenship, or any other status or characteristic is strictly prohibited in decisions related to promotion, transfer, or training. Persons with disabilities are afforded equal protection and safety in situations of risk, armed conflict, humanitarian emergencies, and natural disasters, with disability encompassing various conditions such as speech and language disability, specific learning disability, acid attack victims, dwarfism, muscular dystrophy, and blood disorders like thalassemia, hemophilia, and sickle cell disease.

Note: Please refer HFE's detailed policy.

Prevention of Sexual Harassment

In the HFE workplace, all forms of sexual harassment or sex-based discrimination are strictly prohibited, irrespective of the sex of the victim or perpetrator. HFE is committed to protecting women against sexual harassment and ensuring the prevention and redressal of complaints in compliance with the Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013, and similar acts in other countries. It is the responsibility of all employees to prevent and deter acts of sexual harassment and to contribute to creating a working environment where such behavior is unacceptable. Aggrieved women are encouraged to report incidents of sexual harassment promptly and preserve the confidentiality of their communications. Complaints can be made to the Internal Complaints Committee (ICC), and individuals involved in romantic relationships, particularly those in senior/subordinate positions, are required to disclose such relationships to HR representatives. Senior management and Leadership are strictly prohibited from engaging in any form of romantic relationships.

Note: Please refer HFE's detailed policy.

IT Policy

The purpose of this policy is to lay down the rules, regulations and guidelines for proper usage, effective control and maintenance of IT assets and infrastructure. To ensure ethical and acceptable use of IT assets and assure safety and security of data, products, software, facilities as well as the people using them. It also provides guidelines for purchase of hardware and software, data storage and backup, data protection/security, compliance, IT support and upgradation of IT infrastructure.

This Policy is applicable to all employees on permanent rolls, contractual staff, consultants, part-time staff or any other person (hereinafter referred to as 'users' in this Policy) accessing IT network/asset of HFE, Holdcos, SPVs and affiliate Companies.

- Company is committed to provide IT infrastructure that would enable the users ease of work and improve performance.
- IT department will give recommendations for IT asset/network upgradation from time to time for technological advancements, innovations and to achieve Company objectives.
- IT provides data security and storage services to ensure that in situations of Natural Disasters, Viruses, Human Errors, Software Malfunction and Hardware & System Malfunction, data of users is not lost.
- All users must save their work in the Folder created by IT team. Data saved in other folders will not be saved. In the event of data lost, that data cannot be retrieved
- Users will use IT asset/resources only for authorized purposes.
- Licensed software will be used in all laptops and desktops in the Organisation.
- Downloading screensavers, games, entertainment software or other inappropriate files (video or audio for personal use) is strictly prohibited.
- Use of official E-mail should be strictly for business purpose only.
- Complete data of user email ids belongs to the Company. Confidentiality of email data should be maintained by the individual user.
- Users are prohibited to use their names and email ids in public domain without prior authorization from respective HOD and IT Department.
- Users transferring or receiving files/attachments from external sources should note that the system will automatically check downloaded material for viruses. In case, user suspects virus in file/attachment, it respecave tou anur bepartner.
- Users transferring or receiving files/attachments from external sources should note that the system will automatically check downloaded material for viruses. In case, user suspects virus in file/attachment, it must not be opened. Please immediately contact IT Department.
- Procurement of all IT assets will be done as per Company's CPC Department guidelines.
- IT department reserves the right to block access to any Internet resource without any prior notice. In case anyone requires to access some restricted site, it may be dealt as a special case, provided the same is strictly for official purpose for a specific time. Request for this to be forwarded to IT by respective user's HOD.
- No access will be allowed on laptops and desktops for shopping sites, social media, adult/mature content, drugs, weapons, trading, gambling etc.
- IT department reserves the right to monitor use of IT assets and email and to review the content of files maintained and/or accessed through the IT network.
- All removable devices should be carried with due care and attention to avoid unauthorized access or physical loss of the asset. Loss or theft of IT asset should be immediately reported to the IT department.

Note: Please refer HFE's detailed policy

Anti slavery and Human trafficking policy

Modern slavery, encompassing slavery, servitude, forced and compulsory labor, and human trafficking, is recognized as a crime and a violation of fundamental human rights. Hero Future Energies Global Limited (the "Company" or "HFE") maintains a zero-tolerance stance towards all forms of slavery and is dedicated to conducting business ethically and with integrity. The Company is committed to implementing robust systems and

controls to prevent slavery in its own operations and supply chains. HFE strives for transparency in its business practices and endeavors to combat slavery throughout its supply chains. Expecting high standards from contractors, suppliers, and business partners, HFE includes specific prohibitions against forced, compulsory, or trafficked labor in its contracting processes. This policy applies to all individuals and organizations working for HFE or on its behalf, including employees at all levels, directors, officers, agency workers, volunteers, interns, contractors, and business partners. Management at all levels bears responsibility for ensuring compliance with this policy and providing adequate training on modern slavery issues in supply chains. While compliance with this policy and all other group compliance policies is mandatory for all employees, it does not constitute part of any employee's contract of employment and may be subject to amendment at any time.

Note: Please refer HFE's detailed policy

Slavery and Human trafficking statement

Hero Future Energies Global Limited is dedicated to taking appropriate measures to ensure there is no slavery or human trafficking within its own business operations or supply chains. This statement, as per section 54(1) of the Modern Slavery Act 2015, outlines the actions taken by HFE during the financial year ended 31 March 2018 to prevent slavery and human trafficking. HFE is a leading independent power producer, focusing on innovative and sustainable energy solutions. As a private company incorporated in England, HFE serves as the holding company for the Hero Future Energies group ("the Group"), which includes all holding companies, special purpose vehicles (SPVs), and affiliate companies in the UK, India, and Singapore. The Group's primary activity involves the establishment of solar and wind power plants/projects, with a focus on current and future clean energy initiatives. While the Group's operations are primarily based in India, it also maintains offices or representative presence in Singapore, Vietnam, Mauritius, and the UK.

Note: Please refer HFE's detailed policy

Anti Bribery and Anti Corruption Policy

Hero Future Energies Global Limited is dedicated to conducting business with fairness, honesty, and transparency in all regions where the company and other Group members operate worldwide. It is expected that all the officers and employees embody a culture of professionalism and integrity in their interactions on behalf of the Group. Furthermore, they are tasked with aiding the Company in establishing and maintaining systems to prevent bribery and corruption throughout the Group's operations. The company maintains a zero-tolerance stance towards bribery and corruption, expecting all staff and individuals representing the Group to adhere to the laws pertaining to countering bribery and corruption in every jurisdiction where the Group conducts business.

This policy applies to all persons working for or on behalf of HFE or any member of the Group in any capacity, including employee at all levels, directors, officers, agency workers, seconded workers, volunteers, interns, agents, contractors, external consultants, third-party representatives and business partners, sponsors, or any other person associated with us, wherever located.

The main purpose of the policy is to :

- set out our responsibilities, and of those working for us, in observing and upholding our position on bribery and corruption; and
- provide information and guidance to those working for us on how to recognise and deal with bribery and corruption issues.
- This policy applies to all persons working for or on behalf of the Company or any member of the Group in any capacity, including employee at all levels, directors, officers, agency workers, seconded workers, volunteers, interns, agents, contractors, external consultants, third-party representatives and business partners, sponsors, or any other person associated with us, wherever located.
- You must ensure that you read, understand and comply with this policy at all times.
- The board of directors has approved and adopted this policy and is committed to carrying out business fairly, honestly and openly with a zero-tolerance approach towards bribery and corruption.

- Management at all levels are responsible for implementing this Policy, ensuring those reporting to them understand and comply with this Policy, and are given adequate and regular training on it.
- The group's risk officer "Risk Officer" has primary and day-to-day responsibility for monitoring use of this Policy and its effectiveness, dealing with any queries about it, and auditing internal control systems and procedures to ensure they are effective in countering bribery and corruption.
- References in this policy to a third party include any individual or organisation you come into contact with during the course of your work for us, including actual and potential clients, customers, suppliers, distributors, business contacts, agents, advisors, and government and public bodies, including their advisors, representatives and officials, politicians and political parties.
- All employees are required to comply with this policy and all other group compliance policies, but this policy does not form part of any employee's contract of employment and we may amend it at any time.

Note: Please refer HFE's detailed policy

Anti money laundering and anti terrorist financing policy

Hero Future Energies Global Limited has established procedures to effectively identify, assess, monitor, and manage financial crime risks, including money laundering risk, in a manner that is both comprehensive and proportionate to the nature, scale, and impact of its activities. Regular evaluations of the adequacy of these systems and controls are conducted to ensure ongoing compliance with relevant rules and regulations. HFE is dedicated to adhering to applicable anti-money laundering and criminal financing regimes, and it mandates that all directors, officers, employees, and individuals associated with the Company comply with the relevant rules and regulations governing these matters.

Internal Procedure to Prevent Money Laundering

The Company is exposed to a significant risk of reputational damage if it is associated with money laundering or terrorist financing activity. You must follow the Company's procedures to protect yourself and the Company from involvement in the criminal offences set out above.

- To prevent the Company from engaging in activities relating to money laundering and terrorist financing the Company will establish appropriate and risk-sensitive policies and procedures (in addition to the current group policies and procedures which protect against money laundering) relating to:
- Customer and vendor due diligence measures (including measures to establish identity and ownership and activities) which will include checking Treasury Designated Persons list and anti- money laundering risk associated with the jurisdiction in which the customer or vendor is based) as part of group procurement policies.
- Risk assessment when entering into a new business territory and particularly one which is at higher risk of money laundering; production or trafficking of drugs; or sponsors of or safe havens for terrorism as part of group new business risk assessment procedures.
- Where the group is considering engaging with customers or vendors operating in a high risk jurisdiction, the group will as part of its risk assessment and due diligence, as relevant to the proposed engagement:

    - determine if the customer or vendor is a branch or subsidiary of an entity which is established in the European Economic Area and which is subject to and supervised for compliance with EU money laundering directives, and if it is, whether there is a requirement for further due diligence, applying a risk-based approach;
    - seek additional independent, reliable sources to verify information provided or made available to the group.
    - take additional measures to understand the background, ownership and financial situation of the customer or vendor,
    - take further steps to be satisfied that the transaction is consistent with the intended nature of the relationship; and

    - increase the monitoring of the business relationship.
- Monitoring of compliance with and the internal communication of the above policies and procedures.
- The group's procurement policies are designed to highlight:
    - a reputation for involvement in criminal activities including money laundering, bribery, terrorism, tax evasion and slavery;
    - and unusual contractual arrangements including where the commercial rationale for a transaction is unclear.
    - All employees are required to comply with this policy and all other group compliance policies, but this policy does not form part of any employee's contract of employment and we may amend it at any time.
    - The Company will also provide training to ensure that all staff are kept up to date on their obligations and the Company's policies and procedures.

Note: Please refer HFE's detailed policy

Whitsleblower Policy

Hero Future Energies Global Limited and Hero Future Energies Private Limited are dedicated to conducting their business with honesty and integrity, expecting all staff to uphold high standards. However, organizations inevitably encounter the risk of occasional mishaps or unknowingly harboring illegal or unethical behavior. Cultivating a culture of openness and accountability is crucial to prevent such occurrences or address them promptly when they arise. Any suspected wrongdoing should be reported promptly. Whistleblowing entails the disclosure of information concerning suspected wrongdoing or hazards in the workplace. This encompasses various scenarios such as misuse or abuse of authority, misappropriation or suspected fraud, criminal activity, miscarriages of justice, threats to health and safety, environmental damage, failure to comply with legal or regulatory requirements, bribery, and deliberate concealment of any of these matters. This policy aims to:

- To encourage individuals to report suspected wrongdoing promptly, ensuring their concerns are taken seriously, investigated appropriately, and their confidentiality respected.
- To offer guidance to individuals on how to raise concerns effectively.
- To reassure individuals that they can raise genuine concerns in good faith without fear of reprisals, even if they are later found to be mistaken.
- This policy applies to employees at all levels, directors, officers, agency workers, seconded workers, volunteers, interns, agents, and contractors. It is emphasized that this policy does not constitute part of any employee's contract of employment and may be subject to amendment at any time.
- The elements of HR Policy are also conveyed to the sub-contractors of HFE and applied as part of contractual obligations. The Policy is signed and shared with all employees.

Note: Please refer HFE's detailed policy

3.5 Green Code

HFE acknowledges that its core business is inherently environmentally friendly and expresses a commitment to expanding its environmental impact beyond primary operations. Recognizing the significance of contributing to a sustainable future across all aspects of life, HFE is dedicated to cultivating a "Green Discipline" throughout its organization. This collaborative endeavor involves engaging all stakeholders to adopt practices that prioritize environmental conservation and sustainability, extending beyond the company's core business activities. The Green Code outlines measures to protect the environment and uphold the ecological commitment of HFE:

- Unplugging appliances when not in use
- Maximizing natural light usage
- Preferring carpooling
- Purchasing products with 'Energy Star' rating
- Using compact fluorescent or LED light bulbs

- Consuming locally sourced fruits, vegetables, and food
- Conserving water by avoiding unnecessary running taps
- Repurposing unused water for lawn watering or other tasks
- Filtering tap water instead of buying bottled water
- Watering lawns during non-peak hours to reduce evaporation
- Promoting rainwater harvesting in communities
- Extending the lifespan of electronic items and responsibly recycling electronic waste
- Minimizing plastic usage and opting for recyclable plastics
- Using reusable water bottles during travel
- Creating non-toxic cleaning products at home
- Printing on both sides and condensing prints
- Recycling waste paper and avoiding throwing it in regular bins
- Preferring e-books over paper books
- Using cloth napkins instead of disposable paper napkins.
- Encourage the usage of paints with low VOC or certified green paints, including casein paints made from milk proteins, lime, and non-toxic pigments.
- Promote regular vehicle maintenance such as changing oil to reduce emissions and ensuring proper tire inflation for fuel efficiency.
- Advocate for walking or using public transportation to the grocery store or market at least once a week instead of driving.
- Support initiatives to decrease individual and organizational carbon footprints by reducing greenhouse gas emissions.
- Encourage the use of biodegradable materials at home whenever possible.
- Discourage the bursting of firecrackers during festivals and events to minimize environmental impact.
- Promote green building practices that focus on energy efficiency, renewable energy usage, water conservation, rainwater harvesting, reduced greenhouse gas emissions, recycling, and waste reduction.
- Encourage tree planting on occasions such as birthdays and anniversaries, with the company offering support to match employees' efforts.
- Advocate for reducing the use of disposable items to minimize waste in landfills.
- Recommend the use of rechargeable batteries over disposable ones to reduce landfill waste and environmental harm.
- Stress the importance of properly disposing of all types of batteries, including rechargeable batteries, at the end of their usable life.
- Encourage thoughtful package selection to minimize waste, opting for products with less wasteful packaging.
- Promote responsible residential recycling by checking collection centers and ensuring proper disposal of goods.

3.6 Protection of Women from Sexual Harassment (POSH)

Hero Future Energies Pvt. Ltd. (HFE) expressly prohibits any form of sexual harassment or sex-based discrimination in the workplace, regardless of the recipient's sex or the perpetrator's sex. This policy aims to protect women against sexual harassment at the HFE workplace and ensure the prevention and redressal of such complaints, in compliance with the Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013. Sexual harassment of women in the workplace is considered misconduct under this policy and the HFE Code of Conduct. All complaints by aggrieved women to the Internal Complaints Committees of HFE will be addressed according to the law and this policy. The HFE Grievance Procedure does not apply, except where specifically provided for. If any person not protected by the Act wishes to complain about harassment, sexual harassment, or sex-based discrimination, they may do so following the HFE's Grieavance procedure.

Note: Please refer HFE's detailed policy

3.7 Monitoring, Communication And Training For Global Policies

The Risk Officer holds a pivotal role in ensuring the adherence and efficacy of Global Policies by crafting monitoring procedures to oversee compliance. Through conducting regular risk assessments, they pinpoint and track crucial compliance risks across Group companies. Management, on their part, will uphold this process by maintaining Risk Registers informed by the outcomes of these assessments. At all hierarchical levels, management is entrusted with the responsibility of policy implementation, ensuring their teams comprehend and adhere to these guidelines, facilitated by regular training sessions. Furthermore, the Risk Officer collaborates with management to extend this training across the organization, covering all Group-wide Policies comprehensively for all employees.

All employees will be provided with copies of the Policies, and their acknowledgment of receipt will be documented. Specialized training sessions will be arranged to ensure employees understand, adhere to, and comply with these Policies effectively. New hires will receive training within 45 days of joining the company. Additionally, annual refresher trainings will be conducted for existing employees in the UK, Singapore, and India. The Risk Officer will oversee compliance with training requirements, promptly reporting any instances of non-compliance to the Chief Executive Officer for appropriate action, which may involve disciplinary measures, including dismissal, if necessary.

3.8 CSR Policy

The policy presents the objective of the organization to contribute to various social initiatives introduced by the government such as Prime Minister's Relief Fund, Chief Minister's Relief Fund, Swacch Bharat and Ramakant Munjal Foundation. The policy also outlines the CSR strategy of the company, nature of CSR programmes, funds, implementation process, and follow up activities and responsibilities of CSR working committee. The policy outlines, that:

- HFE will implement projects which will have definite beginnings, ends, expected outputs and outcomes as well as budget associated with it.
- The projects that will undertaken may be of a short duration (a few months) or multi-year.
- HFE implement projects either through in-house teams or in partnership with other agencies or a combination with both. In case of multi-year projects, same will be revirewed on an annual basis or as at such times as may be decided by the Committee.
- Selected projects will be grouped as per their implementation period in a 1 year plan, 2 year plan and a 3-year plan. These plans will be presented annually in a meeting of CSR committee of the board.

3.9 ESG MF Principles

The ESG MF principles are conceptualized as guiding the implementation of the ESG MF. The principles stem from existing policies and commitments of HFE developed over time from implementation of past and present projects. The principles are focused on the conservation of natural environment, community benefit and workers' welfare. The ESG MF principles are:

- **Prevent/Minimise Environmental Impact**: As a principle all new projects or expansions needs to assess and incorporate measures to minimise environmental impacts of the project, including use of resources, change to ambient conditions and proximity to environmentally sensitive receptors.
- **Community Health and Safety:** All projects will ensure adequate setbacks from existing habitations, houses and community facilities. The project planning and operations will ensure mitigation of all related health and safety issues. All site selection will focus on minimal disturbance to existing population.
- **Stakeholder engagement:** Establish and maintain a constructive relationship with all relevant parties, in particular with affected people and communities, over the entire life of the project. The engagement

process should allow stakeholders' views, interests, and concerns to be taken into account and assuring that project activities are maximizing social benefits and mitigation measures are culturally appropriate and effective in minimizing impacts.

- **Workers welfares and safety**: The company shall extend all applicable benefits to its workers and apply the principle of equal opportunity to all employees. The company shall put in place a documented HR Policy and shall extend that to its contractors for compliance. The company shall not engage any child labour and abide by the requirements local regulations in terms of wages and work hours.
- **Effective grievance mechanism:** Local communities and other stakeholders may raise complaints and concerns about adverse social or environmental impacts of the project practices at all times during project implementation and execution. This will be ensured by a formal grievance system which establishes effective, accessible and transparent procedures to receive and resolve complaints. The procedures for which are detailed in the ESG Management Framework Manual.

3.10 Signing Authority and Policy Disclosure

The aforementioned corporate policies shall be attested by Chief Managing Director (CMD), who holds authority to advocate and implement the commitments made through these policies at each and every stage of project implementation. All employees are expected to conduct themselves in accordance with the spirit of the policy. Furthermore, only CMD and ESG Manager have the authorities to amend these policies. The amended versions shall further be attested by CMD.

These signed policy statements shall be displayed at the corporate office and at all sites as well as at the website of the company in designated official format or template.

3.11 Policy Flow and Implementation

The Corporate Policies will govern the overall project development and operations in an environmentally and socially sustainable manner. The employees, contractors, vendors and all those associated with HFE will be encouraged to implement this policy and associated guidelines, with guidance and support from HFE.

These policies, driven by the top management of HFE are suitably reflected in the various procedures, guidelines and plans and applied to the various projects in which HFE is presently involved or proposes to get involved.

3.12 Communication and Disclosure

HFE will reflect these policies, suitably in the various manual, procedures, management plans and guidelines and applies to existing and future assets of HFE.

The above policies shall be adopted by HFE and also communicated to its contractors and sub-contractors, and other stakeholders for their adoption and implementation. Ongoing communication on the requirements under the policies and ESG MF will be included as a core component in the induction process for new employees.

4 Institutional Structure for ESG Management Framework Implementation

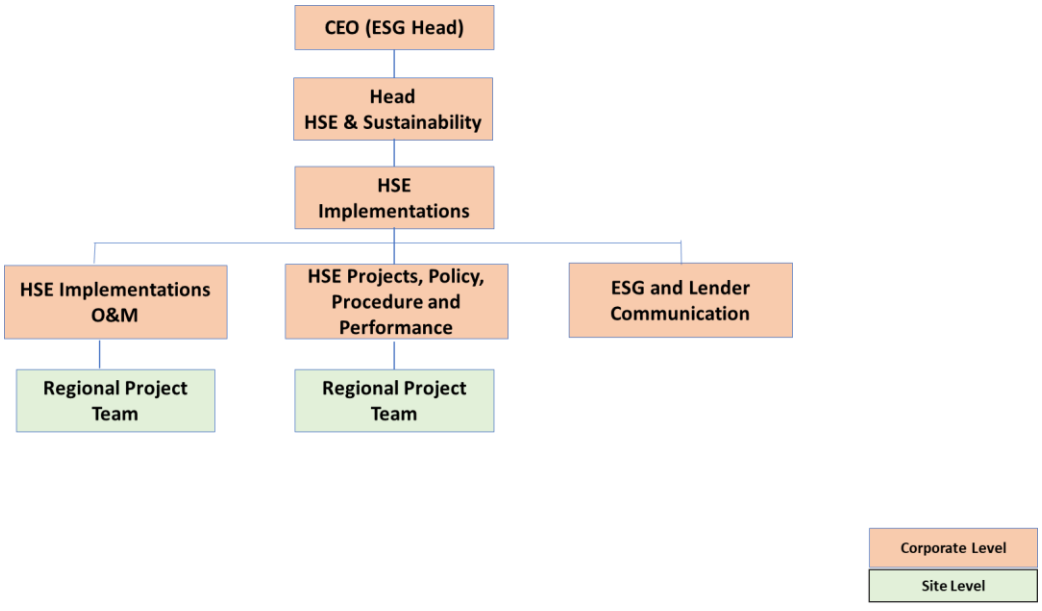
HFE is dedicated to establishing, maintaining, and enhancing an organizational structure that clearly defines roles, responsibilities, and authority for the effective implementation of the Environmental, Social, and Governance Management Framework (ESG MF). This includes assigning specific personnel, including management representatives, with well-defined lines of responsibility and authority. Key environmental and social responsibilities will be communicated to relevant personnel, backed by strong management support and adequate human and financial resources, to ensure ongoing and effective environmental and social performance.

This section provides an overview of the ESG MF committee structure at the corporate level, detailing various departments and their inter-relationships. The organizational structure is complemented by a clear delineation of roles and responsibilities. Additionally, it presents the integration of ESG MF functions at both the corporate and project/site levels, explaining the interconnectedness between these functions and the role of the ESG MF Committee at the corporate level.

4.1 Corporate Governance - ESG Management Framework Implementation Team Structure

HFE has established a corporate-level Environmental, Social, and Governance Management Framework (ESG MF) committee responsible for overseeing the implementation of ESG MF . This includes ensuring compliance with environmental and social (E&S) aspects, monitoring and reporting activities from projects, and reporting E&S aspects to external stakeholders. The Corporate level organisational structure of HFE comprises of the Chief Executive Officer (CEO) who overviews the HSE and Sustainability department and HSE Implementations team. The HSE Implementation team ensures HSE implementation, HSE- Projects, Policy Procedures and Performance, and ESG and Lender communication through different verticals. The HSE- Projects, Policy Procedures and Performance overviews the regional project teams and ESG implementation.

Figure 1 Indicative Organization Structure (Corporate and Project Level)



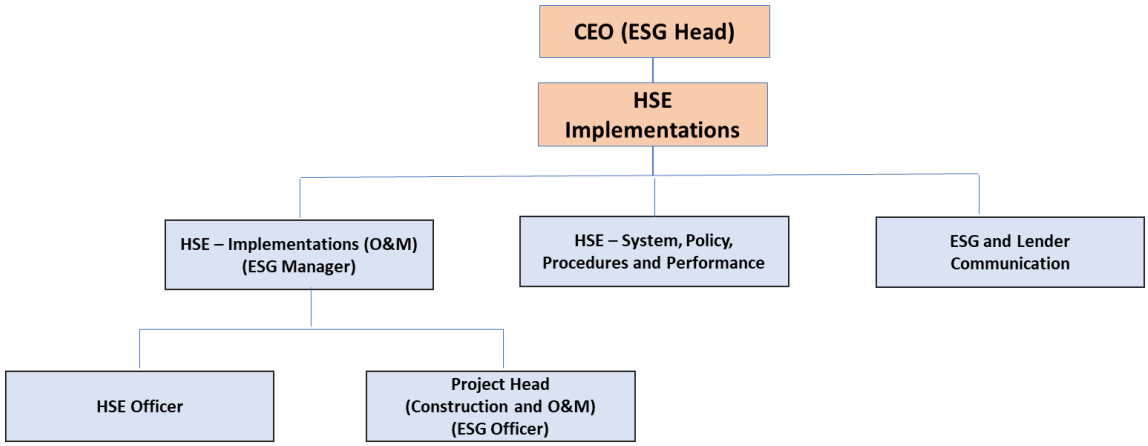
4.2 ESG MF Implementation Team

The indicative organisational structure for ESG MF Implementation is shown in *Error! Reference source not found.***.** T he company shall constitute ESG MF organogram comprising of dedicated ESG Head and ESG MF Manager having relevant ESG background/ skillset/ bandwidth to handle EHG aspects, depending on scale of the company and associated risk. The ***Table 4-1*** below is indicative of the roles and responsibilities of ESG Committee, ESG Head, ESG Managers, ESG Officer for ESG MF Implementation to ensure effective execution.

There will be an ESG Officer on site (generally Project Head) to monitor and manage ESG MF related requirements at the site and the Project Level ESG officer will be supported by Site Safety/HSE Officer (Zonal HSE Officer).

Any potential development decision will have to be sent to the ESG committee for review of E&S aspects and any E&S decision with serious business implications will need to be reported to Board of Directors for review and approval.

Figure 2 Indicative Organization Structure of ESG MF Implementation



4.2.1 Roles and Responsibilities

HFE will allocate resources essential to the implementation and control of the ESG MF. The CEO will be accountable for compliance of HFE's operations to meet the requirements of the ESG MF. This section broadly defines the role of each team member and their responsibilities towards E&S management across renewable portfolio. These roles will need to be updated and modified per requirement basis (since ESG MF will be a live document).

4.2.1.1 ESG Committee and Members

An ESG committee will be set up to oversee the ESG MF implementation across projects/sites. The main roles and responsibilities of the **ESG committee** are laid down below:

- Facilitate appointment of key environment and social personnel at various levels based on requirement.
- Advice on matters related to significant material E&S issues identified, including findings from the Screening Study, ESIA report and other additional E&S studies (if any), and provide recommendations accordingly.
- Oversee the implementation of ESG MF of the entire portfolio through bi-annual meetings.
- Issue directions to the key teams on EHS&S and related Governance policy commitments, E&S resourcing and capacity building needs, contractor engagement and E&S management measures related to portfolio assets.

- Review organization's E&S goals and KPIs for effectiveness and advise Board on the overall E&S performance of the Company.
- Review periodic E&S reports submitted by sites.
- Review and approve correction or appends (as may be necessary) to ESG MF Procedures so as to meet requirements of the applicable reference framework and fulfil E&S policy objectives;
- Undertake annual review of the ESG MF document and updates if deemed necessary

Table 4-1 Roles & Responsibilities for ESG MF Committee Members

Role	Responsibility
Board Of Directors	• Consider the materiality and meaningfulness of corporate values and culture • Commit to considering ESG factors when making any decision • Identify at least one director with relevant skills to support the board on sustainability, and hold Management accountable • Review the materiality, quality and frequency of non-financial data and reports • Ensure that ESG factors are integrated into the risk management framework • Oversee how the different functions of the organization manage relationships with their main stakeholders • Review and approve a company-wide Stakeholder Engagement Policy, which includes grievance mechanisms • Ensure policies are aligned and coherent with the company's purpose and are conducive for delivering its strategy and responsibly creating long-term value • Oversee how the organization's purpose is communicated to the employees, investors, customers and other stakeholders
ESG Head	• Ensuring implementation of Corporate ESG MF related requirements, both at Head Office as well as at all projects • Approve the annual EHS training calendar of the projects/ sites • Review findings of internal audit and monitoring reports • Ensuring annual E & S reporting to Lenders • Review and present changes in corporate ESG MF to the ESG MF Committee • Control of all amendments, revisions, issues and circulation of corporate ESG MF
ESG Manager	• Supporting ESG Head for ensuring implementation of ESG MF at all the projects • Maintenance of necessary documentation supporting corporate ESG MF and its annexures by liaising with the responsible teams/ personnel • Ensuring that the job specific training and ESG MF induction training needs are identified based on the specific requirements of the ESG MF and delivered • Ensuring that any gaps or corrective and preventive actions identified/ implemented during various stages of E&S implementation and assessment are recorded and a systematic follow up is done to ensure their effectiveness • Ensure ESDD & ESIA reviews are conducted and incorporated into the decision-making process; • ESAP and ESMP are documented, accepted, and incorporated into the action plans at the site and all offices • Ensuring closure of findings from internal audits and documentation of the same, by Project level ESG Managers • Coordination with other departments of HFE and / or the government authorities for obtaining and/or renewing relevant approvals/permits. • To ensure that all the legal compliance w.r.t. Environment, Health, Safety and Social aspects are being done to carried out operations • Conducting and facilitating meetings along with Business Development team with the local communities to understand their concerns and expectations • Identification of ESG MF related trainings and induction • Identification of EHS related training to be delivered at Projects

	• Undertake periodic internal audits at all the Projects • Annual E&S reporting for lenders and other stakeholders.
ESG Officer	• Communicate implementation of ESG at site • Tracking of E&S compliance related aspects for regulatory and lenders' requirements • Ensuring incident reporting to ESG MF Committee • Identifying training and capacity building needs at Projects and coordinating with HR on training • Communication and reporting to ESG MF Committee.
Project Specific Safety/EHS Officer	• Communicate implementation of ESG at site • Ensure Implementation of on-site procedures related to the ESG • Conduct relevant EHS trainings for the site staffs. • Prepare and Collate E&S reports at the site level and share the same to the Project Level ESG Officer • Monitoring initiatives and progress against ESG MF to be submitted to the ESG Officer at the frequency established • Ensuring incident reporting to ESG Committee • Supervision of implementation of the ESMP, ESAP and other action plans developed for the Projects • Ensuring contractors, sub-contractors and vendors adhere to practices, trainings, etc. in line with ESG MF; • To supervising contractors and workers in reporting E&S violations and assisting them to effective implementation of corrective action & preventive action
Project Head	• To assisting the ESG Manager in conducting assessment of social and environmental risks of project sites; • To coordinate with the State regulatory authorities for environmental approvals / permits; • Liasoning and coordinate with the local administration, police, medical facilities, fire station, etc.; • To communicate project's E&S requirements to the contractors; • To report E&S violations to the ESG Manager and assisting in implementation of corrective measures; and • To conducting meetings with the local communities

4.2.2 Capability Enhancement Program

HFE will conduct capacity enhancement programs for its E&S team/ ESG Committee to enhance the knowledge of each member regarding the ESG MF manual and its implementation, also other capacity building trainings will be conducted on need basis to facilitate ESG MF team in carrying out the responsibilities more efficiently.

4.2.3 ESG Management Framework Budget

HFE's ESG MF Committee will ensure that sufficient funds/finances are made available to conduct the activities defined in the ESG MF efficiently and managing E&S safeguards in the business operations as a part of the annual budgeting process.

5 Project Phases and ESG Risk Profiling

This section provides a broad overview of the E&S risks associated with key project components and project development activities for the renewable project portfolio. The project specific construction, operation & maintenance activities for the project have been mentioned below:

Table 5-1 Project specific Construction, Operation and Maintenance phase activities

Construction Phase	Operation and Maintenance	Decommissioning
Wind Power		
▪ Selection of Wind Mast location and installation of Wind Mast. ▪ Collection of Wind data and Analysis of Wind Data ▪ Wind Resource Assessment – in-house and through third party consultants ▪ Final selection of sites for development based on Wind Resource Assessment ▪ Land Procurement ▪ Component Unloading and Quality Inspection of the rotor blades, tower and nacelle ▪ Plinth Preparation, Installation of load spreading plates, base frame, tower sections, nacelle, rotor assembly ▪ Development of Pooling Substation and erection of Transmission Lines	▪ Commissioning of the WTG's ▪ Evacuation of power generated via transmission lines to the switch yard from where it is evacuated to the nearest local substation. ▪ Regular Repairs and Component fixes on the structural elements of the WTG ▪ Cleaning of the WTGsz	▪ Dismantling of WTGs ▪ Deinstallation of electrical infrastructure ▪ Disposal of waste ▪ Reclamation of land for further use.
Solar Power		
▪ Site Development: Soil Investigation, site survey, site levelling, fencing, drainage, sewerage etc. ▪ Uptake of land for the project. ▪ Solar Photovoltaic array foundation, load centre transformers and inverter pedestals, switch yard structure etc	▪ Daily, monthly or annual maintenance checks that oversees grid interface healthiness hourly and power being exported, inspection of photovoltaic panel glass surfaces, inspection of all wiring and electrical infrastructure for physical damage and for any sign of excessive heating or physical damage etc ▪ Washing of Solar modules ▪ Regular inspection and maintenance of equipment ▪ De-weeding activity and maintenance of supporting project infrastructure such as site office internal roads and drainage systems etc.	▪ Dismantling of solar panels, ▪ Deinstallation of electrical infrastructure, ▪ Disposal of waste and ▪ Reclamation of land for further use.
Hybrid Projects		

Construction Phase	Operation and Maintenance	Decommissioning
▪ Site Preparation including fencing, clearing of trees, bushes, pit filling, levelling and grading; ▪ Transportation of construction material; ▪ Construction of site office and internal roads; ▪ Construction of temporary storage facilities; ▪ Foundation laying for ground mounted structures; ▪ Storage of PV modules delivery and their installation; ▪ Laying of internal electrical connections; ▪ Installation of inverter and transformers; ▪ Excavation foundation and erection of transmission line towers; and ▪ Stringing of transmission lines.	▪ Daily dry robotic cleaning of PV modules; ▪ Control of vegetation viz. weeds, bushes etc. within the site and those immediately surrounding it; ▪ Routine inspection of all PV modules WTGs and associated structures viz. cables, transformers, inverters, mounting structures etc.; ▪ Operation and maintenance of ancillary facilities such as power substation; ▪ Inspection and maintenance of transmission lines; and ▪ Inspection and maintenance of internal pathways and access roads.	▪ Dismantling of WTGs and Solar panels ▪ Deinstallation of electrical infrastructure ▪ Disposal of waste ▪ Reclamation of land for further use.
Rooftop Solar		
▪ Site Preparation ▪ Solar Photovoltaic array foundation, load centre transformers and inverter pedestals, switch yard structure etc.	▪ Daily, monthly or annual maintenance checks that oversees grid interface healthiness hourly and power being exported, inspection of photovoltaic panel glass surfaces, inspection of all wiring and electrical infrastructure for physical damage and for any sign of excessive heating or physical damage etc ▪ Washing of Solar modules ▪ Regular inspection and maintenance of equipment.	▪ Dismantling of solar panels, ▪ Deinstallation of electrical infrastructure, ▪ Disposal of waste and ▪ Reclamation of roof area for further use.
Fishery or Floating Solar		
▪ Site clearance and site preparation ▪ Setting up of labour camp (***Appendix T)*** ▪ Transportation of construction material ▪ Foundation excavation for construction of sub-stations, transmission towers, transformer, site office etc. ▪ Construction of small captive jetty/pier and floating cables ▪ Transportation of solar modules and ancillary facilities, mobilization of labours and equipment	▪ Daily, monthly or annual maintenance checks that oversees grid interface healthiness hourly and power being exported, inspection of photovoltaic panel glass surfaces, inspection of all wiring and electrical infrastructure for physical damage and for any sign of excessive heating or physical damage etc ▪ Washing of Solar modules ▪ Regular inspection and maintenance of equipment	▪ Dismantling of solar panels, ▪ Deinstallation of electrical infrastructure, ▪ Disposal of waste and ▪ Reclamation of water for further use.
Battery Storage		

Construction Phase	Operation and Maintenance	Decommissioning
▪ Site Development ▪ Uptake of land for the project ▪ Installation of Battery Banks, Storage Containers and power conversion systems	▪ Component and equipment-wise checks and repair, repair work (following expiration of EPC warranty period), verification of repairs, documentation	▪ Dismantling of battery storage, ▪ Deinstallation of electrical infrastructure, ▪ Disposal of battery waste as per the applicable regulations and ▪ Reclamation of land for further use.
Green Hydrogen		
▪ Site clearing and civil works ▪ Uptake of land for the project ▪ Mobilization and Construction ▪ Use of construction vehicles and equipment ▪ Project construction support ▪ Handling, storage and use of fuel and hazardous materials, and waste and wastewater ▪ Influx of expatriate workforce	▪ Development of production and storage units ▪ Operation of the process units ▪ Handling and storage of chemicals used in electrolysis processes ▪ Management of hazardous materials ▪ Influx of expatriate workforce	▪ Decommissioning by setting up necessary infrastructure, such as temporary facilities, waste management systems, and safety barriers ▪ Decontaminating and dismantling equipment, including electrolyzers, storage tanks, pipelines

6 Identification of Risks and Impacts

6.1 Potential Impact Assessment

This section of the ESG MF identified potential risks and impacts that could arise from the activities of the project from the project(s)' lifecycle. Once an understanding of the various project lifecycle stages is established, some of the key environmental and social risks that may emanate during the project lifecycle for all the projects as part of renewable energy portfolio are taken into consideration. Through the type of projects in HFE portfolio are clean forms of energy, there are risks that are required to be managed through the various stages of project lifecycle as discussed in the previous section. In the subsequent section, the management and addressal of these identified risks through implementation measures has been discussed.

S. No	Impact/ Issue	Impact anticipated/project phase and Nature & Duration of impact/ issue					
		Solar (Ground and Rooftop)	Wind	Hybrid	Battery Storage	Green Hydrogen	Fishery or Floating Solar
1.	Land acquisition and rehabilitation and resettlement issues in case the land is not purchased, and acquired through government	☑ Pre- Mobilization and Construction Phase, Impact Anticipated are Long term, Permanent Impacts					☒
2.	Loss of land-based livelihood including agriculture/grazing and economic impact	☑ Pre- Mobilization and Construction Phase, Impact Anticipated are Long term, Permanent Impacts					☒
3.	Displacement of settlements (at times including tribal population)	☑ Pre- Mobilization and Construction Phase, Impact Anticipated are Long term, Permanent Impacts					☒
4.	Loss of vegetation from site clearance (at times including protected areas)	☑ Construction Phase, Impact Anticipated are Short term, Permanent Impact					☒
5.	Interference with ecological corridors and faunal migration routes and well as human access routes	☑ Construction Phase, Impact Anticipated are Short term, Permanent Impact					☒
6.	Air pollution and noise pollution during site clearance and construction activities	☑ Construction Phase, Impact Anticipated are Short term, Permanent Impact					☒
7.	Right of Way requirements for access road, transmission line, water supply etc. creating potential disruption of community access routes	☑ Construction Phase and Operation Phase, Impact Anticipated are Long term, Permanent Impacts					☒
8.	Issue of local labour employment, and their living and working conditions	☑ Construction Phase and Operation Phase, Impact Anticipated are Short term, Permanent Impact					
9.	Influx of migrant population, labour camp and related facilities	☑ Construction Phase and Operation Phase, Impact Anticipated are Short term, Permanent Impact					
10.	Work site facilities and HR and labour related compliances	☑ Construction Phase and Operation Phase, Impact Anticipated are Short term, Permanent Impact					
11.	Traffic Movement and Pedestrian Safety	☑ Construction & Operation Phase, Impact Anticipated are short term, Temporary Impact					☒
12.	Onsite Health and Safety management of workforce	☑ Construction & Operation Phase Construction Phase: Short term, Temporary Operation Phase: Long Term, Permanent					
13.	Wastewater and waste disposal	☑ Construction Phase and Operation Phase, Impact Anticipated are short term temporary impacts					
14.	Effect on cultural or sites of archaeological importance	☑ Construction Phase Short term, temporary long term, permanent					
15.	Diversion of water from community resources such as ground water wells, neighbouring surface water bodies	☑ Construction Phase Short term, temporary long term, permanent		☒	☒	☑ Construction Phase Short term, temporary long term, permanent	
16.	Stress on water availability in the area due to use of water for module cleaning	☑ Construction Phase, Impact Anticipated are long term, Permanent Impacts					
17.	Absence of Grievance redressal mechanism which can contribute to community resentment or agitation	☑ Construction and Operation Phase, Impact Anticipated are long term, Permanent Impacts					
18.	Impact on visual landscape	☑ Operation Phase, Impact Anticipated are long term, Permanent Impacts					
19.	Noise Pollution	☑ Construction Phase, Impact Anticipated are long term, Permanent Impacts					
20.	Species mortality or injury and disturbance	☑ Operation Phase, Impact Anticipated are long term, Permanent Impacts					

S. No	Impact/ Issue	Impact anticipated/project phase and Nature & Duration of impact/ issue					
		Solar (Ground and Rooftop)	Wind	Hybrid	Battery Storage	Green Hydrogen	Fishery or Floating Solar
21.	Habitat alteration	☑ Operation Phase, Impact Anticipated are long term, Permanent Impacts					
22.	Occupational health and safety hazards: • Live power lines; • Working at height; • Electric and magnetic fields; and • Exposure to chemicals • Electrocution; • Electromagnetic interference	☑ Construction and Operation Phase, Impact Anticipated are Long term, Permanent Impacts					
23.	Community health and safety hazards: • Noise due to operation of WTG • Shadow Flicker • Blade throw;	☒	☑ Operation Phase Long Term, Permanent	☒	☒	☒	☒
24.	Community health and safety and hazards • Electromagnetic interference and radiation. • Electrocution;	☑ Construction and Operation Phase, Impact Anticipated are long term, Permanent Impacts					

As part of ESG MF , HFE has developed a Screening Checklist (**Appendix B**) along with detailed scope for Risk assessment studies and hazard identification & risk assessment (**Appendix D**) procedures to identify the potential environmental and social risks & impacts likely to arise as a result of the Project by matching the project components with the surrounding environmental and social cultural resources.

6.2 Project Development and Operations Stages and Activities

The section highlights the key lifecycle stages projects in the HFE renewable energy portfolio including the key activities carried out for the projects. HFE follows the below presented project development schedule considering the key activities, risk mitigation and frameworks/tools/checklist for various project stages.

Figure 6-1 Project Development Stages

6.3 Trigger for E&S Studies and Risk Identification and Assessment for Renewable Projects

After the project development decision is made, the project inception and risk assessment process begins.. The project planning and scheduling varies on the nature and scale of the project to be developed by HFE. Risk and impact identification process developed are appropriate to the nature and scale of the project. The process varies from the single stage screening to multiple stage risk and impact identification process, as detailed below:

- Screening and identification of EHS&S Impacts and Go/ No-Go criteria Screening
- Environmental and Social impact Assessments (ESIAs)
- Environmental and social due diligence (in case of Project being financed by Lenders & Equity partners or HFE acquired the brown project)

Environmental and social risks screening and due diligence involve the systematic identification, quantification, and valuation/evaluation of the environmental and social risks associated with the project portfolio which could present a potential liability HFE. The stage wise activities to be undertaken to screen, categorize, and scope the EHS&S assessment requirements as per the scale of the activities has been discussed below.

6.3.1 E&S Risk Screening and Provisional Categorization

Environmental and social risk screening involves the systematic identification, quantification, and valuation/evaluation of the environmental and social risks by HFE. This entire phase involves key tasks such as preliminary EHS&S screening desk-based review and a site visit with the use of technical experts, to understand the potential environmental and social risks.

This screening will identify the issues and to provisionally categorize the project on the basis of the assessment. The intent is to identify high level issues and risks with regards to the Project location, environmental interactions, extreme climate risks events, ground water availability, sensitive receptors, indigenous people, cultural heritage, labour issues, formal and informal land users, community unrest and any other reparational risks along with land identification. On cases-to-case basis, HFE may also engage third party consultant firms to carry out such screening exercises and assist in categorizing project which will further support in Go-No-Go decision. HFE will categorize the project on the basis of the E&S categorization provided by IFC PS. This categorization will in turn allow for the identification of the additional assessments that might be required to substantiate and support the category

assigned for the project in subsequently have bearing on project level impact mitigations plan and overall EHS&S compliance monitoring.

Go No Go Decision: HFE will not develop/ acquire project located in a critical habitat (CH), Schedule V areas or if the project development or operational activities adversely impact any Indigenous People (IP), unless adequate assessment is undertaken, and all potential impacts are mitigated or compensated/offset for.

IFC Categorization

This ESG MF Framework has provided for three (3) category levels that can be assigned to the projects. These definitions used for these categories have been influenced by categorizations provided by IFC. The below Table 6-1 provides an understanding of the project categories and the recommended studies basis the categorization.

Table 6-1 Provisional Project Categorization

Categorization	Greenfield & Operational Projects
Category A • Category "A" projects are those that are likely to have significant adverse environmental and social impacts that are sensitive, diverse, or unprecedented. These projects may affect an area broader than the sites or facilities subject to physical works. • These projects are likely to have irreversible land use change for a larger area. • These projects are likely those impacting an ecologically sensitive zone. • Typical project scenarios that would be categorized as A would include projects with critical environmental sensitivities (such as low water availability / over exploited zone/ notified zones) or critical ecological sensitivities (such as impact on critical habitats) or social sensitivities (economic displacement, physical displacement, land disputes etc.)	• Full Scale ESIA; and any other specialized studies (such as Critical Habitat Assessment, Resettlement Action Plan, Livelihood Restoration Action Plan, Detailed Assessment for Indigenous Community) as applicable to be done prior to construction phase along with Environment and Social Due Diligence during the operational phase and with quarterly or six-monthly compliance audits for the project during construction and operation phase. • It is to be noted that the ESIA process for Category A projects is required to be triggered as reasonably possible of the initial risk screening and assessment exercise.
Category B • Category "B" projects are those that are likely to have potentially adverse environmental impacts on human populations or environmentally important areas – including wetlands, forests, grasslands, and other natural habitats. But these impacts are likely to be less adverse than those of the Category A projects. These impacts are site-specific, with few, if any, being irreversible and in most cases the mitigation measures can be designed more readily than for Category A projects. • These are projects with limited or reversible land use change over a considerably smaller area and likely to have no significant impacts on any ecologically sensitive zones.	• Full Scale ESIA prior to project construction and an Environmental and Social Due Diligence during the Operational phase • Once the assessment for a B Category project has been completed, the initial categorization that was established as part of the initial screening process would be reviewed and a category for the project would be confirmed.
Category C Category "C" projects are those that are likely to have minimal or no adverse environmental and social impacts.	• Environmental and Social Due Diligence and Development and implementation of Internal E&S checklists; and Management Procedural Guidelines and EHS Plan specific to the facility during the operational phase.

Categorization	Greenfield & Operational Projects
	• HFE has developed a format for Hazard Identification and Risk Assessment ***(Refer Appendix D).*** ESDD will be undertaken in case of acquisition. • The ESDD/ESIA will present the final categorization of the project, which may vary from the preliminary categorization. The ESG MF Committee will remain fully engaged in reviewing and approving the ESDD/ ESIA reports.

Note: Sometimes the project categorization can change from Category C to Category B and Category B to a Category A due to any of the following reasons:

- *If there is a presence of critical habitat (CH) in the study area,*
- *Low water availability for the facility (over exploited zone/notified areas),*
- *Land related issues/protests; or*
- *Cumulative impacts due to presence of other projects.*

The provisional categorization will be done by the ESG MF manager or site EHS manager, land and project design team and reported to the project head.

- Provisional categorization must be sufficiently justified after taking into consideration the context of the project and by providing adequate weightage to EHS&S risk indicators in the overall contest of the HFE's screening report.
- Final Categorization of the project may however be changes based on further availability of the information at a later stage or based on further EHS&S studies conducted in relation to the proposed facility.
- The purpose of the provisional categorization is to make the ESG MF committee and board members aware of the EHS&S risk associated at the initial stages of the project and trigger EHS&S studies based on categorization.

The project team as well as other members of the senior management will take into consideration the results from the aforementioned screening exercise. It is to be noted that for Category A and B projects the final decision would be guided by the Environmental and Social Management Plan (EMSP)/Environmental and Social Action Plan (ESAP) outcome of ESIA/ESDD and additional studies that might be triggered.

6.3.2 Specific EH&S Studies

On the basis of the outcome from the detailed E&S assessment of the project, HFE may consider reviewing its project development decision. It is to be noted that for Category A and B (Greenfield) projects the project development decision review would be guided by the ESMP prepared as part of the ESIA and any additional thematic studies such as (but not limited to) Resettlement Action Plan (RAP), Livelihood Restoration Plan (LRP), Critical Habitat Assessment (CHA), Water Vulnerability Source Assessment (WVSA) suggested as part of the ESMP shall be undertaken.

It is to be noted that higher assessment parameters are required to be taken into consideration for Category A projects and a more stringent scrutiny to be undertaken by the ESG MF Committee during its decision-making process.

Post the screening exercise has been completed, HFE will engage a third party with desired technical expertise and requisite experience to undertake subsequent EHS&S Risk Assessment studies such as Environmental and Social Impact Assessment (ESIA) and Environmental and Social Due Diligence (ESDD) study depending upon the project

categorization. Brief Scope for the assessment studies have been included in ***Appendix C.*** The project categorization posts these studies could be different from the initial provisional categorization. Details to be covered in ESIA & ESDD are provided in subsequent sections.

6.3.3 Environment and Social Impact Assessment (ESIA) – Greenfield Projects

The Environment (Protection) Act, 1986 was introduced as an umbrella legislation for the protection and improvement of environment. The Act and the rules require that environmental clearance is obtained for specific type of new projects or expansion of existing projects (addressed under Environmental Impact Assessment Notification, 1994 and 2006). Based on the categorization and capacity of the Project an EIA may or may not be required. The EIA is not applicable to solar and wind power projects in India as per the clarification issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC).

However, for all project, HFE will undertake a comprehensive Environmental and Social Impact Assessment (ESIA) study through third party of internal team (having required qualification and experience to conduct such studies) aligned to the requirement of Applicable Reference Framework ***(Section 2.1.1****Error! Reference source not found.****).*** T he scope of the ESIA is context and based on the suggestions of the screening results. Project specific environment and social management plan (ESMP) is prepared as an outcome of the ESIA study.

Appendix C includes Standard Terms of Reference for conducting typical ESIA study. Project categorization post these studies could be different from the initial provisional categorization.

On the basis of the outcome from the detailed EHS&S assessment of the project, HFE may consider reviewing its Project development decision. It is to be noted that for Category A and B (Greenfield) projects the project development decision review would be guided by the ESMP and additional thematic studies. It is to be noted that higher assessment parameters are required to be taken into consideration for Category A projects and a more stringent scrutiny to be undertaken by the ESG committee during its decision-making processes.

6.3.4 Environment and Social Due Diligence – Brownfield projects

HFE will undertake a ESDD study for brownfield projects (especially acquiring for brown field or as per the requirement of lender) of material value against the requirement of the Applicable Reference Framework and HFE's ESG MF procedures. The terms of reference will need to be customized and modified to develop a fit to purpose and tailored scope for the projects based on the potential risks for the screening process. Any key EHS&S risk factors that have been identified through the use of screening checklist will be specifically covered as part of the ESDD.

HFE will commission third party consultants/agencies to undertake the ESDD. The selection criteria for such third-party agencies will be based on – their credential and capabilities in advising International Financing Institutions (FI) on EHS&S risks following the relevant reference framework followed in this ESG MF , experience in the relevant sector and geography. This selection activity will be the responsibility of the EHS manager.

The third-party consultant will be required to submit a key issues report highlighting the red flag issues, high risks[5] and medium risk[6] issues associated with the project and assign an EHS&S categorization. Further, as part of the

[5] High-risk issues in renewable energy projects can have significant environmental, social, financial, and operational implications. Identifying and addressing these issues is essential to ensure the successful and responsible development of renewable energy projects. Here are some high-risk issues commonly associated with renewable energy projects – (i) Permanent Environmental Impact and biodiversity loss; (ii) Community displacement; (iii) Regulatory and permitting non-compliance; and (iv) community opposition and social conflicts.

[6] Medium-risk issues in renewable energy projects are challenges and concerns that, while not as severe as high-risk issues, still need careful consideration and management to ensure the successful development and operation of projects. These issues can have implications for project performance, regulatory compliance, and stakeholder relationships. Here are some medium-risk issues commonly associated with renewable energy projects – (i) and acquisition and land use conflicts; (ii) not adequate community engagement and acceptance; (iii) Mitigable environment and social issues; (iv) Mitigable health and safety issues; (v) reputational risks; (vi) mitigable land degradation

main report, the consultant will detail out the high risks, medium risks, and low risks[7] issues of the Project. The consultant shall also provide corrective action plan or Environment and Social Action Plan (ESAP) associated with each issue. Objective, scope and schedule for the ESDD has been detailed in ***Appendix C.***

The key outcome of the ESDD will include validation of the provisional EHS&S category assigned to the project, identification of material EHS&S risks and the development of an Environment and Social Action Plan (ESAP) to address risks/gaps that have been identified. The ESAP will priorities all identified issues and findings based on uniform criteria. Significance criteria for prioritizing key EHS&S issues are provided below.

Table 6-2 Prioritizing EHS&S Issues

Priority of Issue	Definition
Red Flag Issues	Trigger of IFC Project Exclusion List, or; material issue with potential severe consequences and limited opportunities of mitigating, leading to immediate operational shut down, reputational damage/ possibilities of significant reputational risks arising in the future, or impacts to sensitive environmental and social receptors including fence line community and customers as key stakeholders or lead to criminal proceedings.
High Risk Issues	Significant non-conformance to Applicable Reference Framework, including regulatory requirements, which may result in operational disruption; a material cost; regulatory notice; and/or include stakeholder opposition that may lead to reputational risks.
Medium Risk Issues	Non-conformance with the Applicable Reference Framework, which may result in non-material rectification cost or fine, and is unlikely to result in the short-term, in business discontinuity in current regulatory enforcement context.
Low Risk Issues	Minor regulatory or safeguard non-compliance, which may result in limited cost or only require management time to address the issue.
Value Addition	Focus areas on resource conservation, waste minimization, stakeholder goodwill, energy efficiency, and climate proofing and greenhouse gas reduction.

The ESAP will comprise of specific steps and expected outcomes required to ensure compliance with HFE's commitments under this ESG MF . The ESAP will clearly indicate timeline within which the recommended ESAP activities will require to be implemented. The timeframe assigned to each of the ESAP activities will depend on the risk priority and a reasonable time within which compliance can be achieved. A tentative budgetary estimate to comply with the ESAP action items shall also be provided in the ESAP.

The aforementioned studies are required to be completed well in advance of the investment decision and engagement process in order to receive sufficient information which shall enable the project team and other senior management to take appropriate call in going ahead with the Project.

6.3.5 Identification of EHS&S Risks and Impacts during construction and operation

It will be critical to identify environment and social risks and impacts for all project activities on an ongoing basis, depending upon the change in process, activities and types. The objective is to determine the measures required to comply with relevant legislations and thereby reduce the level of environmental damage, social impacts, occupational injuries and health hazards.

[7] Low-risk issues in renewable energy projects represent aspects of the project that typically do not pose significant challenges, obstacles, or adverse consequences. Addressing these issues is relatively straightforward and manageable, and they are generally less likely to lead to project delays or financial impacts

6.3.5.1 Key Environmental, Health and Safety, and Social Risks in a Solar Power Project

Once an understanding of the various project lifecycle stages is established, some of the key environmental and social risks that may emanate during the project lifecycle for the solar power projects are taken into consideration. Solar power projects, though clean forms of energy, have the potential risks that are required to be managed through the various stages of project lifecycle. The risks discussed in subsequent section, are largely attributed to the scale or extent of the project or inherent in its design.

Table 6-3 Key Environmental and Social Risk for Solar Power Projects

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
General Site Selection risk including environmental and social risks				
• Development of an outline structure of the project; • Utilization of secondary information & the formulation of a strategy for project development; • Resource assessment of solar/wind/energy storage potential and economic feasibility; • Ease of availability of land (and associated social and environmental liability) for the project; • Environmental and social assessment of possible technologies to be used in project development including power evacuation so as to enable decision making at the beginning such as avoidance of forest land, irrigated land etc.	• Feasibility of local policy structure for setting up of project setup with respect to land uptake • Ease of doing business in general and ease of acquiring land in particular based on local level laws / rules / policies of relevant statutory offices; • Higher level environmental risks that can be critical to the establishment of the project or potential red flag issues such as seismicity, past incidences of floods, presence of eco sensitive zones, impacts on tribal land, local socio-political scenario, history of social resistance significant displacement or livelihood concerns etc.	• Understanding of higher level EHSS risks and potential impacts associated with assessed sites. • Include critical environmental and social risks assessed from higher level review into the decision-making process for project development • Identified EHSS issues to be categorized on basis of its perceived impact on environment and social. The categorization and assessment of risks at this stage will be largely limited to information available from secondary sources.	Project Conception	***Appendix B***- E&S screening checklist

• Site screening (i.e., current land use -residential, agricultural, environmental, biodiversity and social screening etc.)
• Transitional risks related to site selection.
• Acute and chronic natural hazards risks related to site selection and feasibility.
• Feasibility risk of the project which involves finalizing conceptual design of the project, demand estimation, assessing approximate costs for development, construction, and operation of the project and predicted revenue, permitting requirements etc.
	• Conduciveness of site to support structures to be installed.
	• Proximity of the site to Sanctuaries, National Parks, Reserve Forest, Protected Forest, or reserved land, presence of IUCN threatened species, endemic / restricted range species, migratory / congregatory species, bird migratory path, and wildlife corridor.
	• Project disruption and potential closure risk due to not getting permission for Sites which are near to the notified ecologically sensitive zones (ESZ) or delays in getting applicable approval from Government Department.
	• Potential regulatory challenges in the environmental, land, labour or community domains that can trigger incessant delay to the project and deem it non-feasible.
	• Tribal Population and location in a 5th or 6th Scheduled Area as defined by the Constitution where procurement of land by non-tribal entities may be prohibited or may involve diversion of land which may need special permission from Panchayats and Collector.
	• Potential impact of displacement and socio-economic impacts on the local community, impact of other land users on site.
	• Assessment of local resource availability for the project which involves sourcing of labour and assessing any security issues.
	• Proximity to Archaeological/Cultural sites, and habitations.
	• The reputation of a solar power plant can be at risk due to several factors:
	  • **Environmental Responsibility:** Operating the plant in an environmentally responsible manner is crucial. Any deviation from this standard may lead to reputational damage.
	  • **Protests:** If local communities perceive adverse effects (e.g., land use, aesthetics), they may organize protests, impacting the plant's image.
	  • **Theft and Vandalism:** Security risks include theft or vandalism of plant equipment by external parties.
	• Cumulative impacts due to existing/ planned project.
	• Social acceptance and community relations – Local opposition to solar power projects due to availability of land, visual impacts, or other factors can pose risks to project development and operation.
	• Acute Natural Hazards (Environmental) risks:
	  ○ Cyclones: High-intensity storms can cause immediate and severe damage to the solar installations
	  ○ Flooding: (i) Rapid and intense rainfall can lead to flash floods, affecting project sites and causing immediate damage; and (ii) Prolonged or heavy rainfall can result in river flooding, potentially impacting the solar installations
	  ○ Seismic Activities: Regions prone to earthquakes may face risks of structural damage to solar panels during seismic events.
	• Chronic Natural Hazards (Environmental) Risks:
	  ○ Climate change-related risks: Long-term changes in temperature patterns can impact the efficiency and performance of solar panels.
		Conduciveness of site to support structures to be installed:
		• Conduct thorough geotechnical surveys and assessments to ensure the suitability of the site for supporting solar mounting structures.
		• Implement appropriate foundation designs and engineering solutions to mitigate risks associated with soil conditions.
		Proximity of the site to Ecologically Sensitive Zones:
		• Conduct comprehensive environmental impact assessments / environmental and social impact assessment to identify potential impacts on surrounding habitats and species.
		• Implement buffer zones and habitat avoidance measures to minimize ecological disturbance and preserve biodiversity.
		Project disruption risk:
		• Proactively engage with government departments and regulatory authorities to streamline approval processes and ensure timely compliance with environmental and land-use regulations.
		• Develop contingency plans to mitigate risks of project delays, including alternative site selection or legal strategies to address regulatory challenges.
		Regulatory challenges:
		• Conduct thorough regulatory risk assessments to identify potential challenges in environmental, land, labour, and community domains.
		• Engage with legal experts and stakeholders to address regulatory uncertainties and develop strategies for compliance and risk mitigation.
		Tribal Population and Land procurement:
		• Conduct social impact assessments (as part of environmental and social impact assessment (ESIA)) to understand the potential implications of the project on tribal communities and indigenous land rights.
		• Engage in meaningful consultation and negotiation with local communities, tribal councils, and relevant authorities to address land tenure issues and obtain necessary approvals.
		Displacement Impacts:
		• Project will not procure any land which may lead to physical and economic displacement.
		• Conduct and implement comprehensive resettlement and livelihood restoration program (in case where avoidance is not possible) to mitigate adverse impacts on affected communities.
			Site selection and feasibility	***Appendix B***- E&S screening checklist

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	○ Draught Condition: Prolonged droughts can impact water availability for cooling systems in certain types of power generation facilities. ○ Slope stability: Long-term erosion of soil can impact the stability of structures supporting solar panels. ○ Topographical changes: Over time, changes in the landslides affecting project sites	**Assessment of Local Resource Availability:** • Conduct local resource assessments (as part of environmental and social impact assessment (ESIA)) to identify potential labour shortages, security risks, and natural resources. **Proximity to Archaeological/cultural sites:** • Project will avoid any land procurement which may impact any known archaeological/cultural sites. • Conduct heritage impact assessments (if any unknown archaeological sites emerge during construction) to identify and mitigate potential impacts on archaeological sites. • Implement measures to protect and preserve archaeological assets, including archaeological surveys, site monitoring, and community engagement. **Reputation and Security Risks:** • Develop proactive communication and engagement strategies to build trust and transparency with local communities and stakeholders. • Implement security measures to mitigate risks of protests, vandalism, and other security threats, including community liaison programs and stakeholder engagement. **Social Acceptance and Community Relations:** • Engage in proactive community outreach and consultation to address concerns related to land availability, visual impacts, noise, and other factors. • Implement community benefit programs, such as corporate social responsibility (CSR), local employment, and infrastructure development, to enhance social acceptance and support for the Project.		
Environmental Risks				
Air Emission	Air emission risks associated with solar power plant construction are typically minimal compared to conventional power generation sources like coal-fired power plants. However, certain activities during construction can still result in air emissions. Here are some potential air emission risks from solar power plant construction: • **Dust Generation:** Construction activities such as site clearing, grading, excavation, and earthmoving can generate dust, particularly in dry and windy conditions. This dust may contain particulate matter (PM10 and PM2.5) that can contribute to air pollution and respiratory health issues. • **Vehicle Emissions:** Construction vehicles and equipment used for transporting materials, excavation, and earthmoving can emit air pollutants such as nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter (PM). Diesel-powered equipment, in particular, can emit high levels of pollutants if not properly maintained or operated. • **Fuel Combustion:** On-site generators or temporary power sources used during construction activities may burin fossil fuels (e.g., diesel), emitting pollutants such as NOx, SOx and CO.	**Monitoring of baseline levels**: Before any project is developed, HFE will undertake the baseline air quality monitoring at and in the vicinity of the site to assess background levels of key pollutants, in order to differentiate between existing ambient conditions and project-relate impacts. **Dust Control Measures:** Implement dust suppression techniques such as water spraying, soil stabilization, and covering stockpiles to reduce airborne dust emissions. Limit construction activities during windy conditions and use windbreaks where feasible. **Vehicle and Equipment Maintenance:** Ensure proper maintenance of construction vehicles and equipment to minimize emissions. Use low-emission vehicle and equipment where feasible and optimize vehicle routing to reduce fuel consumption and emissions.	Construction phase	***Appendix A –*** Applicable legal and Regulatory Framework ***Appendix E-*** Pollution Prevention and Management Plan ***Appendix F-*** Environmental Monitoring Framework
Noise Pollution	Noise pollution risks from solar power plant construction can arise from various activities and equipment used during the construction phase. • **Heavy Machinery and Equipment:** Construction activities often involve the use of heavy machinery and equipment such as excavators, bulldozers, cranes, and trucks. These machines can generate high levels of noise, particularly during earthmoving, site preparation, and equipment installation.	• **Noise Monitoring and Assessment:** HFE will monitor baseline noise levels before start of the construction to establish existing ambient noise levels in the vicinity of the construction site. Monitor noise levels throughout the construction phase to assess compliance with regulatory limits and identify areas requiring mitigation. • **Noise Barriers and Enclosures:** Install temporary noise barriers and enclosures around noisy equipment and	Construction phase	***Appendix A –*** Applicable legal and Regulatory Framework ***Appendix E-*** Pollution Prevention and Management Plan

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	• **Construction Vehicles and Transportation:** Vehicles transporting construction materials, equipment, and personnel to and from the construction site can contribute to noise pollution, especially if they operate with diesel engines or emit excessive exhaust noise. • **Construction Activities:** Various construction activities such as pile driving, drilling, welding, and concrete pouring can produce significant noise levels, especially during peak construction periods. • **Generator Sets:** Temporary power generation using diesel generators may be required to provide electricity for construction activities. These generators can emit noise, particularly if they are not adequately soundproofed or maintained.	construction activities to reduce noise propagation to surrounding areas. • **Schedule construction activities:** Schedule noisy construction activities during off-peak hours or times when nearby residents are least likely to be affected, such as during daytime hours. • **Route planning and traffic management:** HFE will plan construction vehicle routes to minimize noise impacts on nearby communities. Use designated access roads and avoid routes that pass close to sensitive receptors, such as residential areas or schools.		***Appendix F***- Environmental Monitoring Framework
Water and Wastewater management	**Construction Phase** • **Water consumption:** Construction activities such as concrete mixing, equipment cooling, and site cleaning require significant water usage. High water consumption during construction can strain local water resources and compete with other users, leading to potential water scarcity issues. Water is also used for dust suppression during construction phase. • **Surface water pollution:** Runoff from construction sites can carry sediment, construction debris, and pollutants such as oil, grease, and chemicals into nearby surface water bodies. This runoff can degrade water quality, harm aquatic ecosystems, and impact downstream users. • **Groundwater contamination:** Improper handling, storage, or disposal of construction materials, fuels, lubricants, and chemicals can result in groundwater contamination. Leaks, spills, or accidents during construction activities may introduce pollutants into the soil and groundwater, posing risks to human health and the environment. **Operation Phase** • **Water usage for cleaning:** Solar panels require periodic cleaning to maintain optimal efficiency. Depending on the cleaning methods employed, water usage for panel cleaning can be significant, particularly in arid regions where water resources are limited. • **Wastewater generation:** Operations such as panel cleaning, equipment maintenance, and facility sanitation can generate wastewater containing contaminants such as dust, cleaning agents, oils, and greases. Improper disposal of wastewater can lead to pollution of soil and water resources. • **Chemical Handling and Spills:** Handling and storage of chemicals used for cleaning, maintenance, and water treatment pose risks of spills or leaks. Accidental releases of chemicals can result in surface water and groundwater contamination, impacting both the environment and public health.	HFE will implement the following mitigation measures for water and wastewater management during both construction and operation phases: • **Water Conservation:** Implement water conservation measures to minimize water usage. Utilize water-efficient equipment and practices and explore alternative water sources such as recycled or non-potable water for non-potable uses. • **Stormwater Management:** Implement erosion and sediment control measures during construction to prevent runoff and sedimentation. Develop stormwater management plans to capture, treat, and infiltrate runoff before discharge to minimize pollution risks. • **Chemical Management:** Store and handle chemicals properly to prevent spills and leaks. Develop spill prevention and response plans, and train staff on proper handling procedures. Use environmentally friendly chemicals and minimize the use of hazardous substances where possible.	Construction and Operation Phase	***Appendix A –*** Applicable legal and Regulatory Framework ***Appendix E***- Pollution Prevention and Management Plan ***Appendix F***- Environmental Monitoring Framework
Climate change resilience	Provided below some potential climate change risks associated with solar power plant: • **Extreme Weather Events:** Solar power plants may be vulnerable to extreme weather events such as hurricanes, cyclones, typhoons, and severe storms. These events can cause physical damage to solar panels, mounting structures, and other infrastructure, leading to production disruptions and downtime. • **Flooding:** Solar power plants located in flood-prone areas may face increased risks of inundation and flood damage due to climate change-induced changes in precipitation patterns, sea level rise, and extreme weather events. Flooding can damage solar panel arrays, electrical	HFE will implement the following mitigation measures to address climate change risks during solar power plant construction: • **Site selection**: HFE will conduct thorough site assessments to identify and prioritize sites with minimal climate change risks such as cyclonic conditions and flooding. • **Resilient Design and Infrastructure:** Design solar power plant infrastructure to withstand extreme weather events and climate impacts, such as high winds, heavy rainfall, and temperature fluctuations. Implement robust construction standards, materials, and engineering practices to enhance resilience and durability.	Construction and Operation Phase	***Appendix-H*** **Climate Risk Assessment**

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	infrastructure, and support structures, leading to operational disruptions, equipment failures, and safety hazards. **Water Scarcity:** Solar power plant during the operation phase requires considerable amount of water for solar panel cleaning purpose. Water scarcity resulting from climate change can pose challenges for solar panel cleaning, affecting the operation and energy producing efficiency.	• **Water Conservation and Efficiency:** Implement water conservation measures and implement dry robotic cleaning wherever feasible to reduce water consumption and dependency on freshwater sources. **Adaptive Management and Planning:** Incorporate climate change considerations into project planning, risk assessments, and long-term operations strategies.		
Land use and habitat disruption	The construction of a solar power plant can pose risks of land use and habitat disruption, particularly if not carefully planned and managed. Provided below the potential risks associated with land use and habitat disruption during the construction of a solar power plant: • **Land Conversion:** Converting natural or agricultural land for solar power plant construction can lead to habitat loss and fragmentation, disrupting local ecosystems and biodiversity. This conversion may result in the loss of habitats for wildlife species and displacement of native flora and fauna. • **Habitat Fragmentation:** Solar power plant construction can fragment contiguous habitats by creating barriers to wildlife movement and dispersal. Fragmentation can isolate populations, reduce genetic diversity, and increase the risk of extinction for vulnerable species. • **Loss of vegetation:** Clearing vegetation for site preparation and infrastructure development can lead to the loss of native plant species and disrupt ecological processes such as soil stabilization, water infiltration, and carbon sequestration. Loss of vegetation can also contribute to soil erosion and degradation. • **Impact on wildlife:** Construction activities such as site grading, excavation, and equipment operation can disturb wildlife habitats and disrupt breeding, nesting, and foraging behaviours. Noise, vibration, and human presence associated with construction can cause stress and displacement for wildlife species. • **Soil Disturbance:** Construction activities can disturb soil structure, composition, and fertility, leading to soil erosion, compaction, and loss of productivity. Soil disturbance can disrupt soil microorganisms, nutrient cycling, and plant-soil interactions, impacting ecosystem health and resilience. • **Water resource impacts:** Alterations to land use and vegetation cover can affect hydrological processes such as runoff, infiltration, and groundwater recharge. Changes in water flow patterns and sedimentation can impact aquatic habitats and water quality in nearby streams, rivers, and wetlands.	HFE will implement the following mitigation measures to address land use and habitat disruption risks during solar power plant construction: • **Site selection:** HFE will conduct thorough site assessments to identify and prioritize sites with minimal ecological value, avoiding areas of high biodiversity, sensitive habitats and protected areas. • **Vegetation and Habitat Conservation:** Implement measures to minimize vegetation clearing and habitat disturbance, such as site design optimization, selective clearing, and preservation of critical habitat patches. • **Wildlife protection:** Conduct wildlife surveys and assessments to identify presence, and movement patterns of sensitive species. Implement buffer zones, exclusion fencing, and wildlife crossings to minimize wildlife mortality and facilitate safe passage. • **Erosion and Sediment Control:** Implement erosion and sediment control measures such as silt fencing, erosion blankets, and vegetative buffers to prevent soil erosion and sedimentation. HFE will use best management practices for soil conservation and revegetation to restore disturbed areas. • **Water resource protection:** Implement stormwater management and erosion control measures to protect water resources from sedimentation and contamination.	Construction phase	***Appendix A –*** Applicable legal and Regulatory Framework ***Appendix B-*** E&S screening checklist ***Appendix E-*** Pollution Prevention and Management Plan ***Appendix F-*** Environmental Monitoring Framework
Terrestrial Habitat Alteration	The construction and operation of a solar power plant can lead to terrestrial habitat alteration, impacting local ecosystems and biodiversity. Provided below the key potential risks associated with terrestrial habitat alteration: • **Conversion of Natural Land:** Converting natural habitat for solar power plant development can lead to the loss of native plant communities, disrupting ecosystem functions and ecological processes. The conversation of diverse and complex habitats to monoculture landscapes can reduce habitat complexity and biodiversity, impacting species composition and abundance. • **Displacement of Wildlife:** Construction activities associated with solar power plant development can disturb wildlife habitats and disrupt breeding, nesting, foraging, and migration patterns. Terrestrial species may be displaced from their native habitats, leading to habitat degradation,	HFE will implement the following mitigation measures to address terrestrial habitat alteration risks associated with solar power plants include: • **Site Selection and Planning:** HFE will conduct thorough site assessments and environmental impact assessments to identify sites with minimal ecological value and lower conservation significance. • **Vegetation and Habitat Conservation:** Implement measures to minimize vegetation clearing and habitat disturbance during construction, such as selective clearing, phased development, and preservation of natural habitat. Develop habitat restoration and enhancement plans to mitigate impacts and offset habitat loss.	Construction and operation phase	***Appendix B-*** E&S screening checklist

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	population declines, and increased vulnerability to predation, competition, and other threats. • **Soil Disturbance and Erosion:** Construction activities such as grading, excavation, and land clearing can disturb soil structure, composition, and stability, leading to soil erosion, compaction, and loss of fertility. Soil disturbance can disrupt soil biota, nutrient cycling, and plant-soil interactions, impacting ecosystem health and resilience. • **Alteration of Hydrological Regimes:** Changes in land use and vegetation cover associated with solar power plant development can alter hydrological processes such as runoff, infiltration, and groundwater recharge. Removal of vegetation can increase surface runoff and sedimentation, leading to changes in water flow patterns and water quality in nearby streams, rivers, and wetlands. • **Introduction of Invasive Species:** Solar power plant construction and operation may introduce invasive plant species through the transportation of construction materials, vehicles, and equipment. Invasive species can outcompete native vegetation, disrupt ecological relationships, and alter habitat structure, leading to further habitat alteration and degradation.	• **Wildlife Protection:** HFE will conduct wildlife surveys and assessment as part of the ESIA to identify sensitive species and habitats present on or near a project site. • **Soil Conservation and Erosion Control:** Implement erosion and sediment control measures such as silt fencing, erosion blankets, and vegetative buffers to prevent soil erosion and sedimentation. • **Hydrological Management:** Implement stormwater management and erosion control measures to protect water resources from sedimentation and contamination. • **Invasive Species Management:** HFE will develop and implement invasive species management plans to prevent the introduction and spread of invasive plants during construction and operation. Monitor project sites for invasive species presence and take timely action to control and eradicate invasive populations.		
Aquatic Habitat Alteration	The construction and operation of a solar power plant can pose risks of aquatic habitat alteration, particularly if located near water bodies or wetlands. HFE has identified the provided below potential risks associated with aquatic habitat alteration: • **Water withdrawal:** Water withdrawal for construction activities, and in operation phase for solar panel cleaning. Withdrawal of large volumes of water from surface water or groundwater sources can deplete local water resources, impacting aquatic habitats, water quality, and ecosystem health. • **Wastewater discharge:** The construction and operation activities may generate wastewater containing pollutants such as sediment, chemicals, and heavy metals. Improper disposal or discharge of wastewater into nearby water bodies can degrade water quality, harm aquatic organisms, and disrupt aquatic food chains and ecosystems. • **Sedimentation and Erosion:** Construction activities associated with solar power plant development can lead to soil disturbance, erosion, and sedimentation in nearby water bodies. Sediment runoff can smother aquatic habitats, degrade water quality, and impair aquatic ecosystem functions such as fish spawning, aquatic vegetation growth, and nutrient cycling. • **Altered Hydrological Regimes:** Changes in land use and vegetation cover can alter hydrological processes such as runoff, infiltration, and groundwater recharge, impacting aquatic habitats and water availability. Reduced infiltration rates and increased surface runoff can lead to changes in streamflow patterns, water temperature, and sediment transport, affecting aquatic ecosystems downstream. **Introduction of Invasive Species:** Solar power plant construction and operation may introduce invasive species through the transportation of construction materials, vehicles, and equipment. Invasive species can outcompete native aquatic vegetation, disrupt ecological relationships, and alter habitat structure, leading to further habitat alteration and degradation.	HFE will implement the following mitigation measures to address aquatic habitat alteration risks associated with solar power plants include: • **Site selection and Planning:** HFE will conduct thorough site assessments and environmental impact assessments to identify and avoid sensitive aquatic habitats and water bodies. Prioritize sites with minimal ecological value and lower conservation significance for solar power plant development to minimize impacts on aquatic ecosystems. • **Water Conservation and Efficiency:** Implement water conservation measures and alternative solar panel cleaning technique to reduce water consumption and dependency on freshwater sources. • **Erosion and Sediment Control:** Implement erosion and sediment control measures such as silt fencing, erosion blankets, and vegetative buffers to prevent soil erosion and sedimentation in nearby water bodies. • **Hydrological Management:** Implement stormwater management and erosion control measures to protect water resources from sedimentation and contamination. • **Invasive Species Management:** Develop and implement invasive species management plans to prevent the introduction and spread of invasive species during construction and operation.	Construction and operation phase	***Appendix B***- E&S screening checklist ***Appendix- G*** Biodiversity Conservation and Management Plan
Health and Safety				

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
Occupational Health and Safety	The construction and operation of a solar power plant involve various occupational health and safety risks for workers and personnel involved. These risks can arise from a range of activities equipment, and hazards present on-site. Key occupational health and safety risks associated with solar power plants includes: • **Electrical Hazards:** Solar power plants involve working with photovoltaic (PV) panels, electrical wiring, inverters, and other electrical components. Workers may be exposed to risks such as electric shock, arc flash, and electrical burns if they come into contact with live electrical components or wiring without proper training and precautions. • **Equipment Operation and Machinery:** Construction and operation of solar power plants involve the use of heavy machinery, equipment, and tools. Risks include crush injuries, entanglement, caught-in/between hazards, and struck-by incidents if proper safety protocols are not followed during equipment operation and maintenance. • **Manual Handling and Ergonomic Risks:** Workers may be required to lift, carry, and manipulate heavy solar panels, equipment, and materials during installation and maintenance activities. Improper lifting techniques and ergonomic hazards can lead to musculoskeletal injuries such as strains, sprains, and repetitive motion injuries. • **Heat Stress and Sun Exposure:** Working outdoors in hot and sunny conditions during construction and maintenance activities can pose risks of heat stress, dehydration, and sunburn. Prolonged exposure to high temperatures and intense sunlight without adequate hydration and sun protection measures can lead to heat-related illnesses such as heat exhaustion and heatstroke. • **Chemical Exposure:** Workers may be exposed to hazardous chemicals and materials during construction, cleaning, and maintenance activities. Risks include exposure to cleaning agents, solvents, adhesives, sealants, and construction materials containing toxic or irritating substances, leading to respiratory irritation, skin contact dermatitis, and other health effects if proper personal protective equipment (PPE) and handling procedures are not followed. • **Traffic and Vehicle Hazards:** Construction and operation activities may involve vehicle traffic, including trucks, cranes, forklifts, and other heavy equipment, posing risks of collisions, pedestrian accidents, and struck-by incidents if traffic management measures and safety protocols are not implemented and followed.	HFE will implement the following mitigation measures to address occupational health and safety risks at solar power plants: • **Safety Training and Education:** Provide comprehensive safety training and education for workers and personnel involved in construction, operation, and maintenance activities. Further, will ensure that workers are trained in hazard recognition, safe work practices, emergency procedures, and proper use of PPE and safety equipment. • **Electrical Safety:** Implement lockout/tagout (LOTO) procedures, electrical safety protocols, and arc flash protection measures to prevent electrical hazards and ensure safe work practices when working with electrical equipment and systems. • **Equipment Safety:** Conduct regular inspections, maintenance, and servicing of machinery, equipment, and tools to ensure proper functioning and safe operation. Further, will provide adequate training and supervision for equipment operators and workers to prevent accidents and injuries. • **Heat Stress Prevention:** Implement heat stress prevention measures such as providing shaded rest areas, hydration stations, cooling measures, and scheduling work activities during cooler times of the day to mitigate the risks of heat-related illnesses. • **Chemical Safety:** Minimize chemical exposure through engineering controls and substitution, provide appropriate ventilation, and ensure proper storage, handling, and disposal of hazardous chemicals and materials. Provide workers with training on chemical hazards, emergency response procedures, and use of PPE. • **Traffic Management:** Establish traffic control plans, designated pedestrian walkways, and signage to manage vehicle traffic and prevent accidents in work areas. Provide training for vehicle operators and workers on traffic safety rules and procedures.	Construction and Operation phase	***Appendix -D*** Risk Identification ***Appendix- I*** Occupational Health and Safety ***Appendix J-*** Emergency Preparedness and Response Plan ***Appendix K-*** Traffic Management Plan
Community Health and Safety	The key community health and safety risks associated with solar power plant includes: • **Construction Hazards:** During the construction phase, nearby communities may be exposed to hazards such as increased traffic, noise, dust, and vibration from construction activities. These hazards can pose risks to public safety, property damage, and disruption of daily activities for residents living in close proximity to the project site. • **Transportation Risks:** Increased transportation activities associated with solar power plant construction, including heavy vehicle traffic, deliveries of materials, and movement of construction equipment, can lead to traffic congestion, road accidents, and pedestrian safety concerns in surrounding communities. • **Public Health Concerns:** Dust and airborne particulate matter generated from construction activities can degrade air quality and pose respiratory health risks for nearby residents, especially vulnerable populations such as	HFE will implement the following mitigation measures to address community health and safety risks associated with solar power plants: • **Community Engagement and Communication:** Engage with local communities early in the project development process to identify concerns, address questions, and establish open lines of communication. Provide timely and transparent information about project activities, potential risks, and mitigation measures to build trust and foster community support. • **Traffic Management and Safety:** Develop traffic management plans to minimize traffic impacts, ensure safe transportation routes, and mitigate risks of accidents and congestion in surrounding communities. Implement traffic control measures, signage, and speed limits to	Construction and Operation phase	***Appendix -K-*** Traffic Management Plan ***Appendix-N*** Community Health and Safety ***Appendix-U-*** Human Rights Risk Assessment

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	children, the elderly, and individuals with pre-existing respiratory conditions. Exposure to construction-related pollutants may exacerbate respiratory symptoms and increase the risk of respiratory illnesses. • **Chemical Exposure:** Storage, handling, and use of hazardous chemicals and materials during construction and maintenance activities may pose risks of chemical exposure to nearby communities. Accidental spills, leaks, or releases of chemicals can result in soil and groundwater contamination, posing health risks to residents and potentially affecting drinking water supplies. • **Fire and Electrical safety:** Solar power plant operations involve electrical equipment, wiring, and infrastructure that pose risks of fire, electrocution, and electrical hazards to nearby communities. Electrical fires, equipment failures, and electrical accidents can threaten public safety, property damage, and disrupt utility services. • **Security Risks:** Solar power plant facilities may be targeted for theft, vandalism, or unauthorized access, posing security risks to nearby communities. Incidents of theft, property damage, or security breaches can impact public safety, raise concerns among residents, and necessitate increased security measures. • **Visual and Aesthetic Impacts:** Solar power plant installations, particularly large-scale utility-scale projects, may alter the visual landscape and aesthetic character of the surrounding area. Visual impacts such as glare, reflection, and visual obtrusiveness from solar panels and associated infrastructure can affect community aesthetics, property values, and quality of life for nearby residents.	improve road safety and minimize disruptions during construction and operation. • **Dust and Air Quality Management:** Implement dust suppression measures, such as water spraying, dust barriers, and vegetative cover, to minimize dust emissions and protect air quality in nearby communities. Monitor air quality parameters and implement mitigation measures as needed to minimize health risks from construction-related pollutants. • **Chemical Management and Spill Prevention:** Implement spill prevention and containment measures, storage protocols, and emergency response procedures to minimize risks of chemical spills and releases during construction and operation. Use safer alternatives, minimize chemical use, and provide training for workers on chemical handling and emergency response. • **Fire Safety and Emergency Preparedness:** Develop fire prevention and emergency response plans to mitigate risks of fires, electrical hazards, and other emergencies associated with solar power plant operations. Conduct regular drills, training exercises, and coordination with local fire departments and emergency responders to ensure preparedness and effective response. • **Security Measures:** Implement security measures such as perimeter fencing, access controls, surveillance cameras, and security patrols to deter theft, vandalism, and unauthorized access to solar power plant facilities. • **Visual Screening and Aesthetics:** Consider, where feasible, landscaping, screening, and visual barriers to minimize visual impacts and integrate solar power plant facilities into the surrounding landscape.		
Social				
Land Rights and Displacement	The development of a solar power plant can potentially pose risks related to land rights and displacement, particularly when project sites are located in areas with existing land use or occupancy by communities, indigenous people, or other stakeholders. The key potential risks associated with land rights and displacement in the context of solar power plant development includes: • **Land acquisition and Ownership:** Solar power plant projects will procure land for site development, installation of solar panels, and construction of associated infrastructure such as substations, access roads, and transmission lines. Risk may arise if there are uncertainties or disputes regarding land ownership, tenure, or use rights, leading to conflicts, legal challenges, and delays in project implementation. • **Community Land Rights:** Indigenous communities, local communities, and other stakeholders may have customary or traditional land rights, customary land use practices, or collective ownership of land and natural resources in project areas. Failure to recognize, respect, or consult with affected communities regarding land rights and land use can lead to grievances, protests, and opposition to solar power plant development. • **Land Tenure and Livelihoods:** Solar power plant development may result in the displacement or loss of land-based livelihoods for communities dependent on agriculture, grazing, forestry, or other land-based activities.	HFE will implement the following mitigation measures to address land rights and displacement risks in solar power plant development: • **Land Rights Assessment:** HFE will conduct comprehensive assessments of land tenure, ownership, and land use rights in project area to identify potential conflicts, overlaps, or uncertainties regarding land rights and access. Engage with affected communities, indigenous people and other stakeholders to understand their land tenure systems, customary land use practices, and tenure-related concerns. • **Community Engagement and Consultation:** Establish transparent, participatory, and culturally appropriate mechanisms for community engagement, consultation, and decision-making throughout the project life cycle. Ensure that affected communities have access to relevant information, opportunities for meaningful participation, and mechanisms for grievance redressal. • **Respect for Indigenous Peoples' Rights:** Recognize and respect the collective rights, cultural heritage, and	Preconstruction phase	***Appendix – Q*** Stakeholder Engagement Framework, ***Appendix-N*** Community Health and Safety

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	Displacement of communities from their ancestral lands or disruption of traditional livelihoods can have adverse social, economic, and cultural impacts, including loss of access to resources, disruption of social networks, and erosion of cultural identity. • **Resettlement and Compensation:** In cases where land acquisition and project development result in involuntary resettlement or displacement of communities, adequate compensation, resettlement assistance, and livelihood restoration measures must be provided in accordance with applicable laws, regulations, and international standards. Risks may arise if resettlement plans are not properly implemented, leading to inadequate compensation, loss of livelihoods, and impoverishment of affected communities. • **Social Impacts and Community Relations:** Solar power plant development can generate social impacts such as changes in land use patterns, demographic shifts, and alterations to community dynamics and social cohesion. Risks may arise if communities perceive negative impacts on their land rights, cultural heritage, or quality of life, leading to social unrest, community opposition, and reputational damage for project developers. • **Consultation and Free, Prior, and Informed Consent (FPIC):** Meaningful consultation and engagement with affected communities, indigenous peoples, and other stakeholders are essential to ensure that their rights, interests, and concerns are adequately addressed in project planning, design, and implementation. Risks may arise if consultation processes are tokenistic, inadequate, or lack transparency, leading to mistrust, conflict, and project delays.	traditional knowledge of indigenous peoples in project areas, in accordance with the International Finance Corporation's Performance Standards, 2012. HFE will obtain free, prior, and informed consent (FPIC) from indigenous communities for project activities that may affect their lands, territories, or resources. • **Resettlement Planning and Livelihood Restoration:** HFE will develop comprehensive resettlement plans and livelihood restoration programs to address the needs of displaced individuals and/or community (if any) by the project development. HFE will also ensure that resettlement and compensation measures are fair, equitable, and culturally appropriate with meaningful participation of affected communities in decision-making processes. • **Conflict Resolution and Grievance Mechanisms:** HFE will establish transparent, accessible and affective grievance mechanisms to address land-related disputes, conflicts, and grievance raised by affected communities, stakeholders, and indigenous people. Provide avenues for dialogue, and resolution of disputes in a timely and culturally sensitive manner.		
Risk of depletion/disruption of local water resources	The development and operation of a solar power plant can pose risks of depletion or disruption of local water resources, particularly in regions where water availability is limited or where competition for water resources exists. Provided the following key potential risks associated with depletion or disruption of local water resources: • **Water Availability:** The extraction of water for solar power plant operations, can reduce the availability of water for local communities, especially in regions already facing water scarcity or competing water demands. Reduced access to water for domestic use, agriculture, and livelihood activities can impact community well-being, food security, and economic sustainability. • **Water Consumption:** The extraction and consumption of water from local sources, such as rivers, lakes, aquifers, or municipal water supplies, can contribute to water stress, reduce water availability for other users, and exacerbate competition for limited water resources. • **Water Quality Impacts:** Discharge of wastewater from solar power plant operations can degrade local water quality, posing risks to public health, aquatic ecosystems, and drinking water sources for nearby communities. Contamination of surface water bodies or groundwater aquifers with pollutants, chemicals, or heavy metals can threaten human health, aquatic biodiversity, and ecosystem services relied upon by communities. • **Competition for water resources:** Solar power plant development may compete with water users, such as agriculture, industry, other solar power plants, and local communities, for access to limited water resource. Increased water demand form solar power plants can exacerbate water scarcity, conflict, and tensions among different stakeholders, leading to social, economic, and environmental impacts.	HFE has identified the following mitigation measures to address risks of depletion or disruption of local water resources on local communities due to solar power plant development: • **Community Engagement and Consultation:** HFE will engage with affected communities, indigenous peoples, and local stakeholders to understand their water-related concerns, interests, and priorities. Foster inclusive dialogue, participation, and collaboration to co-design solutions for sustainable water management, resource sharing, and conflict resolution. • **Water Resource Management:** HFE will conduct comprehensive assessment (as part of ESIA) of local water resources, including availability, quality, usage patterns, and vulnerabilities, to inform project planning, design, and operational decisions. Develop water management plans that prioritize water conservation, efficiency, and sustainability to minimize impacts on local communities and ecosystems. • **Alternative water sources:** HFE will explore alternative water supply (wherever feasible) options such as rainwater harvesting, greywater recycling, or use of non-potable water sources for solar power plant operation to reduce reliance on freshwater sources and alleviate pressure on local water resources. • **Water conservation and efficiency:** HFE will implement water-saving techniques, and efficiency measures in solar	Construction and Operation Phase	***Appendix – Q*** Stakeholder Engagement Framework

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	• **Impact on Livelihoods:** Depletion or disruption of local water resources due to solar power plant development can affect livelihood and economic activities dependent on water, such as agriculture, livestock grazing, fishing, and small-scale industries. Reduced water availability, changes in water quality, or loss of access to water sources can undermine community resilience, livelihood security, and socio-economic development opportunities. • **Social Conflicts:** Competition for water resources between solar power plant operations and local communities may lead to social tensions, conflicts, and disputes over water allocation, usage rights, and access to water sources. Conflicts over water availability and quality can exacerbate existing socio-economic inequalities, exacerbate community divisions, and undermine social cohesion and peace. • **Health Impacts:** Degradation of local water quality due to contamination from solar power plant operations can pose risks to public health and safety, including exposure to waterborne diseases, toxic chemicals, and pollutants. Communities relying on contaminated water sources for drinking, cooking, bathing, and irrigation may face increased risks of water-related illnesses, respiratory ailments, and chronic health conditions.	power plant operation to minimize water consumption, optimize water use, and reduce wastewater generation.		
Risk of labour influx	The development of a solar power plant can lead to an influx of labour into local communities, which may pose various risks and challenges to the social, economic, and environmental well-being of the area. HFE has identified key potential risks associated with the influx of labour on local communities: • **Pressure on Local Infrastructure:** A sudden increase in population due to labour influx can strain local infrastructure such as housing, transportation, healthcare facilities, schools, and sanitation services. Insufficient infrastructure capacity to accommodate the needs of incoming workers and their families can lead to overcrowding, congestion, and deterioration of living conditions in host communities. • **Housing Shortage and Affordability:** High demand for housing from incoming workers may result in housing shortages, inflated rental prices, and affordability challenges for local residents. Displacement of existing residents or informal settlements may occur as landlords prioritize renting to higher-paying temporary workers, exacerbating housing insecurity and homelessness in host communities. • **Social Disruption and Community Cohesion:** Rapid population growth and cultural diversity resulting from labor influx can disrupt community cohesion, social networks, and traditional ways of life in host communities. Tensions may arise between newcomers and long-term residents over competition for resources, access to services, and socio-cultural differences, leading to social divisions and conflicts. • **Pressure on Natural Resources:** Increased demand for natural resources such as water, land, and energy from a growing population of workers can strain local ecosystems and natural resources. Overexploitation of water resources for drinking, sanitation, and industrial purposes may lead to water scarcity, environmental degradation, and competition with agriculture and other sectors reliant on water. • **Cultural and Social Integration:** The influx of labour from diverse backgrounds and cultures may pose challenges to cultural integration, social cohesion, and community resilience in host communities. Language barriers, cultural differences, and social isolation may hinder effective	HFE has identified following mitigation measures to address risks of labour influx on local communities due to the solar power plant development: • **Community Engagement and Participation:** HFE will engage with local communities, stakeholders, and representatives early in the project planning process to identify potential risks, concerns, and opportunities associated with labor influx. Foster inclusive dialogue, participation, and collaboration to co-design solutions that address community needs, priorities, and aspirations. • **Local Employment and Skills Development:** HFE will prioritize local hiring, skills development, and training programs to maximize employment opportunities for local residents and enhance their capacity to participate in solar power plant development and operation. Collaborate with local vocational training institutions, community organizations, and government agencies to provide training and capacity-building initiatives tailored to local needs and preferences. • **Social Integration and Cultural Exchange:** HFE will promote social integration, cultural exchange, and community cohesion through cross-cultural awareness programs, community events, and intercultural dialogue initiatives. Encourage collaboration, mutual respect, and understanding among diverse groups within the community to foster social harmony and inclusivity. • **Environmental Management and Sustainability:** Implement sustainable resource management practices to minimize the environmental footprint of labor influx on local ecosystems and natural resources. Adopt water conservation measures, waste management strategies, and Renewable energy solutions to mitigate pressures on	Construction and Operation Phase	***Appendix O-*** Labour Management

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	communication, cooperation, and collaboration among residents, contributing to social exclusion and marginalization of certain groups.	natural resources and promote environmental sustainability in host communities. • **Health and Safety Protection:** HFE will ensure compliance with occupational health and safety regulations, standards, and best practices to protect the health and well-being of workers and local residents. Provide adequate housing, sanitation, healthcare, and emergency response services to mitigate health and safety risks associated with labour influx.		
Labour rights	The development of a solar power plant may pose various labour rights risks for workers involved in construction, operation, and maintenance activities. These risks can arise from factors such as working conditions, employment practices, occupational health and safety standards, and adherence to labour laws and regulations. HFE has identified the following key labour rights risks associated with the development of a solar power plant: • **Unsafe Working Conditions:** Workers may be exposed to hazardous working conditions during construction, installation, and maintenance of solar power plant infrastructure, such as exposure to electrical hazards, and risks associated with heavy machinery and equipment. Failure to implement adequate safety measures and provide personal protective equipment (PPE) can jeopardize worker safety and result in occupational accidents, injuries, or fatalities. • **Noncompliance with labour laws:** Employers (especially HFE's appointed contractor) may fail to comply with labour laws, regulations, and standards related to wages, working hours, overtime pay, and other employment conditions. Violations of labour laws such as minimum wage laws, overtime regulations, and employment contracts can result in exploitation of workers, wage theft, and labour rights abuses, undermining worker rights and dignity. • **Exploitative Employment Practices:** Workers may be subject to exploitative employment practices such as informal employment arrangements, subcontracting, precarious work, and subcontracting of labour. Subcontracting chains and outsourcing arrangements can obscure accountability, weaken labour protections, and increase the risk of labour exploitation, forced labour, and human trafficking within the supply chain. • **Discrimination and Harassment:** Workers may experience discrimination, harassment, or abuse based on factors such as race, ethnicity, gender, nationality, or migrant status. Discriminatory practices in recruitment, hiring, promotion, and termination decisions can create hostile work environments, perpetuate inequalities, and violate workers' rights to equal treatment, dignity, and non-discrimination in the workplace. • **Inadequate Labour Rights Protections:** Workers may lack awareness of their labour rights, legal protections, and avenues for recourse in case of labour rights violations. Limited access to labour unions, collective bargaining, and grievance mechanisms can impede workers' ability to advocate for their rights, address workplace grievances, and seek redress for labour rights abuses. • **Migrant workers exploitation:** The recruitment and employment of migrant workers in solar power plant projects may increase the risk of labor exploitation, human trafficking, and forced labor. Migrant workers may face vulnerabilities such as language barriers, lack of legal	HFE has identified the following mitigation measures to address labour rights risks associated with the development of a solar power plant: • **Compliance with Labour Laws and Standards:** Ensure compliance with national labor laws, regulations, and international labour standards, including fundamental principles and rights at work outlined by the International Labour Organization (ILO). Adhere to legal requirements related to wages, working hours, occupational health and safety, and employment conditions, and monitor compliance throughout the project lifecycle. • **Worker Training and Capacity Building:** Provide comprehensive training, education, and capacity-building programs for workers on their labour rights, occupational health and safety practices, and workplace policies and procedures. Empower workers to assert their rights, identify hazards, and advocate for safer working conditions through awareness-raising initiatives and worker empowerment programs. • **Worker Engagement and Participation:** Foster worker engagement, participation, and representation in decision-making processes, workplace committees, and health and safety committees. Encourage open communication, feedback mechanisms, and dialogue between workers, employers, and management to address labour rights concerns, resolve grievances, and improve working conditions collaboratively. • **Supply chain due diligence:** HFE will conduct due diligence (wherever feasible) on labour practices within the supply chain, including subcontractors, suppliers, and recruitment agencies, to identify and address labour rights risks. Establish clear expectations, contractual obligations, and monitoring mechanisms to ensure compliance with labour standards and prevent labor exploitation and abuse throughout the supply chain. • **Access to Grievance Mechanisms:** HFE will establish transparent, accessible, and effective grievance mechanisms for workers to report labor rights violations, seek redress for grievances, and access remedies in case of abuses. Ensure confidentiality, impartiality, and protection from retaliation for workers who raise concerns or file complaints through grievance channels.	Construction and operation phase	***Appendix O-*** Labour Management ***Appendix-T-*** Labour Accomodation

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	documentation, debt bondage, and dependency on employers, making them susceptible to exploitation and abuse.	• **Worker Empowerment and Advocacy:** Empower workers to organize, form labor unions, or participate in collective bargaining to negotiate fair wages, working conditions, and employment terms. Support worker-led initiatives, capacity-building activities, and advocacy campaigns to promote labor rights awareness, strengthen worker solidarity, and improve labor standards in the solar power sector.		
Archaeological, Historic and Cultural Effects	The development of a solar power plant has the potential to impact archaeological, historic, and cultural sites, as well as cultural landscapes and heritage resources. These effects can arise from land disturbance, construction activities, infrastructure installation, and operation of the solar facility. HFE has identified the following key potential risks associated with the archaeological, historic, and cultural effects of a solar power plant: • **Damage to Archaeological Sites:** Construction activities associated with solar power plant development, such as site clearing, earthworks, and ground disturbance, can pose risks to archaeological sites, artifacts, and cultural remains present within the project area. Excavation, grading, and trenching activities may inadvertently damage or destroy archaeological resources, undermining their scientific, historical, and cultural value. • **Impact on Historic Structures:** Proximity of solar power plant facilities to historic buildings, structures, and landmarks may pose risks of visual impact, overshadowing, or alteration of historic features and architectural elements. Construction of solar panels, support structures, access roads, and transmission lines in close proximity to historic sites can compromise their integrity, authenticity, and aesthetic value, detracting from their cultural significance and heritage value. • **Alteration of cultural landscapes:** Solar power plant development may alter cultural landscapes, traditional land uses, and historic settings associated with indigenous peoples, local communities, and cultural heritage sites. Changes in land use patterns, vegetation cover, and visual character of the landscape can disrupt cultural continuity, traditional practices, and spiritual connections to the land, affecting cultural identity and sense of place. • **Disruption of Cultural Routes and Corridors:** Construction of solar power plant infrastructure, access roads, and transmission corridors may intersect with or disrupt cultural routes and historic travel corridors used by indigenous peoples, nomadic communities, or historic trade routes. Fragmentation of cultural landscapes and disruption of traditional travel patterns can sever cultural connections, impede access to sacred sites, and erode cultural heritage values. • **Loss of Cultural Heritage Resources:** Clearance of vegetation, land conversion, and habitat destruction associated with solar power plant development can lead to loss or degradation of cultural heritage resources, including sacred sites, burial grounds, ceremonial grounds, and cultural artifacts. Destruction of culturally significant landscapes, ecological habitats, and natural resources can diminish cultural values and erode community ties to the land.	HFE has identified the following mitigation measures to address archaeological, historic, and cultural effects risks associated with solar power plant development: • **Cultural Heritage Assessments:** HFE will conduct comprehensive cultural heritage assessments, archaeological surveys, and impact assessments to identify, evaluate, and mitigate potential risks to archaeological, historic, and cultural resources within the project area. Engage with indigenous communities, cultural heritage experts, and stakeholders to incorporate traditional knowledge, oral histories, and community perspectives into heritage assessments and decision-making processes. • **Heritage Conservation Planning:** HFE will develop heritage conservation plan (if applicable as per the ESIA), management strategies, and mitigation measures to minimize impacts on archaeological sites, historic structures, and cultural landscapes during project development and construction. Designate buffer zones, exclusion areas, and protective measures to safeguard sensitive heritage resources and mitigate risks of damage or destruction. • **Avoidance and Minimization Measures:** Design solar power plant layouts, infrastructure alignments, and construction methods to avoid, minimize, or mitigate impacts on archaeological, historic, and cultural resources. HFE will consider alternative siting options, construction techniques, and operational practices to reduce disturbance to sensitive heritage areas and minimize visual impacts on cultural landscapes. • **Monitoring and Compliance Oversight:** HFE will implement monitoring programs, site inspections, and compliance audits to ensure adherence to cultural heritage mitigation measures, permit conditions, and regulatory requirements throughout the project lifecycle. Engage with heritage conservation authorities, regulatory agencies, and community monitors to track compliance, address emerging issues, and respond to heritage-related concerns in a timely manner. • **Community Engagement and Consultation:** Engage with indigenous communities, local stakeholders, and heritage conservation organizations in meaningful dialogue, consultation, and collaboration to identify, assess, and address cultural heritage risks and concerns associated	Preconstruction, construction and operation phase	***Appendix- V*** Chance find procedure

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
		with solar power plant development. Foster partnerships, knowledge sharing, and capacity-building initiatives to promote cultural heritage conservation and community involvement in decision-making processes.		
Rooftop Projects				
Site Selection	• Improper site selection leading to habitat disruption, loss of green space, or disturbance to sensitive ecosystems. • Inadequate assessment of structural integrity leading to the risk of roof collapse during installation or operation. • Disruption to local aesthetics, views, or cultural heritage sites.	• Conduct thorough environmental assessments to identify sensitive habitats or cultural sites. Engage with stakeholders to address concerns and ensure community acceptance. Engage structural engineers to assess roof integrity and suitability for solar panel installation.	Site Assessment and Design Phase	***Appendix- B*** Environmental and Social Screening
Environmental pollution	• Improper waste disposal leading to soil and water contamination, as well as potential damage to vegetation. • Worker exposure to fall hazards, electrical hazards, and construction-related accidents. • Noise and disruption to local communities during construction.	• Implement proper waste management practices and ensure compliance with environmental regulations. Provide workers with adequate training, personal protective equipment (PPE), and safety protocols. Communicate construction schedules and potential disruptions to local residents and businesses.	Installation Phase	***Appendix- E*** Pollution Prevention and Maangement Plan
Waste Generation	• Potential leaks or spills of hazardous materials during maintenance activities, leading to soil and water contamination. • Worker exposure to electrical hazards, such as arc flashes or electrical shocks, during maintenance. • Visual impacts, glare, or shadows affecting neighboring properties.	• Develop spill prevention measures and protocols for safe handling of hazardous materials. Conduct regular maintenance inspections and prioritize safety measures. Address visual impacts through screening, landscaping, or architectural design considerations.	Operation and Maintenance Phase	***Appendix- E*** Pollution Prevention and Maangement Plan
Decommissioning	• Improper disposal of decommissioned solar panels leading to electronic waste and potential pollution. • Risks associated with handling and dismantling of solar panels, including exposure to toxic materials. • Disposal impacts on local communities and ecosystems.	• Develop recycling and disposal programs to ensure proper handling and recycling of decommissioned solar panels. Partner with certified recycling facilities and implement take-back programs. Provide training on safe handling and disposal procedures to workers. Engage with local communities to address concerns and ensure responsible end-of-life management.	End of Life Management	***Appendix- E*** Pollution Prevention and Maangement Plan
Fishery OR Floating Solar Projects				
Impacts on aquatic habitats	• The installation of Floating solar can disturb aquatic habitats, affecting fish, birds, and other wildlife. Shading can alter the ecosystem balance, potentially impacting species that rely on sunlight penetration into the water. • Changes in sunlight penetration and water circulation can impact the oxygen levels in the water, which might affect water quality and the health of aquatic life. However, the reduction in algae growth due to shading can be beneficial in preventing harmful algal blooms. • Risks associated with construction activities in aquatic environments, such as drowning, slips, and falls. • Potential conflicts with local fishery communities over land and water use, as well as impacts on traditional fishing practices.	• Conduct comprehensive environmental impact assessments to assess potential impacts on aquatic ecosystems. Engage with fishery communities and stakeholders to address concerns and ensure community acceptance. Implement safety measures for workers involved in construction activities on water bodies.	Site Selection and Design Phase:	
Environmental Pollution	• Potential for contamination of surface resources resulting from improper management during the construction phase near to the reservoir area or the riparian zone.	• Planning of toilets, soak pits and septic tanks, waste collection areas will be away from the reservoir area. Provision of septic tank and soak pits onsite for treatment	• Construction and Installation Phase	***Appendix- E*** Pollution

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
	• Furthermore, accidental spillage of chemical and fuel may easily contaminate the surface water. Therefore, the spillage of chemicals and fuel may cause changes in the surface water quality during construction activities • Disposal of construction materials or accidental spills of hazardous substances into water bodies, leading to water pollution. • Worker exposure to hazards associated with working on water, such as drowning, electrical hazards, and confined spaces. • Disruption to local fishery activities and livelihoods during construction. • Working at height during erection of transmission towers and establishment of transmission lines; • Construction of support structure for PV module would require operation of pile drivers • Drowning or falling in the waters during installations of the floating platforms for solar modules, construction of small captive jetty/pier and floating cables; • Working in confined spaces at pooling substation or excavated areas; • Operation of cranes and other mechanical lifting equipment • Working with rotating machinery including the rollers and layers; • Working with live electrical components – transmission towers, lines and internal electrical parts; and • Unhygienic conditions at site including contaminated drinking water for workers. • Anchoring the floating modules using weighted anchors or monopiles can disturb the sediment layer and potentially affect benthic habitat and species; • Laying of submarine cables from the inverters to the transformers can also disturb and impact benthic habitat and species; • The construction of the captive jetty can result in direct loss of benthic habitat and fauna and may increase sediment impact and water quality deterioration; • The laying of floating and submarine cables can potentially increase the ambient temperature of the water column due to the live electrical components; • Movement of construction material has the potential to contaminate the water layer including leaching of diesel from motorized boats, storage/transport of transformer oil near the water edge, storage of lubricants or oil components on the PV modules, corrosion control on any metallic components, etc.; • Increased movement of boats and personnel in the area can result in a net displacement of aquatic fauna from the area; and • Noise and vibrational impacts from jetty construction, floating platform assembly, drilling (for monopiles), trenching (for submarine cables), boat movement and general construction work on the water column.	and disposal of sewage, thereby minimizing the impacts of wastewater discharge. • Ensure proper cover and stacking of loose construction material at Batching plant site and to prevent surface runoff and contamination of receiving water body. • Implement spill prevention measures and proper waste management practices to minimize pollution risks. • Provide workers with appropriate safety training, flotation devices, and emergency response procedures for working on water bodies. • Coordinate construction activities to minimize disruptions to local fishery activities and livelihoods. • Maintained and Serviced small motorised marine vessels to be used to avoid accidental fuel or oil leakage in the surface water body. • All construction activities (to the extent possible) should be carried out during daytime hours and vigilance should be maintained for any potential accidents; • Personal Protective Equipment (PPEs) including safety shoes, life jackets, Floatation device, helmet, goggles, ear muffs and face masks; • Floatation devices, life jackets, buoyancy aid to be provided and kept readily available for emergency rescue • Structural integrity should be checked before undertaking any work; • Electrical and maintenance work should not be carried out during poor weather and during lightning strikes; • Training of the workers on climbing techniques, and rescue of fall-arrested workers. • Construction and transportation activities should be avoided at dawn and dusk where bird activity is at its highest and therefore there is a higher chance of impact; • Pre-cast floating platforms should be preferred so that the assembly and construction noise and vibration impacts are reduced to the extent possible • No waste disposal including packaging material should be followed when working on the water column; • Boat movement should be minimized to the extent possible and travel should be pre-planned and consolidated to reduce disturbance on aquatic fauna; • An oil spill control plan should be developed for the Project that models any oil/diesel spill and identifies appropriate mitigation measures to counteract the spread; • A survey of benthic ecology in the area through the use of grab samplers and benthic ecology assessment should be undertaken in those areas where the sediment layer will be disturbed (e.g. floating platform anchoring and trenching for cabling) • The material used for the cabling and platform should be non-toxic, recyclable, corrosion-proof, ultraviolet radiation resistant and moisture resistant; • Drag forces during heavy wind events and cyclone-based events should be modelled for the Project before finalizing		Prevention and Maangement Plan

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project	Associated Framework/Tools/Checklist
		the technology to ensure that there is no structural collapse during the operation phase; • Local fisheries department should be consulted when identifying construction and maintenance activity periods such that natural fish breeding and rearing cycles are not disturbed; • All cabling including the DC cabling connecting module to inverter on the same platform should include proper insulation and water resistant technology such that there is no impact to the water column in the case of an accident/incident.		
Risk and Hazards	• Electrical hazards associated with maintenance activities on water-based solar installations. • Long-term impacts on fishery resources and livelihoods due to changes in water quality or fish habitat. • The floating components of the project i.e., floating solar modules, floating string inverters, floating transmission lines will float over the water. These floating components will be used by the water birds as a roosting and/or nesting sites. This may also act as a feeding site due to the aggregation of fishes under the platforms because of the shadow especially in summers. • This all will increase the risk of electrocution from the electric components. Any kind of oil spill from the floating components of the project can cause adverse impacts on aquatic flora and fauna.	• Implement regular monitoring programs to detect and address potential leaks or spills. Provide specialized training and safety protocols for workers conducting maintenance activities on water-based solar installations. Engage with fishery communities to address concerns and ensure ongoing communication and collaboration. • Regular checking of the floating solar modules and other infrastructure to avoid nesting by any of the birds. • The floating transmission line and inverters should have the perch rejecters in order to reduce the chance of electrocution of bird species. • Provide secondary containments and spill kits at all oil containing components. • Develop and implement an oil spill response procedure.	Operation and Maintenance Phase	***Appendix- D*** Risk Identification
Decommissioning	• Improper disposal of decommissioned solar panels or components into water bodies, leading to pollution and impacts on aquatic ecosystems. • Risks associated with handling and dismantling solar panels on water, such as cuts from broken glass or exposure to hazardous materials. • Disposal impacts on fishery resources and local communities.	• Develop recycling and disposal programs to ensure proper handling and recycling of decommissioned solar panels and components. Partner with certified recycling facilities and implement take-back programs. Provide training on safe handling and disposal procedures to workers. Engage with fishery communities to address concerns and ensure responsible end-of-life management.	Decommissioning Phase	***Appendix- E*** Pollution Prevention and Maangement Plan

6.3.5.2 Key Environmental, Health and Safety, and Social Risks in a Wind Power Project

Once an understanding of the various project lifecycle stages is established, some of the key environmental and social risks that may emanate during the project lifecycle for the wind power projects are taken into consideration. Wind power projects, though clean forms of energy, have the potential risks that are required to be managed through the various stages of project lifecycle. The risks discussed in subsequent section, are largely attributed to the scale or extent of the project or inherent in its design.

Table 6-4 Key Environmental and Social Risk for Wind Power Project

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
General Site Selection risk including environmental and social risks			
• Site screening (i.e., current land use - residential, agricultural, environmental, biodiversity and social screening etc.) • Transitional risks related to site selection.	• Conduciveness of site to support structures to be installed. • Proximity of the site to Sanctuaries, National Parks, Reserve Forest, Protected Forest, or reserved land, presence of IUCN threatened species, endemic / restricted range species, migratory / congregatory species, bird migratory path, and wildlife corridor. • Project disruption and potential closure risk due to not getting permission for Sites which are near to the notified ecologically sensitive zones (ESZ) or delays in getting applicable approval from Government Department.	**Conduciveness of site to support structures to be installed:** • Conduct thorough geotechnical surveys and assessments to ensure the suitability of the site for wind turbines and associated infrastructures. • Implement appropriate foundation designs and engineering solutions to mitigate risks associated with soil conditions. **Proximity of the site to Ecologically Sensitive Zones:** • Conduct comprehensive environmental impact assessments / environmental and social impact assessment to identify potential impacts on surrounding habitats and species.	Site selection and feasibility

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project

• Acute and chronic natural hazards risks related to site selection and feasibility.
Feasibility risk of the project which involves finalizing conceptual design of the project, demand estimation, assessing approximate costs for development, construction, and operation of the project and predicted revenue, permitting requirements etc.
	• Potential regulatory challenges in the environmental, land, labour or community domains that can trigger incessant delay to the project and deem it non-feasible.
	• Tribal Population and location in a 5th or 6th Scheduled Area as defined by the Constitution where procurement of land by non-tribal entities may be prohibited or may involve diversion of land which may need special permission from Panchayats and Collector.
	• Potential impact of displacement and socio-economic impacts on the local community, impact of other land users on site.
	• Assessment of local resource availability for the project which involves sourcing of labour and assessing any security issues.
	• Proximity to Archaeological/Cultural sites, and habitations.
	• The reputation of a wind power plant can be at risk due to several factors:
	  • **Environmental Responsibility:** Operating the plant in an environmentally responsible manner is crucial. Any deviation from this standard may lead to reputational damage.
	  • **Protests:** If local communities perceive adverse effects (e.g., land use, aesthetics), they may organize protests, impacting the plant's image.
	  • **Theft and Vandalism:** Security risks include theft or vandalism of plant equipment by external parties.
	• Cumulative impacts due to existing/ planned project.
	• Social acceptance and community relations – Local opposition to wind power projects due to availability of land, visual impacts, or other factors can pose risks to project development and operation.
	• Acute Natural Hazards (Environmental) risks:
	  ○ **Cyclones:** High-intensity storms can cause immediate and severe damage to the wind turbine installations
	  ○ **Flooding:** (i) Rapid and intense rainfall can lead to flash floods, affecting project sites and causing immediate damage; and (ii) Prolonged or heavy rainfall can result in river flooding, potentially impacting the wind project(s)' installations
	  ○ **Seismic Activities:** Regions prone to earthquakes may face risks of structural damage to solar panels during seismic events.
	  ○ **Topographical changes:** Over time, changes in the landscape and topography may increase the risk of landslides affecting project sites
		• Implement buffer zones and habitat avoidance measures to minimize ecological disturbance and preserve biodiversity.
		Project disruption risk:
		• Proactively engage with government departments and regulatory authorities to streamline approval processes and ensure timely compliance with environmental and land-use regulations.
		• Develop contingency plans to mitigate risks of project delays, including alternative site selection or legal strategies to address regulatory challenges.
		Tribal Population and Land procurement:
		• Conduct social impact assessments (as part of environmental and social impact assessment (ESIA)) to understand the potential implications of the project on tribal communities and indigenous land rights.
		• Engage in meaningful consultation and negotiation with local communities, tribal councils, and relevant authorities to address land tenure issues and obtain necessary approvals.
		Displacement Impacts:
		• Project will not procure any land which may lead to physical and economic displacement.
		• Conduct and implement comprehensive resettlement and livelihood restoration program (in case where avoidance is not possible) to mitigate adverse impacts on affected communities.
		Assessment of Local Resource Availability:
		• Conduct local resource assessments (as part of environmental and social impact assessment (ESIA)) to identify potential labour shortages, security risks, and natural resources.
		Proximity to Archaeological/cultural sites:
		• Project will avoid any land procurement which may impact any known archaeological/cultural sites.
		• Conduct heritage impact assessments (if any unknown archaeological sites emerge during construction) to identify and mitigate potential impacts on archaeological sites.
		• Implement measures to protect and preserve archaeological assets, including archaeological surveys, site monitoring, and community engagement.
		Reputation and Security Risks:
		• Develop proactive communication and engagement strategies to build trust and transparency with local communities and stakeholders.
		• Implement security measures to mitigate risks of protests, vandalism, and other security threats, including community liaison programs and stakeholder engagement.
		Social Acceptance and Community Relations:
		• Engage in proactive community outreach and consultation to address concerns related to land availability, visual impacts, noise, and other factors.
		Implement community benefit programs, such as corporate social responsibility (CSR), local employment, and infrastructure development, to enhance social acceptance and support for the Project.	

Landscape, and Visual Impacts	Depending on the location, a wind energy facility may have an impact on views capes, especially if visible from or located near residential areas or tourism sites. Visual impacts associated with wind energy projects typically concern the installed and operational turbines themselves (e.g., colour, height, and number of turbines).
	Impacts may also arise in relation to operational wind facilities' interaction with the character of the surrounding landscape and/or seascape. Impacts on Legally Protected and Internationally Recognized Areas of importance to biodiversity and cultural heritage features are also a consideration. Preparing zone of visual influence maps and preparing wire-frame images and photomontages from key viewpoints is recommended to inform both the assessment and the consultation processes.
		Avoidance and minimization measures to address landscape, seascape, and visual impacts are largely associated with the siting and layout of wind turbines and associated infrastructure, such as meteorological towers, onshore access tracks, and substations. Thus, HFE has identified following key considerations to mitigate or minimize the landscape and visual impacts:
		• Consideration will be given to turbine layout, size, and scale in relation to the surrounding landscape and seascape character and surrounding visual receptors (e.g., residential properties, users of recreational areas/routes).
		• Consideration will also be given to the proximity of turbines to settlements, residential areas, and other visual receptors to minimize visual impacts and impacts on residential amenity, where possible. All relevant viewing angles will be considered when considering turbine locations, including viewpoints from nearby settlements.
		• HFE will consider the following other factors in relation minimizing visual impacts:
		  • Incorporate community input into wind energy facility layout and siting.
		  • Maintain a uniform size and design of turbines (e.g., type of turbine and tower, as well as height).
			Site selection and feasibility

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
		• Adhere to country-specific standards for marking turbines, including aviation/navigational and environmental requirements, wherever applicable. • Erosion measures will be implemented and cleared land will be promptly re-vegetated with local seed stock or native species.	
Environmental			
Noise	**Construction** Noise pollution risks from wind power plant construction can arise from various activities and equipment used during the construction phase. • **Heavy Machinery and Equipment:** Construction activities often involve the use of heavy machinery and equipment such as excavators, bulldozers, cranes, and trucks. These machines can generate high levels of noise, particularly during earthmoving, site preparation, and equipment installation. • **Construction Vehicles and Transportation:** Vehicles transporting construction materials, equipment, and personnel to and from the construction site can contribute to noise pollution, especially if they operate with diesel engines or emit excessive exhaust noise. • **Construction Activities:** Various construction activities such as pile driving, drilling, welding, and concrete pouring can produce significant noise levels, especially during peak construction periods. • **Generator Sets:** Temporary power generation using diesel generators may be required to provide electricity for construction activities. These generators can emit noise, particularly if they are not adequately soundproofed or maintained. **Operations** Wind turbines produce noise through a number of different mechanisms, which can be roughly grouped into mechanical and aerodynamic sources[8]. The major mechanical components include the gearbox, generator, and yaw motors, each of which produce their own characteristic sounds. Other mechanism systems, such as fans and hydraulic motors, can also contribute to the overall acoustic emissions. Mechanical noise is radiated by the surface of the turbine and by openings in the nacelle housing. The interaction of air and turbine blades produces aerodynamic noise through a variety of processes as air passes over and past the blades.	**Construction** • **Noise Monitoring and Assessment:** HFE will monitor baseline noise levels before start of the construction to establish existing ambient noise levels in the vicinity of the construction site. Monitor noise levels throughout the construction phase to assess compliance with regulatory limits and identify areas requiring mitigation. • **Noise Barriers and Enclosures:** Install temporary noise barriers and enclosures around noisy equipment and construction activities to reduce noise propagation to surrounding areas. • **Schedule construction activities:** Schedule noisy construction activities during off-peak hours or times when nearby residents are least likely to be affected, such as during daytime hours. • **Route planning and traffic management:** HFE will plan construction vehicle routes to minimize noise impacts on nearby communities. Use designated access roads and avoid routes that pass close to sensitive receptors, such as residential areas or schools. **Operation** Measures to prevent and control noise during operation are mainly related to engineering design standards and turbine siting. With modern turbine, mechanical noise is usually significantly lower than aerodynamic noise, and continuous improvement in airfoil design is reducing the latter. However, HFE will implement additional mitigation measures (wherever possible) to mitigate or minimize the noise impacts: • Operating turbines in reduced noise mode. • Building walls/appropriate noise barriers around potentially affected building (only an option in hilly terrain, due to the height of turbines). • Curtailing turbine operations above the wind speed at which turbine noise becomes unacceptable in the project-specific circumstances.	Construction, Operation and Decommissioning phases
Biodiversity	Wind energy facilities have the potential to cause both direct and indirect adverse impacts on onshore and offshore biodiversity throughout their lifecycle, including during construction, operation, maintenance, and decommissioning. These impacts can affect various aspects of the environment. HFE has identified the following key risks associated with biodiversity and wind power project: • **Bird and Bat Fatalities:** Wind turbines can lead to collisions with birds and bats, resulting in fatalities. • **Bat Pulmonary Barotrauma:** The rapid pressure changes caused by wind turbines blades can cause pulmonary barotrauma in bats. • **Wildlife displacement:** The presence of wind farms may displace wildlife from their natural habitats. • **Habitat conversion and degradation:** Construction and operation can alter habitats, affecting local ecosystems. • **Benthic Disturbance:** Offshore structures can disrupt benthic habitats. • **Disruption of wildlife movements:** Operational turbines can hinder the daily movements of bats and birds, potentially affecting their feeding, roosting, or breeding patterns. • **Infrastructure related impacts:** Associated infrastructure, such as overhead transmission lines, substations, roads, lighting, and maintenance traffic, can also contribute to adverse effects on biodiversity.	**Site Selection** Site selection is critical to avoiding and minimizing potential adverse impacts on biodiversity. Thus , during the planning phase of wind project HFE will consider the proximity of proposed project to areas of high biodiversity value. HFE will undertake early screening which will enhance macro-level site selection and prioritize further assessments, ultimately minimizing unnecessary biodiversity impacts and associated costs. HFE has considered the following sites of significance at local, regional, and international levels: • **Protected Areas:** These include national and internal protected areas, including marine protected zones. • **Important Bird Areas (IBA);** Locations critical for bird conservation. • **Key Biodiversity Areas (KBAs):** Sites with exceptional biodiversity value. • **Alliance for Zero Extinction (AZE) Sites:** Area's housing species on the brink of extinction. • **Ramsar sites:** Wetlands of international importance. • **Congregatory Sites:** Where wildlife gathers during specific life stages (e.g., breeding, migration). • **Unique or Threatened Ecosystems:** Habitats facing specific risks. These sites may serve as migration routes wetlands, breeding grounds, or bat hibernation areas. Additionally, they may feature topographical elements like ridges, river valleys, shorelines, and riparian zones.	Site selection, pre-construction, construction, and operation phases.

[8] Generally, wind turbines radiate more noise as the wind speed increases.

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project

HFE will implement the following site selection tools:

- **Strategic Environmental Assessments:** Comparing biodiversity and environmental sensitivity across different wind resource areas.
- **Sensitivity (overlay) Maps:** Visualizing areas of high biodiversity value.
- **Digital Resources:** Displaying biodiversity-rich regions.
- **Zoning Maps:** Informing decision-making.

Pre-construction

After conducting scoping and desktop studies, HFE through a third-party contractor/consultant will gather site-specific baseline biodiversity information to inform the Environmental and Social Impact Assessment (ESIA) for wind power project. These baseline survey will commence at the earliest feasible stage, such as when wind meteorological masts are erected, and will account for seasonal variations.

To optimize survey efforts, a tiered approach will be employed, aligning the survey intensity with the Project's development stage. Additionally, the existing biodiversity value of the area will be taken into consideration during survey design. HFE through its third-party contractor/consultant will consider the following aspects during the biodiversity surveys:

1. **Site Specific Consideration:**
   - **Habitats:** Thoroughly assess the impact of wind energy facilities on local habitats, considering factors such as geographical location, topography, and proximity to sites of high biodiversity value:
   - **Existing Biodiversity Value:** Understand the baseline biodiversity of the area to inform project planning effectively.
2. **Species Specific Values:**
   - **High-value species:** Direct surveys toward species of significant ecological importance. These include species with special international or national conservation status, endemics, and those at elevated risk from wind energy facilities.
   - **Collision Risks:** Certain bird species (such as soaring, migratory, and birds of prey) and tree-roosting bats are particularly susceptible to collisions with wind turbines.
   - **Visual Disturbance:** Open-country species instinctively avoid tall structures, potentially leading to visual disturbance.
   - **Attracted Species:** Some species may be drawn to wind facilities as perches or feeding areas, increasing the potential for collision.
   - **Transmission Lines:** Assess collision and electrocution risks for birds near associated transmission lines.
3. **Season Specific Issues:**
   - **Migration[9], Breeding[10], and Winter[11] Seasons:** Surveys should consider specific periods during the year when the project site may have a greater or different ecological function or value.

   - **Survey Duration:** When at-risk wildlife is identified, surveys will typically span at least one year (wherever feasible). However, in areas with exceptional aggregations of at-risk migratory birds and limited existing biodiversity data, longer surveys may be necessary. The duration of surveys should be determined on a project-by-project basis.

Construction and Operation Phase

Biodiversity-related mitigation measures for offshore facilities, including noise-related mitigation, following key mitigation measures has been identified by HFE:

1. **Turbine Configuration and Layout:**

[9] Assess the impact during peak migration periods.

[10] Understand how the facility may affect breeding habitats.

[11] Consider the ecological dynamics during winter seasons.

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
		• **Adapt to Site-Specific Risks:** Modify the number, size, and layout of turbines based on site-specific, species-specific, and season-specific risks and impacts. • **Reducing Collision Risk:** Consider using fewer, taller towers to minimize collision risks for most bird species. Additionally, this approach can help reduce vegetation clearing during construction. • **Infrastructure Placement:** Ensure that associated infrastructure (such as transmission lines, substations, and access roads) is strategically located based on biodiversity risk and impact assessments. **2. Mitigation Strategies for High Biodiversity Areas:** • **Active Turbine Management:** If the wind energy facility is situated near areas of high biodiversity value, implement active turbine management. This may involve curtailment (reducing turbine operation) and shut-down on-demand procedures. • **Adaptive Approach:** Develop a robust post-construction monitoring program to guide adaptive management. Monitor both curtailed and control turbines to assess the effectiveness of fatality reduction. **3. Avoiding Artificial Attraction:** • **Environmental Features:** Refrain from creating artificial features that could attract birds and bats to the wind energy facility. Examples include water bodies, perching or nesting areas, novel feeding spots, and staging or roosting habitats. • **Avoid Predictable Food Sources:** Specifically, avoid attracting birds to predictable food sources, such as on-site or off-site waste disposal areas or landfills. This is especially relevant when vultures or other carrion-eating birds are present. These mitigation measures may also need to extend to the surroundings of the wind energy facility. • **Eliminate Free-Wheeling:** Prevent free spinning of rotors under low wind conditions when turbines are not generating power. • **Light Pollution Reduction:** Avoid artificial light sources where possible. White, steady lights attract prey (e.g., insects), which, in turn, attracts predators. If lights are used, opt for red or white blinking or pulsing lights. Steady or slow blinking lights should be avoided. Timers, motion sensors, or downward-hooded lights can help reduce light pollution. • **Bird Flight Diverters:** Install bird flight diverters on transmission lines and guy wires from meteorological masts. This reduces bird collisions, especially in areas of high biodiversity value. • **Raptor-Safe Power Line Poles:** Use “raptor safe” designs for power line poles to reduce the risk of electrocution. • **Assess Bird and Bat Deterrence Technology:** Evaluate the current state of bird and bat deterrence technology and consider implementing proven effective technologies where appropriate.	
Air Emission	Air emission risks associated with wind power plant construction are typically minimal compared to conventional power generation sources like coal-fired power plants. However, certain activities during construction can still result in air emissions. Here are some potential air emission risks from wind power plant construction: • **Dust Generation:** Construction activities such as site clearing, grading, excavation, and earthmoving can generate dust, particularly in dry and windy conditions. This dust may contain particulate matter (PM10 and PM2.5) that can contribute to air pollution and respiratory health issues. • **Vehicle Emissions:** Construction vehicles and equipment used for transporting materials, excavation, and earthmoving can emit air pollutants such as nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter (PM). Diesel-powered equipment, in particular, can emit high levels of pollutants if not properly maintained or operated. • **Fuel Combustion:** On-site generators or temporary power sources used during construction activities may burin fossil fuels (e.g., diesel), emitting pollutants such as NOx, SOx and CO.	**Monitoring of baseline levels**: Before any project is developed, HFE will undertake the baseline air quality monitoring at and in the vicinity of the site to assess background levels of key pollutants, in order to differentiate between existing ambient conditions and project-relate impacts. **Dust Control Measures:** Implement dust suppression techniques such as water spraying, soil stabilization, and covering stockpiles to reduce airborne dust emissions. Limit construction activities during windy conditions and use windbreaks where feasible. **Vehicle and Equipment Maintenance:** Ensure proper maintenance of construction vehicles and equipment to minimize emissions. Use low-emission vehicle and equipment where feasible and optimize vehicle routing to reduce fuel consumption and emissions.	Construction and Decommissioning phases.
Water and Wastewater management	**Construction Phase** • **Water consumption:** Construction activities such as concrete mixing, equipment cooling, and site cleaning require significant water usage. High water consumption during construction can strain	HFE will implement the following mitigation measures for water and wastewater management during both construction and operation phases:	Construction, Operation and Decommissioning phases

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	local water resources and compete with other users, leading to potential water scarcity issues. Water is also used for dust suppression during construction phase. • **Surface water pollution:** Runoff from construction sites can carry sediment, construction debris, and pollutants such as oil, grease, and chemicals into nearby surface water bodies. This runoff can degrade water quality, harm aquatic ecosystems, and impact downstream users. • **Groundwater contamination:** Improper handling, storage, or disposal of construction materials, fuels, lubricants, and chemicals can result in groundwater contamination. Leaks, spills, or accidents during construction activities may introduce pollutants into the soil and groundwater, posing risks to human health and the environment.	• **Water Conservation:** Implement water conservation measures to minimize water usage. Utilize water-efficient equipment and practices and explore alternative water sources such as recycled or non-potable water for non-potable uses. • **Stormwater Management:** Implement erosion and sediment control measures during construction to prevent runoff and sedimentation. Develop stormwater management plans to capture, treat, and infiltrate runoff before discharge to minimize pollution risks. • **Chemical Management:** Store and handle chemicals properly to prevent spills and leaks. Develop spill prevention and response plans, and train staff on proper handling procedures. Use environmentally friendly chemicals and minimize the use of hazardous substances where possible.	
Climate change resilience	Provided below some potential climate change risks associated with wind power plant: • **Extreme Weather Events:** Wind power plants may be vulnerable to extreme weather events such as hurricanes, cyclones, typhoons, and severe storms. These events can cause physical damage to wind turbine blades and other infrastructure, leading to production disruptions and downtime. • **Increased Variability in wind resources:** Climate change can alter wind patterns, leading to increased variability in wind resources. This variability affects the consistency and predictability of wind energy generation. • **Changing Wind Patterns:** Climate change may alter wind patterns, affecting the overall wind resource availability. Some regions may experience decreased wind speeds, impacting energy production. • **Infrastructure Vulnerability:** Transmission lines, substations, and other infrastructure are susceptible to climate-related damage. Flooding, storms, and extreme temperatures can disrupt power transmission.	HFE will implement the following mitigation measures to address climate change risks during wind power plant construction and operation phase: • **Site selection**: HFE will conduct thorough site assessments to identify and prioritize sites with minimal climate change risks such as cyclonic conditions and other climate change risks. • **Resilient Design and Infrastructure:** Design wind power plant infrastructure to withstand extreme weather events and climate impacts, such as high winds, heavy rainfall, and temperature fluctuations. Implement robust construction standards, materials, and engineering practices to enhance resilience and durability. • **Enhanced Turbine Design and Maintenance:** (i) Regularly inspect and maintain wind turbines to ensure optimal performance and reduce vulnerability to extreme weather events; and (ii) Design turbines with robust materials and structural integrity to withstand storms and other climate-related challenges. • **Climate resilient infrastructure:** Elevate or protect critical infrastructure (such as substations and transmission lines) to prevent damage from flooding or extreme weather. • **Adaptive siting and layout:** (i) Choose wind farm locations that minimize exposure to extreme weather events; and (ii) Optimize turbine layout to reduce mutual shading and enhance energy capture while considering changing wind patterns. • **Adaptive Management and Planning:** Incorporate climate change considerations into project planning, risk assessments, and long-term operations strategies.	Construction, Operation and Decommissioning phases
Occupational Health and Safety			
Working at Height and Protection from Falling Objects	Working at elevated locations is a common occurrence during all phases of wind energy facility operation, particularly during maintenance activities. The primary focus when managing work at height should be fall prevention. However, additional hazards that warrant consideration include falling objects and adverse weather conditions (such as wind speed, extreme temperatures, humidity, and wetness).	HFE has identified the following key mitigation and management measures: • **Elimination or Reduction of Work at Heights:** (i) During the planning and design phases, assess specific tasks to minimize the need for working at height; and (ii) Examples include assembling structures at ground level and then lifting them into position, where feasible and cost-effective. • **Fall Prevention Measures:** (i) Implement edge protection or guardrails before individual fall arrest equipment; and (ii) Use safety nets or airbags to minimize the consequences of a fall if it occurs. • **Additional Prevention Strategies:** (i) Ensure all structures adhere to appropriate standards and incorporate suitable working-at-height systems; (ii) Establish and maintain exclusion zones beneath work areas to protect workers from falling objects; (iii) All employees working at height should be trained and competent in using working-at-height and rescue systems; (iv) Provide suitable work-positioning devices, ensuring compatibility with tower components; (v) Properly rate and maintain hoisting equipment, and train operators accordingly; and (vi) Equip all tools and equipment with lanyards where possible, and consider capture netting. • **Signs and Obstruction:** Prior to any work, ensure that signs and other obstructions are removed from poles or structures. Clear visibility is essential for safe operations. • **Tool Handling:** Use approved tool bags for raising or lowering tools and materials to workers on elevated structures. Proper equipment ensures safety and efficiency.	Construction, Operation and Decommissioning Phases.

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
		• **Weather Consideration:** (i) Refrain from conducting tower installation or maintenance work during adverse weather conditions; and (ii) Especially avoid work during lightning storms to prevent electrical hazards. • **Emergency Preparedness:** (i) Develop a comprehensive emergency rescue plan. This plan should outline methods and procedures to rescue operatives who become stranded or incapacitated while working at height; and (ii) Ensure all workers are trained in emergency procedures and familiar with the rescue plan.	
Lifting operations	Lifting operations play a crucial role in the construction of wind energy facilities. During the construction phase, components are assembled and transported to the site for final assembly. This process involves utilizing large and intricate lifting equipment to raise loads of varying dimensions and weights repeatedly.	Lifting operations are integral to wind energy facility construction. Assembling and transporting components to the site involves using sophisticated lifting equipment to handle loads of varying dimensions and weights. To ensure safety and efficiency, HFE has identified following key mitigation and management area: • **Load Information:** (i) Gather all relevant information about the load, including size, weight, slinging method, and attachment points; and (ii) Ensure that all lifting equipment, including load attachment points, is suitable, well-maintained, and compliant with statutory inspections. • **Personnel Competency:** All supervisors, equipment operators, and slingers must be trained and competent in handling the lifting equipment and intended techniques. • **Exclusion Zones:** (i) Establish and maintain exclusion zones around lifting areas to prevent unauthorized entry; and (ii) Implement barriers and signage to safeguard against accidental access during lifting operations. • **Weather Consideration:** (i) When lifting large loads, ensure favourable weather conditions; and (ii) Heavy lifting equipment has specified safe operating parameters; these should never be exceeded.	Construction and Decommissioning Phases.
Other occupational health and safety	The construction and operation of a wind power plant involve various occupational health and safety risks for workers and personnel involved. These risks can arise from a range of activities equipment, and hazards present on-site. Key occupational health and safety risks associated with wind power plants includes: • **Electrical Hazards:** Wind power plants involve working with electrical wiring, and other electrical components. Workers may be exposed to risks such as electric shock, arc flash, and electrical burns if they come into contact with live electrical components or wiring without proper training and precautions. • **Equipment Operation and Machinery:** Construction and operation of wind power plants involve the use of heavy machinery, equipment, and tools. Risks include crush injuries, entanglement, caught-in/between hazards, and struck-by incidents if proper safety protocols are not followed during equipment operation and maintenance. • **Manual Handling and Ergonomic Risks:** Workers may be required to lift, carry, and manipulate heavy equipment, and materials during installation and maintenance activities. Improper lifting techniques and ergonomic hazards can lead to musculoskeletal injuries such as strains, sprains, and repetitive motion injuries. • **Heat Stress and Sun Exposure:** Working outdoors in hot and sunny conditions during construction and maintenance activities can pose risks of heat stress, dehydration, and sunburn. Prolonged exposure to high temperatures and intense sunlight without adequate hydration and sun protection measures can lead to heat-related illnesses such as heat exhaustion and heatstroke. • **Chemical Exposure:** Workers may be exposed to hazardous chemicals and materials during construction, and maintenance activities. Risks include exposure to cleaning agents, solvents, adhesives, sealants, and construction materials containing toxic or irritating substances, leading to respiratory irritation, skin contact dermatitis, and other health effects if proper personal protective equipment (PPE) and handling procedures are not followed. • **Traffic and Vehicle Hazards:** Construction and operation activities may involve vehicle traffic, including trucks, cranes, forklifts, and other heavy equipment, posing risks of collisions, pedestrian accidents, and struck-by incidents if traffic management measures and safety protocols are not implemented and followed.	HFE will implement the following mitigation measures to address occupational health and safety risks at wind power plants: • **Safety Training and Education:** Provide comprehensive safety training and education for workers and personnel involved in construction, operation, and maintenance activities. Further, will ensure that workers are trained in hazard recognition, safe work practices, emergency procedures, and proper use of PPE and safety equipment. • **Electrical Safety:** Implement lockout/tagout (LOTO) procedures, electrical safety protocols, and arc flash protection measures to prevent electrical hazards and ensure safe work practices when working with electrical equipment and systems. • **Equipment Safety:** Conduct regular inspections, maintenance, and servicing of machinery, equipment, and tools to ensure proper functioning and safe operation. Further, will provide adequate training and supervision for equipment operators and workers to prevent accidents and injuries. • **Heat Stress Prevention:** Implement heat stress prevention measures such as providing shaded rest areas, hydration stations, cooling measures, and scheduling work activities during cooler times of the day to mitigate the risks of heat-related illnesses. • **Chemical Safety:** Minimize chemical exposure through engineering controls and substitution, provide appropriate ventilation, and ensure proper storage, handling, and disposal of hazardous chemicals and materials. Provide workers with training on chemical hazards, emergency response procedures, and use of PPE. • **Traffic Management:** Establish traffic control plans, designated pedestrian walkways, and signage to manage vehicle traffic and prevent accidents in work areas. Provide training for vehicle operators and workers on traffic safety rules and procedures.	Construction, Operation and Decommissioning phases
Community health and safety			

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
Blade Throw (community health and safety)	Blade Throw refers to the potential hazard associated with the operation of wind turbines, particularly during maintenance activities or in the event of blade failure. Blade throw incidents can have significant community health and safety impacts, which may include: • **Physical Injury or Fatality:** Blade throw incidents can result in serious injuries or fatalities to workers or nearby residents if they are struck by a thrown blade or debris. The impact force of a thrown blade can be substantial and can cause severe trauma or even death upon contact. • **Property Damage:** Blade throw incidents can result in damage to nearby structures, vehicles, or property if thrown blades or debris land outside the turbine's designated safety zone. Falling debris may also pose a risk to infrastructure such as roads, power lines, or other critical facilities. • **Community Fear and Stress:** It can instill fear and anxiety within the local community, especially if they occur unexpectedly or frequently. Concerns about safety may lead to increased stress levels among residents, impacting their overall well-being and quality of life. • **Disruption to Daily Activities:** Safety concerns related to blade throw incidents may disrupt normal daily activities for residents living in close proximity to wind turbines. Temporary evacuations or restrictions on access to certain areas may be necessary during emergency response or recovery efforts. • **Loss of Confidence in Renewable Energy:** High-profile blade throw incidents can erode public trust and confidence in the safety of wind energy projects and Renewable energy technologies. Negative perceptions of wind energy safety may hinder public support for future Renewable energy development initiatives.	To mitigate the community health and safety impacts associated with blade throw incidents, wind energy developers and operators should implement rigorous safety measures and protocols, including: • Regular inspection, maintenance, and monitoring of wind turbine components to detect and address potential blade defects or structural issues. • Establishment of appropriate setback distances and safety zones to minimize the risk of injury or property damage in the event of a blade throw incident. • Implementation of emergency response plans and procedures to quickly and effectively respond to blade throw incidents, including notification of relevant authorities and evacuation protocols if necessary. • Public outreach and communication efforts to educate local residents about wind turbine safety measures, emergency procedures, and risk mitigation strategies. • Collaboration with regulatory agencies, industry stakeholders, and community representatives to address safety concerns and ensure compliance with applicable safety standards and regulations. • By prioritizing community health and safety and implementing robust risk management strategies, wind energy projects can help minimize the potential impacts of blade throw incidents and maintain public confidence in the safety and reliability of Renewable energy technologies.	Operation phase
Shadow Flicker (community health and safety)	Shadow flicker is an optical phenomenon that occurs when the sun passes behind a wind turbine, casting a moving shadow on the ground. As the rotor blades rotate, these shadows repeatedly pass over the same point, creating a flickering effect. The impact of shadow flicker becomes relevant when potentially sensitive receptors, such as residential properties, workplaces, schools, or healthcare facilities, are located in close proximity to the wind energy facility or have a specific orientation relative to it. Thus, HFE has identified the following key impact of shadow flickers: • **Location and Receptors:** (i) The proximity of sensitive receptors to the wind turbines plays a crucial role. If these receptors are within the shadow flicker zone, it can lead to annoyance and potential health concerns; and (ii) Sensitive receptors include areas where people live, work, learn, or receive healthcare services. • **Geographical Factors:** (i) Shadow flicker impact is more pronounced at higher latitudes, where the sun's angle is lower in the sky. Longer shadows are cast, extending the radius within which significant shadow flicker occurs.	HFE has identified the following recommendation to mitigate or minimize the impact of shadow flickers due to installation of wind turbines: • **Modelling and Prediction:** (i) Utilize commercially available software to model shadow flicker and determine the potential distance of its effects; and (ii) Predict the duration and timing of shadow flicker occurrence under real weather conditions at specific receptors within the impact zone. • **Threshold Limits:** (i) If complete avoidance of shadow flicker is not feasible, ensure that sensitive receptors do not experience excessive impact; and (ii) Recommended limits: Not more than 30 hours per year and 30 minutes per day on the worst affected day (worst-case scenario). • **Site selection and Turbine Placement:** (i) Locate wind turbines to minimize shadow flicker impact on neighbouring receptors; and (ii) Program turbines to shut down during times when shadow flicker limits are exceeded.	Operation phases
Traffic Management (community health and safety)	Traffic management during wind power projects can have significant impacts on community health and safety, which may include: • **Increased Traffic Volume:** Heavy transport vehicles carrying wind turbine components can increase traffic volume on local roads, leading to congestion and potential safety hazards. • **Road Safety:** The movement of oversized loads may pose risks to other road users due to limited visibility, reduced manoeuvrability, and longer stopping distances of heavy transport vehicles. • **Pedestrian and Cyclist Safety:** Wind power projects may disrupt pedestrian and cyclist routes, posing risks to non-motorized road users due to increased traffic, construction activities, and temporary road closures. • **Emergency Response Access:** Traffic congestion and road closures associated with wind power projects may impede the timely response of emergency vehicles, posing risks to public safety in case of accidents or medical emergencies. • **Community Disruption:** Construction-related traffic disruptions, including road closures, detours, and increased noise and dust levels, may disrupt daily activities and inconvenience local residents and businesses. • **Environmental Considerations:** Increased traffic associated with wind power projects can contribute to air and noise pollution, habitat disturbance, and ecosystem fragmentation, impacting local environmental quality and wildlife.	HFE will implement the following mitigation measures to address Traffic Management risks in wind power plant development: • Implement traffic management plans to schedule deliveries during off-peak hours, minimize disruption to regular traffic flow, and use designated routes to avoid congestion in residential or high-traffic areas. • Employ convoy escorts, pilot vehicles, and flaggers to ensure safe passage of oversized loads, communicate with motorists about potential delays and hazards, and provide clear signage and warning devices to alert drivers to the presence of slow-moving or oversized vehicles. • Establish temporary pedestrian and cyclist pathways, designate safe crossing points, and provide clear signage to guide non-motorized road users safely around construction zones. Coordinate with local authorities to implement traffic calming measures and reduce vehicle speeds in areas with high pedestrian or cyclist activity. • Coordinate with local emergency services to develop emergency response plans and ensure access to project sites during construction activities. Establish clear routes for emergency vehicles, provide advance notice of road closures, and maintain communication channels with emergency responders to facilitate rapid intervention and assistance. • Engage with the local community and stakeholders to communicate construction schedules, traffic management plans, and potential impacts in advance. Minimize	Construction and operation phasses

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	• **Public Engagement and Communication:** Inadequate communication and community engagement can lead to public dissatisfaction, resistance, and opposition to wind power projects, hindering project approval and implementation.	disruption by scheduling construction activities during non-peak hours, providing alternative access routes, and implementing measures to mitigate noise, dust, and other environmental nuisances. • Implement measures to minimize vehicle emissions, such as using low-emission vehicles and optimizing transportation routes to reduce travel distances. Protect sensitive habitats and wildlife corridors by establishing buffer zones, implementing speed limits, and conducting ecological assessments to identify and mitigate potential impacts on biodiversity. • Engage with local residents, businesses, and community stakeholders throughout the project lifecycle to solicit feedback, address concerns, and build trust and support for the project. Provide clear and transparent information about project objectives, benefits, and potential impacts, and involve stakeholders in decision-making processes to ensure their interests are considered and addressed.	
Social			
Land Rights and Displacement	The development of a wind power plant can potentially pose risks related to land rights and displacement, particularly when project sites are located in areas with existing land use or occupancy by communities, indigenous people, or other stakeholders. The key potential risks associated with land rights and displacement in the context of wind power plant development includes: • **Land acquisition and Ownership:** Wind power plant projects will procure land for site development, installation of Wind turbines, and construction of associated infrastructure such as substations, access roads, and transmission lines. Risk may arise if there are uncertainties or disputes regarding land ownership, tenure, or use rights, leading to conflicts, legal challenges, and delays in project implementation. • **Community Land Rights:** Indigenous communities, local communities, and other stakeholders may have customary or traditional land rights, customary land use practices, or collective ownership of land and natural resources in project areas. Failure to recognize, respect, or consult with affected communities regarding land rights and land use can lead to grievances, protests, and opposition to wind power plant development. • **Land Tenure and Livelihoods:** Wind power plant development may result in the displacement or loss of land-based livelihoods for communities dependent on agriculture, grazing, forestry, or other land-based activities. Displacement of communities from their ancestral lands or disruption of traditional livelihoods can have adverse social, economic, and cultural impacts, including loss of access to resources, disruption of social networks, and erosion of cultural identity. • **Resettlement and Compensation:** In cases where land acquisition and project development result in involuntary resettlement or displacement of communities, adequate compensation, resettlement assistance, and livelihood restoration measures must be provided in accordance with applicable laws, regulations, and international standards. Risks may arise if resettlement plans are not properly implemented, leading to inadequate compensation, loss of livelihoods, and impoverishment of affected communities. • **Social Impacts and Community Relations:** Wind power plant development can generate social impacts such as changes in land use patterns, demographic shifts, and alterations to community dynamics and social cohesion. Risks may arise if communities perceive negative impacts on their land rights, cultural heritage, or quality of life, leading to social unrest, community opposition, and reputational damage for project developers. • **Consultation and Free, Prior, and Informed Consent (FPIC):** Meaningful consultation and engagement with affected communities, indigenous peoples, and other stakeholders are essential to ensure that their rights, interests, and concerns are adequately addressed in project planning, design, and implementation. Risks may arise if consultation processes are tokenistic, inadequate, or lack transparency, leading to mistrust, conflict, and project delays.	HFE will implement the following mitigation measures to address land rights and displacement risks in wind power plant development: • **Land Rights Assessment:** HFE will conduct comprehensive assessments of land tenure, ownership, and land use rights in project area to identify potential conflicts, overlaps, or uncertainties regarding land rights and access. Engage with affected communities, indigenous people, and other stakeholders to understand their land tenure systems, customary land use practices, and tenure-related concerns. • **Community Engagement and Consultation:** Establish transparent, participatory, and culturally appropriate mechanisms for community engagement, consultation, and decision-making throughout the project life cycle. Ensure that affected communities have access to relevant information, opportunities for meaningful participation, and mechanisms for grievance redressal. • **Respect for Indigenous Peoples' Rights:** Recognize and respect the collective rights, cultural heritage, and traditional knowledge of indigenous peoples in project areas, in accordance with the International Finance Corporation's Performance Standards, 2012. HFE will obtain free, prior, and informed consent (FPIC) from indigenous communities for project activities that may affect their lands, territories, or resources. • **Resettlement Planning and Livelihood Restoration:** HFE will develop comprehensive resettlement plans and livelihood restoration programs to address the needs of displaced individuals and/or community (if any) by the project development. HFE will also ensure that resettlement and compensation measures are fair, equitable, and culturally appropriate with meaningful participation of affected communities in decision-making processes. • **Conflict Resolution and Grievance Mechanisms:** HFE will establish transparent, accessible, and affective grievance mechanisms to address land-related disputes, conflicts, and grievance raised by affected communities, stakeholders, and indigenous people. Provide avenues for dialogue, and resolution of disputes in a timely and culturally sensitive manner.	Preconstruction phase

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
Risk of labour influx	The development of a wind power plant can lead to an influx of labour into local communities, which may pose various risks and challenges to the social, economic, and environmental well-being of the area. HFE has identified key potential risks associated with the influx of labour on local communities: • **Pressure on Local Infrastructure:** A sudden increase in population due to labour influx can strain local infrastructure such as housing, transportation, healthcare facilities, schools, and sanitation services. Insufficient infrastructure capacity to accommodate the needs of incoming workers and their families can lead to overcrowding, congestion, and deterioration of living conditions in host communities. • **Housing Shortage and Affordability:** High demand for housing from incoming workers may result in housing shortages, inflated rental prices, and affordability challenges for local residents. Displacement of existing residents or informal settlements may occur as landlords prioritize renting to higher-paying temporary workers, exacerbating housing insecurity and homelessness in host communities. • **Social Disruption and Community Cohesion:** Rapid population growth and cultural diversity resulting from labor influx can disrupt community cohesion, social networks, and traditional ways of life in host communities. Tensions may arise between newcomers and long-term residents over competition for resources, access to services, and socio-cultural differences, leading to social divisions and conflicts. • **Pressure on Natural Resources:** Increased demand for natural resources such as water, land, and energy from a growing population of workers can strain local ecosystems and natural resources. • **Cultural and Social Integration:** The influx of labour from diverse backgrounds and cultures may pose challenges to cultural integration, social cohesion, and community resilience in host communities. Language barriers, cultural differences, and social isolation may hinder effective communication, cooperation, and collaboration among residents, contributing to social exclusion and marginalization of certain groups.	HFE has identified following mitigation measures to address risks of labour influx on local communities due to the wind power plant development: • **Community Engagement and Participation:** HFE will engage with local communities, stakeholders, and representatives early in the project planning process to identify potential risks, concerns, and opportunities associated with labor influx. Foster inclusive dialogue, participation, and collaboration to co-design solutions that address community needs, priorities, and aspirations. • **Local Employment and Skills Development:** HFE will prioritize local hiring, skills development, and training programs to maximize employment opportunities for local residents and enhance their capacity to participate in wind power plant development and operation. Collaborate with local vocational training institutions, community organizations, and government agencies to provide training and capacity-building initiatives tailored to local needs and preferences. • **Social Integration and Cultural Exchange:** HFE will promote social integration, cultural exchange, and community cohesion through cross-cultural awareness programs, community events, and intercultural dialogue initiatives. Encourage collaboration, mutual respect, and understanding among diverse groups within the community to foster social harmony and inclusivity. • **Environmental Management and Sustainability:** Implement sustainable resource management practices to minimize the environmental footprint of labor influx on local ecosystems and natural resources. Adopt water conservation measures, waste management strategies, and Renewable energy solutions to mitigate pressures on natural resources and promote environmental sustainability in host communities. • **Health and Safety Protection:** HFE will ensure compliance with occupational health and safety regulations, standards, and best practices to protect the health and well-being of workers and local residents. Provide adequate housing, sanitation, healthcare, and emergency response services to mitigate health and safety risks associated with labour influx.	Construction and Operation Phases
Labour rights	The development of a wind power plant may pose various labour rights risks for workers involved in construction, operation, and maintenance activities. These risks can arise from factors such as working conditions, employment practices, occupational health and safety standards, and adherence to labour laws and regulations. HFE has identified the following key labour rights risks associated with the development of a wind power plant: • **Unsafe Working Conditions:** Workers may be exposed to hazardous working conditions during construction, installation, and maintenance of wind power plant infrastructure, such as exposure to electrical hazards, and risks associated with heavy machinery and equipment. Failure to implement adequate safety measures and provide personal protective equipment (PPE) can jeopardize worker safety and result in occupational accidents, injuries, or fatalities. • **Noncompliance with labour laws:** Employers (especially HFE's appointed contractor) may fail to comply with labour laws, regulations, and standards related to wages, working hours, overtime pay, and other employment conditions. Violations of labour laws such as minimum wage laws, overtime regulations, and employment contracts can result in exploitation of workers, wage theft, and labour rights abuses, undermining worker rights and dignity. • **Exploitative Employment Practices:** Workers may be subject to exploitative employment practices such as informal employment arrangements, subcontracting, precarious work, and subcontracting of labour. Subcontracting chains and outsourcing arrangements can obscure accountability, weaken labour protections, and increase the risk of labour exploitation, forced labour, and human trafficking within the supply chain. • **Discrimination and Harassment:** Workers may experience discrimination, harassment, or abuse based on factors such as race, ethnicity, gender, nationality, or migrant status. Discriminatory practices in recruitment, hiring, promotion, and termination decisions can create hostile work environments, perpetuate inequalities, and violate workers' rights to equal treatment, dignity, and non-discrimination in the workplace.	HFE has identified the following mitigation measures to address labour rights risks associated with the development of a wind power plant: • **Compliance with Labour Laws and Standards:** Ensure compliance with national labor laws, regulations, and international labour standards, including fundamental principles and rights at work outlined by the International Labour Organization (ILO). Adhere to legal requirements related to wages, working hours, occupational health and safety, and employment conditions, and monitor compliance throughout the project lifecycle. • **Worker Training and Capacity Building:** Provide comprehensive training, education, and capacity-building programs for workers on their labour rights, occupational health and safety practices, and workplace policies and procedures. Empower workers to assert their rights, identify hazards, and advocate for safer working conditions through awareness-raising initiatives and worker empowerment programs. • **Worker Engagement and Participation:** Foster worker engagement, participation, and representation in decision-making processes, workplace committees, and health and safety committees. Encourage open communication, feedback mechanisms, and dialogue between workers, employers, and management to address labour rights concerns, resolve grievances, and improve working conditions collaboratively. • **Supply chain due diligence:** HFE will conduct due diligence (wherever feasible) on labour practices within the supply chain, including subcontractors, suppliers, and recruitment agencies, to identify and address labour rights risks. Establish clear expectations, contractual obligations, and monitoring mechanisms to ensure compliance with labour standards and prevent labor exploitation and abuse throughout the supply chain. • **Access to Grievance Mechanisms:** HFE will establish transparent, accessible, and effective grievance mechanisms for workers to report labor rights violations, seek	Construction and operation phase

Risk Themes	EHS&S and transitional Risks/Impacts/Elements to be considered	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	• **Inadequate Labour Rights Protections:** Workers may lack awareness of their labour rights, legal protections, and avenues for recourse in case of labour rights violations. Limited access to labour unions, collective bargaining, and grievance mechanisms can impede workers' ability to advocate for their rights, address workplace grievances, and seek redress for labour rights abuses. • **Migrant workers exploitation:** The recruitment and employment of migrant workers in wind power plant projects may increase the risk of labor exploitation, human trafficking, and forced labor. Migrant workers may face vulnerabilities such as language barriers, lack of legal documentation, debt bondage, and dependency on employers, making them susceptible to exploitation and abuse.	redress for grievances, and access remedies in case of abuses. Ensure confidentiality, impartiality, and protection from retaliation for workers who raise concerns or file complaints through grievance channels. • **Worker Empowerment and Advocacy:** Empower workers to organize, form labor unions, or participate in collective bargaining to negotiate fair wages, working conditions, and employment terms. Support worker-led initiatives, capacity-building activities, and advocacy campaigns to promote labor rights awareness, strengthen worker solidarity, and improve labor standards in the wind power sector.	
Archaeological, Historic and Cultural Effects	The development of a wind power plant has the potential to impact archaeological, historic, and cultural sites, as well as cultural landscapes and heritage resources. These effects can arise from land disturbance, construction activities, infrastructure installation, and operation of the wind power project. HFE has identified the following key potential risks associated with the archaeological, historic, and cultural effects of a wind power plant: • **Damage to Archaeological Sites:** Construction activities associated with win power plant development, such as site clearing, earthworks, and ground disturbance, can pose risks to archaeological sites, artifacts, and cultural remains present within the project area. Excavation, grading, and trenching activities may inadvertently damage or destroy archaeological resources, undermining their scientific, historical, and cultural value. • **Impact on Historic Structures:** Proximity of wind power plant facilities to historic buildings, structures, and landmarks may pose risks of visual impact, overshadowing, or alteration of historic features and architectural elements. Construction activities associated with wind turbines erection, support structures, access roads, and transmission lines in close proximity to historic sites can compromise their integrity, authenticity, and aesthetic value, detracting from their cultural significance and heritage value. • **Alteration of cultural landscapes:** Wind power plant deveopment may alter cultural landscapes, traditional land uses, and historic settings associated with indigenous peoples, local communities, and cultural heritage sites. Changes in land use patterns, vegetation cover, and visual character of the landscape can disrupt cultural continuity, traditional practices, and spiritual connections to the land, affecting cultural identity and sense of place. • **Disruption of Cultural Routes and Corridors:** Construction of wind power plant infrastructure, access roads, and transmission corridors may intersect with or disrupt cultural routes and historic travel corridors used by indigenous peoples, nomadic communities, or historic trade routes. Fragmentation of cultural landscapes and disruption of traditional travel patterns can sever cultural connections, impede access to sacred sites, and erode cultural heritage values. • **Loss of Cultural Heritage Resources:** Clearance of vegetation, land conversion, and habitat destruction associated with wind power plant development can lead to loss or degradation of cultural heritage resources, including sacred sites, burial grounds, ceremonial grounds, and cultural artifacts. Destruction of culturally significant landscapes, ecological habitats, and natural resources can diminish cultural values and erode community ties to the land.	HFE has identified the following mitigation measures to address archaeological, historic, and cultural effects risks associated with wind power plant development: • **Cultural Heritage Assessments:** HFE will conduct comprehensive cultural heritage assessments, archaeological surveys, and impact assessments to identify, evaluate, and mitigate potential risks to archaeological, historic, and cultural resources within the project area. Engage with indigenous communities, cultural heritage experts, and stakeholders to incorporate traditional knowledge, oral histories, and community perspectives into heritage assessments and decision-making processes. • **Heritage Conservation Planning:** HFE will develop heritage conservation plan (if applicable as per the ESIA), management strategies, and mitigation measures to minimize impacts on archaeological sites, historic structures, and cultural landscapes during project development and construction. Designate buffer zones, exclusion areas, and protective measures to safeguard sensitive heritage resources and mitigate risks of damage or destruction. • **Avoidance and Minimization Measures:** Design wind power plant layouts, infrastructure alignments, and construction methods to avoid, minimize, or mitigate impacts on archaeological, historic, and cultural resources. HFE will consider alternative siting options, construction techniques, and operational practices to reduce disturbance to sensitive heritage areas and minimize visual impacts on cultural landscapes. • **Monitoring and Compliance Oversight:** HFE will implement monitoring programs, site inspections, and compliance audits to ensure adherence to cultural heritage mitigation measures, permit conditions, and regulatory requirements throughout the project lifecycle. Engage with heritage conservation authorities, regulatory agencies, and community monitors to track compliance, address emerging issues, and respond to heritage-related concerns in a timely manner. • **Community Engagement and Consultation:** Engage with indigenous communities, local stakeholders, and heritage conservation organizations in meaningful dialogue, consultation, and collaboration to identify, assess, and address cultural heritage risks and concerns associated with wind power plant development. Foster partnerships, knowledge sharing, and capacity-building initiatives to promote cultural heritage conservation and community involvement in decision-making processes.	Preconstruction, construction and operation phase

Note: The Key Environmental, Health and Safety, and Social Risks impacts /risks for Hybrid projects will be same as discussed in Table 6-1 & 6-2.

6.3.5.3 Key Environmental, Health and Safety, and Social Risks in a Battery Storage

Table 6-5 Key Environmental and Social Risk for Battery Storage

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
Project Conception	• Evaluation of raw material extraction processes for battery production should consider the environmental impacts associated with mining activities, including habitat destruction and water pollution.	• Source raw materials from suppliers that adhere to sustainable mining practices and environmental regulations. Promote recycling and closed-loop supply chains to minimize the need for new resource extraction. • Establish transparent communication channels with local communities and stakeholders to address concerns and gather feedback throughout the project	Pre-Construction Phase

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	• Engaging with local communities and stakeholders during the project conception phase helps identify potential social impacts, such as community displacement or land use conflicts, and develop strategies to address concerns. • Consideration of land use planning and zoning regulations ensures compatibility with existing land uses and minimizes conflicts with agriculture, conservation, or residential areas.	conception phase. Incorporate community input into project planning and decision-making processes. • Collaborate with local authorities and land use planners to ensure alignment with zoning regulations and land use plans. Consider buffer zones and setbacks to mitigate potential conflicts with neighboring land uses.	
Site Selection and Feasibility	• Inappropriate site selection may lead to environmental degradation, such as habitat destruction, loss of biodiversity, or disruption of sensitive ecosystems. • Assessment of potential exposure to hazardous chemicals during battery manufacturing or recycling processes is crucial to protect the health and safety of workers and nearby communities. • Evaluation of fire and explosion risks associated with battery storage systems is essential to implement appropriate safety measures and emergency response protocols. • Identification of potential electric shock hazards during installation, maintenance, or operation of battery systems is necessary to ensure worker safety. • Conducting a health impact assessment helps evaluate potential health effects on nearby communities due to air or water pollution associated with battery manufacturing or operation.	• Conduct comprehensive environmental assessments to identify suitable sites with minimal environmental impact. Prioritize brownfield sites or locations with existing infrastructure to reduce habitat disturbance. • Conduct comprehensive health impact assessments to evaluate potential health effects on nearby communities. Implement measures to minimize air and water pollution, such as emissions controls and wastewater treatment systems.	Pre-Construction Phase
Planning and Scheduling	• Planning for proper disposal or recycling of batteries at the end of their life cycle should be considered to minimize environmental contamination and e-waste accumulation. • Lack of community engagement can lead to social conflicts and opposition to the project. • Failure to consider land use regulations and community preferences may result in land use conflicts.	• Establish transparent communication channels, engage with local stakeholders, address concerns, and incorporate community input into project planning. • Collaborate with local authorities and communities, adhere to zoning regulations, and consider buffer zones to minimize conflicts.	Pre-Construction Phase
Mobilization and Construction	• Construction activities can lead to habitat destruction, soil erosion, and disruption of wildlife habitats. • Excavation and grading may alter the natural landscape and affect local ecosystems. • Construction equipment and vehicles emit pollutants such as particulate matter, nitrogen oxides, and noise pollution, which can degrade air quality and disturb local communities. • Runoff from construction sites can carry sediment, chemicals, and other pollutants into nearby water bodies, leading to water contamination and impacts on aquatic ecosystems. • Battery storage systems pose risks of fire or explosion due to thermal runaway or short circuits. • Workers involved in installation, maintenance, or operation of battery systems are at risk of electric shock. • Construction sites pose risks of falls, equipment-related injuries, and other accidents to workers. Exposure to hazardous materials or unsafe working conditions can lead to injuries or illnesses. • Installation of electrical systems and wiring for battery storage facilities presents risks of electric shock and arc flash incidents to workers. • Construction activities involving battery systems or electrical components pose risks of fire or explosion incidents if proper safety protocols are not followed.	• Implement electrical safety protocols, provide training, and use insulation barriers to prevent electric shock hazards. • Implement plans for responsible disposal or recycling of batteries at the end of their life cycle. Develop partnerships with certified recycling facilities and ensure compliance with waste management regulations. • Implement strict protocols for handling hazardous chemicals in battery manufacturing and recycling facilities. Provide comprehensive training, personal protective equipment (PPE), and ventilation systems to minimize exposure risks. • Install fire detection and suppression systems in battery storage facilities. Develop emergency response plans and conduct regular drills to ensure swift and effective response in case of fire or explosion incidents. • Implement stringent electrical safety protocols, including lockout/tagout procedures and insulation barriers, to protect workers from electric shock hazards. Implement erosion control measures such as sediment barriers and silt fences to minimize soil erosion and protect nearby water bodies. • Use low-emission construction equipment and vehicles and implement dust control measures to reduce air pollution. • Schedule construction activities to minimize noise disturbances during sensitive periods and implement noise mitigation measures such as barriers or soundproofing. • Implement comprehensive safety training programs for construction workers, emphasizing hazard identification, proper equipment usage, and emergency response procedures. • Conduct regular safety inspections and audits to identify and address potential hazards on construction sites.	Construction Phase
Operation and Maintenance	• Battery operation requires energy input for charging and discharging cycles, which may contribute to resource consumption and associated environmental impacts, depending on the energy source used. • Energy generation for battery charging may produce air emissions such as greenhouse gases (GHGs), particulate matter, and nitrogen oxides, depending on the energy source, leading to air pollution and climate change impacts. • Water may be required for cooling systems or other operational processes, leading to water consumption and potential impacts on local water resources. • Workers may be exposed to hazardous chemicals during battery manufacturing or recycling processes.	• Prioritize the use of renewable energy sources for battery charging to minimize GHG emissions and air pollution. • Implement energy efficiency measures and optimize battery charging and discharging schedules to reduce resource consumption and environmental impacts. • Implement water-saving measures and recycling systems to minimize water usage and mitigate impacts on local water resources. • Provide comprehensive training and personal protective equipment (PPE) to workers involved in maintenance activities, emphasizing hazard identification and safe handling procedures.	Pre-Construction Phase

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	• Workers involved in installation, maintenance, or operation of battery systems are at risk of electric shock. • Maintenance activities may involve handling hazardous materials or chemicals, posing risks of exposure to workers. Battery electrolytes and other components may present health hazards if not handled properly. • Operations and maintenance personnel are at risk of electric shock or arc flash incidents when working with energized electrical systems and battery components. • Battery systems pose risks of fire or explosion incidents due to thermal runaway, short circuits, or overcharging, requiring proper safety protocols and emergency response procedures. • Operations and maintenance activities may impact nearby communities through air and noise pollution, traffic congestion, or other disturbances, affecting residents' health and safety. • Ensuring fair labor practices, wages, and working conditions for operations and maintenance workers is essential to prevent social tensions and promote community acceptance. • Continued engagement with local communities and stakeholders is important to address concerns, gather feedback, and maintain positive relationships throughout the operational phase.	• Implement lockout/tagout procedures and other electrical safety protocols to prevent electrical accidents and ensure safe maintenance operations. • Install fire detection and suppression systems, develop emergency response plans, and conduct regular safety drills to mitigate fire and explosion risks. • Implement measures to minimize operational impacts on nearby communities, such as noise barriers, dust control measures, and traffic management plans. • Adhere to labor laws and regulations, promote fair employment practices, and provide training and capacity building opportunities for operations and maintenance workers. • Maintain open communication channels with local communities and stakeholders, address concerns in a timely manner, and involve stakeholders in decision-making processes related to operations and maintenance activities.	

6.3.5.4 Key Environmental, Health and Safety, and Social Risks in a Green Hydrogen Project

Typical Environmental & Social concerns in a Green Hydrogen Project has been presented in **Table 6-4.**

Table 6-6 Key Environmental, Health and Safety and Social Risks for Green Hydrogen Projects

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
Project Conception	• Feasibility of local policy structure for setting up of project with respect to land uptake • Ease of doing business in general and ease of acquiring land in particular based on local level laws / rules / policies of relevant statutory offices. • Changes in government policies – alternations in government initiatives, subsidies, or regulations supporting development of apparatus for Renewable energy project can impact the economic viability of the project. • Supply Chain Risks – Dependence on specific suppliers for components like electrolysers, rectifiers and transformers can expose projects to supply chain disruptions, affecting timelines and costs. • Policy and supportive framework evolution – changes in government support schemes, or Renewable energy target can influence the financial viability of green hydrogen business.	• Understanding of higher level EHS&S risks and potential impacts associated with assessed sites. • Include critical environmental and social risks assessed from higher level review into the decision-making process for project development. • Identify EHS&S issues to be categorized on basis of its perceived impact on environment and social. The categorization and assessment of risks at this stage will be largely limited to information available from secondary sources. • Managing transitional risks through robust risk assessment, strategic planning, and continuous monitoring. It also involves staying abreast of policy development, market dynamics, and technological advancements to adapt to changing circumstances effectively.	Pre-Construction Phase
Site Selection and Feasibility	• Proximity of the site to ecological sensitivities like Sanctuaries, National Parks, Reserve Forest, Protected Forest, or reserved land, presence of endangered species/ migratory path/ corridor for threatened species. • Potential regulatory challenges in the environmental, land, labour or community domains that can trigger incessant delay to the project and deem it non-feasible. • Large-scale green hydrogen projects may require land acquisition or infrastructure development, potentially leading to the displacement of communities or disruption of traditional livelihoods. • Assessment of local resource availability for the project which involves sourcing of labour and assess any security issues. • Assessment of supply chain risks w.r.t environment and social aspects • Presence of polluting industries in vicinity. • Reputational risks and possibility of protests and other security risks etc. • Social acceptance and community relations – Local opposition to industries due to availability of land, visual impacts, noise, or other factors can pose risks to project development and operation. • Natural Hazards (Environmental) risks like flooding, seismic activities, fire outbreak etc causing structural damage.	• Site reconnaissance survey for evaluating the EHS&S scenario at the site level should be undertaken by the project team and supported by the EHS team and sector specific experts (such as social expert, biodiversity expert geologist etc.) as per requirement and necessity. Output from site screening and reconnaissance exercise can be captured in the site screening checklist which has been developed as part of this ESG MF . • ESG MF Manager and ESG MF head shall identify the team for the site survey based on skill, experience, local knowledge of the place, people, and language. • Follow the developed land screening & procurement procedure as part of this ESG MF for undertaking the land screening. • Conduct thorough site assessments to avoid locations prone to natural hazards. • Liaison and procurement process for the identified sites in parallel to the EHS&S screening process • Avoidance of land which may result into physical and economic displacement of formal and/or informal land users. If avoidance is not possible then undertake the Resettlement Action Plan (RAP) and/or Livelihood Restoration Plan (LRP) if identified by Environmental and Social Impact Assessment (ESIA). • The Land team would be assisted by the ESG MF Committee and relevant personal in evaluating land for the project.	Pre-Construction Phase
Planning and Scheduling	• Environmental and Social impacts / risks associated with Project and its associated facilities.	• Conduct detailed ESIA/ ESDD in order to assess social, cultural, environmental, health and safety risks in accordance with the applicable reference framework.	Pre-Construction Phase

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project

	• Land related issues specifically when land is acquired following the Land Acquisition Act for the project and not purchased via willing buyer-willing seller negotiated settlement or land allocated within industrial or SEZ zones.
	• Some of the typical concerns associated with land include:
	  ○ Issue of compensation in case of land acquisition especially keeping in mind the market rate and the valuation of assets.
	  ○ Conflict arising from Local level (Panchayat level) consultations.
	  ○ Issue of land ownership and right of Way.
	  ○ Addressing the rights of informal occupants or people depending upon the land in any way for their livelihood
	  ○ Effect on land-based livelihood
	  ○ Significance of impact on customary rights of use and access to land and natural resources; socioeconomic status; cultural and communal integrity; health, education, livelihood, and social security status; and the recognition of Indigenous knowledge of schedule tribes' families and communities
	  ○ Common property resources and effect on the local population in case of land acquisition
	• Non-existent stakeholder engagement mechanism or redressal mechanism for grievances
	• Risks related to permits and approvals:
	  ○ Inadequacy of obtaining key approvals and permissions for prior start of construction within stipulated period
	  ○ Non-Compliance to regulatory requirements leading to delay of construction and mobilization.
	• Risk related to acute and chronic natura hazards (environment)
		• Formulation of site-specific management plans which meets the applicable reference framework requirements.
		• The ESG MF head shall identify individuals at the project site level to undertake responsibilities identified under each plan.
		• EHS&S criterions to be included in the contractor evaluation process.
		• Land team to identify land-based impacts as part of the initial land screening process.
		• Land team to review the ESIA/ESDD outcomes from the report and put into implementation suggested mitigation measures as per the action plan from the study.
		• In case land-based impacts such as resettlement and rehabilitation, impact or any socio-economic status of the community is identified as per the ESIA/ESDD, the TOR to be developed for detailed assessment of land-based impacts by the Land Team in association with the EHS team.
		• The ESIA study commissioned to be mandatory concluded prior to mobilization and construction activities at the project site.
		• The inputs from the ESIA study to the project finalization shall include in detail the following element in the Environment and Social Management Plan:
		  ○ Environment Management and Action Plan (Pollution Prevention, Resource Efficiency, Environment Monitoring)
		  ○ Health and Safety Management Plans (Occupational Health & Safety, Emergency Preparedness, Traffic Management, Community Health & Safety)
		  ○ Social Action Plan (Labour Management, Supply Chain management, Security Personal Management, Stakeholder Engagement Framework, Gender Based Violence, Human Rights Risk Assessment, Internal & External grievance redressal mechanism)
		• To avoid delays regarding regulatory approvals, the process for obtaining permissions will be initiated in the initial stages of the project itself.
		• The contractor engaged for rendering security services shall be guided as per the security management plan
		• Design and construct projects with resilient infrastructure to withstand natural hazards and maintain structural integrity
		• Implement monitoring systems and early warning mechanism to detect and respond to hazards promptly
		• Integrate climate-resilient planning into the design and operation of projects to address chronic risks
		• Secure appropriate insurance coverage and integrate financial planning for potential natural hazards events	

Mobilization and Construction	Construction phase of green hydrogen projects will typically include development of production and storage units which will primarily have following EHS&S risks: <u>Environmental risks</u> **Land Use and Habitat Disruption:** • Large-scale deployment of Renewable energy infrastructure, such as solar panels or wind turbines, for electricity generation required for electrolysis may lead to land use changes and habitat disruption, impacting biodiversity and ecosystem services. • Installation and operation of hydrogen production facilities and associated infrastructure may require land clearance, excavation, or alteration of natural landscapes, potentially affecting sensitive ecosystems and protected areas. **Water Consumption and Quality:** • Construction activities may require water for dust suppression, equipment operation, and concrete mixing, leading to increased water consumption. • Surface runoff from construction sites can carry sediment, pollutants, and construction-related contaminants into nearby water bodies, potentially degrading water quality and aquatic habitats. **Chemical Pollution and Spills:** • Handling and storage of chemicals used in electrolysis processes, such as electrolyte solutions, cleaning agents, or hydrogen sulphide gas, can lead to chemical spills or releases if proper containment measures are not in place. • Accidental spills or leaks of hazardous chemicals can contaminate soil, water bodies, and groundwater, posing risks to human health, aquatic ecosystems, and wildlife. **Waste Generation and Disposal:** • Green hydrogen projects may generate waste streams, such as spent catalysts, membranes, or other materials from electrolysis processes. Proper waste management	<u>Environment</u> **Land Use and Habitat Disruption:** • Prioritize siting green hydrogen projects on degraded or non-pristine land to minimize habitat disruption. • Conduct comprehensive environmental impact assessments to identify sensitive habitats and ecosystems and implement avoidance and mitigation measures. • Implement habitat restoration and conservation initiatives to offset any unavoidable impacts, such as reforestation or wetland restoration projects. **Water Consumption and Quality:** • Exclusion of surface and ground water usage for H_2 production in areas with water stress (water supply less than 1700 m^3/year per person) • Optimize water use efficiency through the adoption of advanced water recycling and reuse systems to minimize freshwater consumption. • Implement water-saving technologies and practices, such as drip irrigation or low-flow fixtures, in electrolysis facilities and associated infrastructure. • Treat wastewater and brine discharge to meet water quality standards before release and explore opportunities for beneficial reuse or recycling of treated water. **Chemical Pollution and Spills:** • Implement spill prevention and response measures, such as secondary containment systems, leak detection systems, and emergency response training, to minimize the risk of chemical spills.	Construction Phase

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	practices are necessary to minimize environmental pollution and ensure responsible disposal or recycling of waste materials. • Decommissioning of hydrogen production facilities and infrastructure at the end of their operational life may result in the generation of waste materials and require proper remediation and site restoration measures. **Air Pollution and Emissions:** • Construction activities, such as earthmoving, excavation, and vehicle traffic, can generate dust, particulate matter, and air pollutants, contributing to local air pollution. • Emissions from construction equipment, including diesel engines and heavy machinery, can release pollutants such as nitrogen oxides (NOx), sulfur dioxide (SO_2), and volatile organic compounds (VOCs), impacting air quality and human health. **Ecological and Climate Impacts:** • Indirect land use change, such as deforestation or conversion of natural ecosystems for biomass feedstock production, may occur to meet the demand for Renewable resources used in green hydrogen production. • Changes in land use patterns, water availability, and ecosystem dynamics associated with green hydrogen projects can have long-term ecological and climate impacts, affecting biodiversity, soil health, carbon sequestration, and ecosystem resilience. **Occupational Health and Safety Risks** **Electrolyzer Installation and Construction:** • **Physical Hazards:** Construction activities involving heavy machinery, lifting equipment and structural installations pose risks of injuries due to falls, collisions, or accidents. • **Electrical Hazards:** Installation and connection of electrical equipment, such as electrolyzers and power distribution systems, may lead to electric shocks or arc flash incidents if not handled properly. • **Chemical Hazards:** Handling of chemicals used in electrolysis processes, such as electrolyte solutions or cleaning agents, can result in chemical exposure or spills if proper safety protocols are not followed. **Environmental Health Hazards:** • **Chemical Exposure:** Workers may be exposed to hazardous chemicals, such as electrolyte solutions, cleaning agents, or hydrogen sulfide gas, which can pose health risks if proper personal protective equipment (PPE) and ventilation measures are not implemented. • **Noise and Vibration:** Noise and vibration from equipment operation, such as compressors, pumps, or cooling systems, may lead to hearing loss, musculoskeletal disorders, or other health issues if not adequately controlled. **Community Health and Safety** • Increased incidence of communicable and vector-borne diseases attributable to construction activities represents a potentially serious health threat to residents of local communities. • Significant increase in movement of heavy vehicles for the transport of construction materials may increase the risk of traffic-related accidents and injuries to local communities. • Exposure to high noise level and air emissions. **Social Risks** • Non-Compliance with national requirements with respect to minimum wage and other social benefits (e.g., payment of ESI, provident fund, etc.) • Discrimination against contract or migrant workers. • Forced labour/human trafficking. • Low or insufficient wages. • Excessive overtime. • Lack of freedom of association or grievance mechanisms • If land is leased for a project, the construction activities associated with the project may result in land contamination, altering its characteristics and rendering it unsuitable for agriculture or other activities once the lease period expires.	• Conduct regular inspections and maintenance of chemical storage and handling equipment to ensure integrity and prevent leaks or releases. • Use less hazardous chemicals or alternative green chemistry approaches where feasible to reduce the risk of environmental contamination. **Waste Generation and Disposal:** • Adopt a waste minimization hierarchy, prioritizing waste prevention, reuse, recycling, and responsible disposal practices. • Implement waste management plans to segregate, treat, and dispose of waste streams generated from green hydrogen projects in accordance with regulatory requirements. • Explore opportunities for by-product utilization or valorization to minimize waste generation and maximize resource efficiency. **Air Pollution and Emissions:** • Implement emission control technologies and best practices to reduce air pollutant emissions from construction, transportation, and operation of green hydrogen projects. • Use clean fuels and low-emission vehicles and equipment for construction and transportation activities to minimize air pollution impacts. • Monitor air quality regularly and implement corrective actions as needed to mitigate adverse effects on human health and the environment. **Ecological and Climate Impacts:** • Implement sustainable sourcing practices for Renewable resources used in green hydrogen production, such as biomass feedstocks, to avoid negative impacts on ecosystems and biodiversity. • Conduct strategic environmental assessments to evaluate the cumulative impacts of green hydrogen projects on biodiversity, ecosystem services, and climate resilience. • Enhance carbon sequestration and ecosystem resilience through land restoration, reforestation, and conservation initiatives to offset greenhouse gas emissions and promote climate adaptation. **Occupational Health and Safety** **Risk Assessment and Management:** • Conduct comprehensive risk assessments to identify potential hazards and assess the likelihood and severity of risks associated with green hydrogen projects. • Implement risk management strategies, including hazard controls, risk mitigation measures, and emergency response plans, to minimize OHS risks and ensure worker safety. **Engineering Controls:** • Design and engineer facilities and equipment with built-in safety features to minimize OHS risks. Examples include pressure relief valves, gas detection systems, emergency shutdown systems, and automated safety interlocks. • Use inherently safer design principles to reduce or eliminate hazards where feasible, such as selecting non-flammable materials, designing for passive safety, and minimizing the use of hazardous chemicals. **Administrative Controls:** • Develop and implement safe work procedures, standard operating procedures (SOPs), and job safety analyses (JSAs) to guide workers in performing tasks safely. • Establish clear protocols for equipment operation, maintenance, and emergency response, and ensure workers are trained on these procedures.	

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	• Furthermore, the unintentional release of hazardous materials during the construction phase poses a risk of contaminating nearby land or land in close proximity to the construction site. <u>Supply Chain Risks</u> • Sustainable supply chain risks refer to potential disruption or negative impacts on the environmental, social, and ethical aspects of the Project's supply chain. Provided below the key sustainability supply chain risks: o Conflict minerals: Chemicals specially used for manufacturing of electrolysers sourced from conflict zones may contribute to human rights abuses and environmental harm. o Exploitative Labour: Supplier engaging in exploitative labour practices, such as child labour or unsafe working conditions, can lead to ethical and legal issues. o Poor working conditions: Suppliers with inadequate working conditions may contribute to negative social impacts. o Non-compliance: Suppliers not adhering to environmental regulations or social standards may expose the company to legal and reputational risks o Human rights violations: Suppliers involved in human rights violations, such as forced labour, can lead to reputational damage	• Implement permit-to-work systems, lockout/tagout procedures, and confined space entry protocols to control hazardous energy sources and prevent accidents during maintenance activities. Personal Protective Equipment (PPE): • Provide appropriate PPE, such as safety glasses, gloves, hearing protection, respiratory protection, and flame-resistant clothing, to workers based on the hazards present in their work environment. • Ensure workers are trained on the proper selection, use, maintenance, and disposal of PPE to protect themselves from workplace hazards effectively. Training and Competency: • Provide comprehensive training and competency assessment programs for workers involved in green hydrogen projects, covering topics such as hydrogen safety, electrical safety, chemical handling, emergency response, and first aid. • Offer specialized training for supervisors, operators, maintenance personnel, and contractors to ensure they have the knowledge and skills to perform their roles safely and effectively. Emergency Preparedness and Response: • Develop and implement emergency response plans and procedures to address potential incidents, such as fires, explosions, leaks, spills, or chemical releases. • Conduct regular emergency drills and exercises to test the effectiveness of response plans and familiarize workers with emergency procedures. • Establish communication protocols, emergency contact information, and evacuation routes to ensure timely response and coordination during emergencies. Continuous Improvement and Monitoring: • Establish a system for ongoing monitoring, inspection, and auditing of OHS performance to identify areas for improvement and ensure compliance with regulatory requirements. • Encourage worker participation in safety committees, hazard reporting systems, and incident investigations to promote a culture of safety and continuous improvement. <u>Community Health and Safety</u> • Providing surveillance and active screening and treatment of workers • Undertaking health awareness and education initiatives, for example, by implementing an information strategy to reinforce person-to-person counselling addressing systemic factors that can influence individual behaviour as well as promoting individual protection and protecting others from infection. • A traffic management plan should be developed to detail out routes to be used during transportation activities and measures to be taken to avoid accidents. • Adequate trainings should be provided to workers on driving safety. <u>Social</u> • Develop adequately defined hiring and remuneration policies and terms of employment for contract/migrant workers. • Communicate policies to workers, supervisors, managers and recruitment agencies. • Make sure that contract/migrant workers are informed (in all applicable languages) on their rights including wages, benefits and deductions. • Ensure organizational labour policies are understood by the contractors and make policies contractually binding under the service agreement with contractors. • Overtime should be paid to the workers in line with national regulations.	

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
		• Contamination prevention during construction – (i) Properly manage hazardous materials, chemicals, and waste generated during construction activities; and (ii) Regularly monitor soil quality and groundwater to detect any contamination early. • Post-lease land restoration – (i) Develop a restoration plan for the land once the lease period ends; (ii) Remediate any contamination caused during the project; and (iii) Restore the land to its original state. <u>Supply Chain</u> • Conduct thorough assessments of suppliers to ensure they align with sustainability standards and ethical practices • Implement and enforce procurement and supply chain policy	
Operation and Maintenance	Operation phase of green hydrogen projects will typically include **production of green hydrogen, storage, distribution and transportation** which will primarily have following EHS&S risks: <u>Environmental risks</u> **Air Quality:** • Emissions from hydrogen production processes, such as electrolysis or steam methane reforming (if natural gas is used), can contribute to air pollution. This may include emissions of greenhouse gases (e.g., CO_2), Nitrogen oxides (NOx), Sulfur dioxide (SO_2), and Particulate matter (PM). • Hydrogen production facilities may also emit fugitive volatile organic compounds (VOCs) or other air pollutants from storage tanks, piping, or leaks in equipment. • Emissions associated with the production and transportation of materials, equipment, and hydrogen fuel may contribute to air pollution and local environmental impacts, particularly during operation phases. • Dust, particulate matter, and other pollutants generated from construction activities, transportation, and operation of green hydrogen projects can degrade air quality and affect human health and ecosystems. **Water Resource:** • During the operational phase, water is required in electrolysis for green hydrogen production. However, depending on where the water comes from and how much is available, there could be substantial water consumption. This might result in competition for water resources with other users and ecosystems, especially in regions facing water scarcity. • Green hydrogen projects that use water-intensive electrolysis processes or require large quantities of water for cooling may impact local water resources. This includes freshwater abstraction from rivers, lakes, or aquifers, which can affect aquatic ecosystems and water availability for other users. • Discharge of wastewater or brine from desalination processes used in electrolysis may affect water quality, increasing salinity levels in water bodies and impacting aquatic ecosystems and freshwater resources. • Green hydrogen production typically requires large amounts of water for the electrolysis process. This can put a strain on water resources in areas that are already facing water scarcity or water stress. While the use of deionized water produced by desalination plants may reduce freshwater demand, it generates a need to discharge a stream of brine into the water sources and soils. Discharge of wastewater / brine - Increase in salinity and density of water in the receiving body, which may lead to higher water stratification and reduced oxygen exchange in the water column. Eutrophication due to phosphate enrichment if polyphosphates and organic cleaning solutions are added to the brine. Discoloration of receiving waters, due to high concentration of ferric substances, also with high suspended solids and turbidity.	<u>Environment</u> **Air Quality:** • Diesel generators should be equipped with acoustic enclosure and should have adequate stack height as per Central Pollution Control Board (CPCB) norms. • Implement emission control technologies, such as catalytic converters, scrubbers, or selective catalytic reduction (SCR) systems, to reduce air pollutant emissions from hydrogen production processes. • Optimize process efficiency and fuel switching to low-carbon or Renewable energy sources to minimize greenhouse gas emissions and criteria air pollutants. • Conduct regular monitoring of air quality and emissions to assess compliance with regulatory standards and identify opportunities for improvement. **Water Resource:** • Implement water conservation measures, such as recycling and reuse of process water, to minimize freshwater consumption and reduce the impact on local water resources. • Use alternative water sources, such as treated wastewater or brackish water, for non-potable uses to reduce pressure on freshwater supplies. • Treat wastewater and brine discharge to meet water quality standards before release and explore opportunities for beneficial reuse or recycling of treated water. **Land Use and Habitat Impacts:** • Minimize land disturbance and habitat loss by optimizing site layout and design to reduce the footprint of green hydrogen facilities and associated infrastructure. • Implement biodiversity conservation measures, such as habitat restoration, creation of wildlife corridors, and establishment of buffer zones, to mitigate habitat impacts and enhance ecological connectivity. • Conduct ecological surveys and environmental impact assessments to identify sensitive habitats and specie and implement avoidance and mitigation measures to minimize impacts on biodiversity. • Development of brine water management plan. Discharge of brine water to be in compliance with the applicable norms and legal permits. • Water discharge modelling: The increase in salinity or temperature, or the reduction in dissolved oxygen, in the water bodies receiving brine discharge from electrolysers or cooling systems shall be modelled. **Biodiversity:** • Implement habitat restoration and conservation initiatives to offset habitat loss and fragmentation caused by project development, such as reforestation, wetland restoration, or creation of artificial habitats. • Implement measures to reduce wildlife disturbances and mitigate the impact of project operations on sensitive species, such as timing construction activities to avoid breeding seasons or migratory periods. • Monitor wildlife populations and habitat conditions to assess the effectiveness of mitigation measures and adapt management practices as needed.	

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project

	Land Use and Habitat Impacts:
	• Operation of green hydrogen facilities may require land for infrastructure such as electrolyzer plants, storage tanks, pipelines, and access roads. Land clearance and development can result in habitat loss, fragmentation, and disturbance, affecting terrestrial ecosystems, wildlife habitats, and biodiversity.
	• Changes in land use patterns associated with green hydrogen projects may also impact soil quality, erosion rates, and vegetation cover, leading to degradation of natural landscapes and ecosystems.
	
	Biodiversity Impacts:
	• Alteration of land use and habitat loss due to green hydrogen project operations can result in biodiversity impacts, including loss of habitat for native species, fragmentation of ecosystems, and disruption of ecological processes.
	• Construction activities, noise, and disturbances associated with project development and operation may also disrupt wildlife behaviour, migration patterns, and reproductive cycles, particularly in sensitive or protected areas.
	
	Ecosystem:
	• Green hydrogen projects may impact ecosystem services provided by natural ecosystems, such as carbon sequestration, water purification, flood regulation, and soil fertility. Alteration of land use and habitat conversion can compromise the capacity of ecosystems to provide these services, affecting both human well-being and ecological integrity.
	
	Energy Intensity and Carbon Footprint:
	• The energy intensity of electrolysis processes can result in high energy consumption and carbon emissions if not optimized.
	• Energy requirements for manufacturing electrolyzers, Renewable energy infrastructure, and other components of green hydrogen projects may contribute to carbon emissions and other environmental impacts associated with the production and transportation of materials.
	
	Impact on the composition and distribution of biota
	• Both ammonia and methanol are not persistent and biodegradable. However, in case of continuous discharge or leaks into water bodies, these may represent an immediate danger to aquatic life, with subsequent impacts also on the livelihood of communities depending on it.
	
	Noise and Visual Impacts:
	• Operation of hydrogen production facilities, transportation of hydrogen, and associated infrastructure can generate noise and visual impacts that may affect local communities and wildlife habitats.
	• Noise pollution from equipment operation, vehicle traffic, and construction activities can disrupt wildlife behavior, stress sensitive species, and degrade the quality of the surrounding environment.
	• Main source of noise generation at hydrogen production facility would be compressors and other process equipment, venting if tanks or trailers. ,Potential contamination by oil from compressor (leak, vapour emission), hydraulic system, transformer, storage of refill oil.
	
	Occupational Health & Safety Risks
	Hydrogen Handling and Storage:
	• **Fire and Explosion Risks:** Hydrogen is highly flammable and can form explosive mixtures with air. Handling, storage, and transfer of hydrogen gas pose fire and explosion risks if leaks or ignition sources are present.
		Ecosystem:
		• Identify and prioritize ecosystem services provided by natural ecosystems in project areas, such as carbon sequestration, water purification, and soil stabilization, and incorporate them into project planning and decision-making processes.
		• Implement measures to enhance ecosystem services, such as reforestation, soil conservation, and sustainable land management practices, to restore and protect natural capital and support human well-being.
		• Collaborate with local communities and stakeholders to identify and address their needs and priorities related to ecosystem services, ensuring equitable access and distribution of benefits.
		
		Noise and Visual:
		• Low noise emitting machinery and equipment will be purchased.
		• Plant layout to be established such that noise level at the boundary / sensitive receptors adjacent to the facility should be minimum.
		• Implement noise mitigation measures, such as sound barriers, acoustic insulation, and buffer zones, to minimize the impact of project operations on nearby communities and sensitive wildlife habitats.
		• Design and landscape green hydrogen facilities and associated infrastructure to minimize visual impacts and integrate them harmoniously into the surrounding environment.
		• Engage with local communities and stakeholders to address concerns related to noise and visual impacts and implement measures to enhance public awareness and acceptance of green hydrogen projects.
		
		Waste Management
		• Preparation of a management plan to manage obsolete, abandoned, hazardous materials or oil consistent with the approach to hazardous waste management.
		• A dedicated waste management plan should be developed for storage, handling and treatment of wastes generated at site in line with regulatory requirements.
		• Hazardous material/ waste to be stored and handled as per the applicable rules. Spill control procedure to be developed and spill kit to be placed at storage area. Adequate training on handling and management of spill to be provided to the staff.
		• The spent electrolyte must be managed and disposed of in accordance with the regulations. This may involve treating the spent electrolyte to neutralize any hazardous constituents and then disposing of it at a designated hazardous waste disposal site.
		• When transformers and rectifiers reach the end of their useful life, they must be properly disposed of or recycled.
		<u>Occupational Health and Safety</u>
		• Perform a complete Quantitative Risk Assessment (QRA) and assess individual and societal risk. It should include detailed analysis of-
		  ○ The forecasted frequency and magnitude of potential accidents
		  ○ The extension of potentially affected areas
		  ○ The forecasted number of injuries and fatalities within the population
		  ○ The overall risk assessment in terms of both individual and societal risk
		• Compliance with the Rules and permits obtained for the Project.
		• Hydrogen is colorless and odorless, and it burns without a visible flame. The odorizing of hydrogen in production facilities is not feasible. Sensors and alarms shall be installed within plants that are capable of providing early warning in case of leaks.
		• In case of significant leak from systems under pressure, the jet of released hydrogen may undergo autoignition due to electrostatic charges originated by the jet itself. Control of electrostatic charges is crucial in hydrogen facilities.
		• Material selection (stainless steel, nickel alloys) for pipes, tanks, equipment, such as compressors, pumps, and valves, will be compatible with hydrogen gas and resistant to corrosion and embrittlement.
		• Preventive maintenance on a regular basis to be undertaken avoid failure and potential loss of hydrogen containment.	

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	• **Asphyxiation Hazard:** Hydrogen gas is lighter than air and can displace oxygen in poorly ventilated areas, leading to asphyxiation hazards for workers. • **Pressure Hazards:** High-pressure storage vessels and pipelines used for hydrogen storage pose risks of rupture or bursting if not operated within safe pressure limits. **Maintenance and Repair:** • **Confined Space Risks:** Maintenance activities inside confined spaces, such as electrolyzer compartments or storage tanks, may pose risks of asphyxiation, chemical exposure, or entrapment if proper safety precautions are not implemented. • **Mechanical Hazards:** Maintenance tasks involving moving parts, equipment inspection, or repairs may lead to injuries due to mechanical hazards, such as crushing, entanglement, or contact with rotating machinery. • **Lockout/Tagout:** Proper lockout/tagout procedures are essential to prevent unexpected equipment startup or release of hazardous energy sources during maintenance activities, reducing the risk of injuries or fatalities. Community Health and Safety • Process safety is a major concern in facilities where hydrogen, ammonia, or methanol are produced and stored. Fire, explosions, and accidental toxic releases may affect areas well beyond the plant area and endanger lives of communities in the area of influence • Increased incidence of communicable and vector-borne diseases attributable to construction activities represents a potentially serious health threat to residents of local communities. • Significant increase in movement of heavy vehicles for the transport of construction materials may increase the risk of traffic-related accidents and injuries to local communities. • Exposure to high noise level and air emissions • The transportation of hydrogen to end-users involves safety risks, including leakage and handling during transit. Pipeline Failure: • Corrosion, mechanical damage, or improper installation can lead to pipeline leaks or ruptures, resulting in ammonia release. • Aging infrastructure and inadequate maintenance practices increase the likelihood of pipeline failures. Fire Hazard: • Ammonia is flammable and can form explosive mixtures in air at certain concentrations (16-25% by volume). • Ignition sources such as sparks, open flames, or hot surfaces can trigger fires or explosions if ammonia vapors are present. Ammonia Leakage: • Ammonia is toxic and can cause respiratory irritation, burns, and chemical burns upon contact with skin, eyes, or mucous membranes. • Inhalation of high concentrations of ammonia vapor can result in severe respiratory distress and pulmonary edema, leading to potentially fatal outcomes. Chemical Exposure: • Workers handling ammonia are at risk of exposure through inhalation, skin contact, or ingestion, which can lead to acute or chronic health effects. • Exposure to ammonia can cause irritation of the respiratory system, eyes, and skin, as well as systemic toxicity and chemical burns. Release of Hazardous By-products:	• OHS manual with the required SOPs will be developed. • Proper handling, storage, and safety protocols to prevent accidents and protect personnel. • Hydrogen production facility will be adequately ventilated and regular maintenance and inspection of ventilation system will be undertaken. • Procedure for safety audits will be developed and regular audits will be conducted as per the procedure. • Robust containment and cleanup measures. • Develop emergency response plans covering **all the identified emergencies like fire, explosion, chemical leaks, equipment failure, natural disasters, etc. to be prepared and implemented. Period mock drills shall be undertaken.** • Adequate personal protective equipment (PPE) such as eaHFEugs, safety shoes, safety helmet and reflective coats should be provided to the workers • Periodic trainings should be imparted to workers with respect to safe work practices, appropriate use of PPE, Electrical Safety, Fire Safety, hazardous material handling etc. • Periodic mock drills on fire and natural disasters should be conducted at site. • Permit to work at confined areas should be issued prior to working in such areas. • Conduct periodic drinking water test to ensure safe water is provided to workers for drinking. • Development of on-site and off-site emergency response plan including all site specific hazards and associated safe procedures to be followed. Community Health and Safety • **Transportation of hydrogen** o Compliance with the certification of the vehicle and transport to be as per the applicable norms o Inspection of transportation vehicle to be undertaken before start of the transportation o Regular maintenance of transportation vehicles to be undertaken o Vehicle drivers to be adequately trained on the safety risks & management measures, safe driving, loading / unloading procedures, signalling, maximum allowable speed, emergency management and documentation o The design of pipeline paths shall consider safety distances from existing buildings o Inherent safety measures will include pipeline with small diameter, flow restriction devices, inside pipes and tanks. • A quantitative risk assessment (QRA) shall be conducted for identify potential hazards, explosions, etc. management plan based on the outcome of the QRA to be developed. • Emergency Response Plan developed for the Project shall be implemented and communicated to the staff and nearby community. • Community health and safety management plan shall be prepared and implemented • Put in place a grievance mechanism to allow for the workers and community members to report any concern or grievance related to project activities • Providing surveillance and active screening and treatment of workers. • A traffic management plan should be developed to detail out routes to be used during transportation activities and measures to be taken to avoid accidents; • Adequate trainings should be provided to workers on driving safety; • Stringent safety measures must be in place to ensure safe hydrogen transportation. Social • Develop adequately defined hiring and remuneration policies and terms of employment for contract/migrant workers; • Communicate policies to workers, supervisors, managers and recruitment agencies; • Make sure that contract/migrant workers are informed (in all applicable languages) on their rights including wages, benefits and deductions. • Ensure organizational labour policies are understood by the contractors and make policies contractually binding under the service agreement with contractors; • Overtime should be paid to the workers in line with national regulations	

Project Phase	EHS&S and transitional Risks/Impacts	Recommended Risk/Impact Mitigation and Management Measures	Phase of the Project
	• During ammonia production, other hazardous chemicals may be used or produced as by-products, posing additional risks if released into the environment. • Chemical spills or releases of by-products such as hydrogen sulfide (H2S) can result in environmental contamination and health hazards. <u>Storage Tank Failures:</u> • Storage tanks used for storing ammonia may fail due to corrosion, overpressure, or structural weaknesses, leading to leaks or ruptures. • Improper tank maintenance, inspection, or inadequate safety measures increase the risk of storage tank failures. <u>Reactive Chemicals:</u> • Ammonia production processes may involve the use of reactive chemicals or catalysts that can pose chemical reaction hazards if mishandled or improperly controlled. • Uncontrolled chemical reactions or runaway reactions can result in release of toxic gases, heat, or pressure, leading to safety incidents or equipment damage. <u>Social Risks</u> • Non-Compliance with national requirements with respect to minimum wage and other social benefits (e.g., payment of ESI, provident fund, etc.)Discrimination against contract or migrant workers. • Forced labour/human trafficking. • Low or insufficient wages. • Lack of freedom of association or grievance mechanisms. • The operation of green hydrogen facilities, including electrolyzers and storage tanks, may generate noise or alter the visual landscape, affecting the quality of life for nearby residents. • Increased transportation activities associated with the operation of green hydrogen projects can lead to congestion, road wear, and strain on local infrastructure, impacting residents' mobility and access to services. • Green hydrogen projects may add to existing environmental burdens in communities already facing pollution from other industrial sources, exacerbating environmental injustices and health disparities. • Misinformation or lack of understanding about hydrogen technologies and their safety may lead to heightened fears and resistance among community members. • The operation of green hydrogen projects may disrupt traditional land uses, cultural practices, or indigenous rights. • Social divisions or conflicts may arise within communities over issues such as land use, employment opportunities, or revenue distribution.	• Noise and visual impact – HFE will implement soundproofing measures and landscaping to mitigate noise and visual disturbances from electrolyzers and storage tanks. • Increase transportation activities – (i) HFE will develop transportation management plans to minimize congestion and road wear by scheduling deliveries during off-peak hours or using alternative transportation routes; and (ii) HFE will invest in road maintenance and infrastructure upgrades to accommodate increased traffic and ensure smooth mobility for residents. • Exacerbation and Environmental Burdens – (i) HFE will conduct thorough environmental impact assessments to identify potential cumulative impacts and develop mitigation strategies; and (ii) Implement pollution control measures and adopt best practices in environmental management to minimize emissions and reduce environmental burdens. • Addressing Misinformation and Lack of understanding – (i) HFE will engage in transparent and accessible communication with the community to provide accurate information about hydrogen technologies, safety measures, and potential benefits; and (ii) HFE can offer educational programs, workshops, and site visits to increase public awareness and understanding of green hydrogen projects and their associated risks (wherever feasible). • Respect for traditional land uses and indigenous rights – HFE will consult with indigenous communities and stakeholders early in the project planning process to understand and respect traditional land uses and cultural practices. • Managing social divisions and conflicts – (i) Facilitate inclusive community engagement processes that allow for meaningful participation and representation from diverse stakeholders; and (ii) Establish transparent mechanisms for resolving conflicts and addressing grievances, such as community forums, mediation, or dispute resolution committees.	

7 Implimentation of Environmental, Social, and Governanace Management Framework

In this section, we delineate guidelines and procedures for deploying Environmental, Social, and Governanace MF s across the Planning, construction, operations, and maintenance phases of the project site, encompassing major maintenance and upgrade activities. The implementation of the ESG MF across all the phases of the project will lies on the ESG MF committee and Projects HSE committee.

The detailed description of the management plans and procedures applicable across different stages in project construction and operation phase is provided in this section. Each management plan developed encompasses the scope, objectives, reference framework, procedures to manage impacts, types, and frequency of training, as well as responsibilities at both the site and corporate levels for implementation and supervision (including workers, contractors, sub-contractors, etc.).

7.1 Environment Management

HFE is committed towards environmental protection and has prepared Environment Management Plan (EMP) to outline key guidelines that will improve the impact on environment as well as human health. EMP provides the measures to be implemented in all the phases of the project viz. construction and operation phase in order to minimize the identified risk or adverse impacts to the extent possible and enhance the opportunities of the project. This plan basically comprises of the following points: -

- Mitigation measures to deal with the adverse impacts on various environmental components (such as air and water quality, waste generated etc.) identified for construction, operation and decommissioning phases of the projects.
- Protection of environmental resources and enhance the value of environmental components where possible.
- Efficient resource utilization and conservation in every possible way at every possible place.
- Ensuring efficient waste management that includes waste collection, on-site segregation and final disposal as per the applicable regulations.
- Setting the minimum requirements necessary to manage project operations in compliance with applicable environmental legal requirements and good industry practices.

The scope of the EMP includes but not limited to management of following environmental elements:

7.1.1 Pollution Prevention

The construction and operational phases of renewable projects inherently possess the potential to generate a variety of pollution sources. It is imperative to engage in thorough planning from the project's inception to prevent adverse impacts on human, ecological, and environmental receptors. These potential pollutants encompass emissions to air, water, soil, and others. HFE is committed to proactive management of these potential pollution sources and will implement a comprehensive management program accordingly. The aspects incorporated into the pollution prevention MF are delineated below.

A detailed procedure, outlined in ***Appendix E,*** is applicable to all activities conducted by each project site and their contractors/sub-contractors during construction, upgrading, expansion, as well as operation and maintenance phases. The key aspects covered in the management plan is mentioned below:

- **Air Pollution Management:** This section incorporates procedures and delineates measures for mitigating and managing both point source and fugitive emissions specifically during the construction phase. While limited air emissions are anticipated during the operational phase of the project portfolio, this procedure is developed with the overarching goal of preventing, controlling, and abating air pollution. Its purpose

extends to establishing the minimum requirements for the management and supervision of both construction and operational activities concerning air emission management.

- **Noise/Vibration Management:** This section incorporates measures to regulate and control sources that produce and generate noise, with the objective of upholding ambient noise quality standards within the project site. Additionally, the procedure seeks to establish the minimum requirements for the management and supervision of operations and activities related to noise management.
- **Water and Wastewater Management:** This section outlines the procedures for both the management and discharge of water, as well as the development of a plan for the minimization and management of wastewater. The primary objective is to assess the wastewater management requirements associated with the development and identify the preferred wastewater treatment alternative, if deemed necessary.
- **Solid Waste Management:** Solid Waste Management involves a range of activities aimed at minimizing the health, environmental, and aesthetic impacts arising from the generation, storage, handling, collection, transportation, and disposal of solid waste. The primary goal is to mitigate the risks associated with solid waste and implement a systematic process for its management. This includes establishing a procedure for the management of large quantities of waste, ensuring proper storage, collection, authorized transportation, primary treatment, and disposal in an environmentally acceptable manner, in adherence to statutory requirements and related guidelines.
- **Hazardous Waste Management:** This plan is prepared with an objective to mitigate the risks associated with hazardous waste and implement an effective process for the management of hazardous chemicals. The objectives include reducing the generation of hazardous waste and minimizing the accumulation of unattended hazardous waste to alleviate the environmental, social, and economic impacts associated with hazardous waste generation and management.

7.1.2 Environmental Monitoring

Environmental monitoring is essential to evaluate environmental conditions and trends within the project site, generating information for reporting purposes. HFE will conduct monitoring activities to ensure compliance with laws and regulations, aiming to mitigate risks to the natural environment and protect human health. This monitoring effort spans both the construction and operation phases. The data obtained through monitoring serves as an indicator of any changes in environmental quality attributed to the project, compared to baseline environmental conditions. This enables timely implementation of mitigatory measures to safeguard the environment. The monitoring action plan, inclusive of various performance indicators and their frequency, is detailed in ***Appendix F***.

7.1.3 Biodiversity Management

The Biodiversity Management Plan is prepared to ensure that the development and operation of HFE's projects are carried out in an environmentally responsible and sustainable manner. The biodiversity management plan is crucial to conserve ecosystems, mitigating habitat disruption, protecting endangered species, sustaining ecosystem services, protecting sustainable land use etc. It is also essential for integrating projects into their surrounding ecosystems responsibly. It not only addresses environmental concerns but also contributes to the long-term sustainability and success of the project by ensuring harmony with the natural environment and local communities. A Biodiversity Management Plan is enclosed as ***Appendix G.***

7.1.4 Climate Risk Assessment and GHG Emission Estimation Procedure

Climate change will have a drastic impact on water resources, water demands and their respective temporal and spatial resolutions. An assessment of anticipated climate change, its impacts and potential adaptation strategies is needed to guide future development strategies such an analysis is needed for existing systems as well as planned investments.

Appendix H includes assessment of exposure to relevant physical climate risks, resilience plan and climate change strategy. HFE conducts GHG estimation under scope 1, 2 and limited scope 3 emissions from their supply chain. The estimation considerations have also been described in *Appendix H.*

7.2 Occupational Health & Safety Management

7.2.1 Occupational Health & Safety Plan

The Occupational Health and Safety Plan developed by HFE addresses all aspects of occupational health and safety risks associated with the project operations with an objective to identify sources of occupational risks and develop required safety behaviors, prevent workplace injuries, occupational illnesses and fatalities. This Plan outlines the safety measures and procedures to be implemented at the site. An Occupational Health & Safety Plan is enclosed as ***Appendix I.***

7.2.2 Emergency Preparedness and Response Plan

HFE is committed to maintaining an Emergency Preparedness and Response Plan (EPRP) in collaboration with relevant stakeholders for all its project sites. This procedure aims to identify potential emergency situations and outline the necessary arrangements to respond effectively in the event of a serious and imminent emergency. Effective planning and response are crucial to minimizing unnecessary calls to public emergency services and reducing overall injury, damage, and loss. A detailed Emergency Preparedness and Response Plan is enclosed as ***Appendix J***, which outlines key aspects, including Emergency Preparedness, Fire Safety and Explosion, Medical & First Aid, Hazardous Material Release, Natural Calamities, among others.

7.2.3 Traffic Management Plan

A Traffic Management Plan is crucial for preventing personal injuries, vehicle and property damage, and risks to community health and safety associated with the construction and operations activities of the project. During the construction phase, there is the transportation of raw materials and manpower to project sites. These activities can have a significant impact on the nearby community, particularly in the vicinity of schools and hospitals. To ensure compliance and the adoption of good practices, HFE, along with its contractors and subcontractors, has established a Traffic Management Plan. This plan outlines specific planned activities and control measures to be implemented. For further details, please refer to the Traffic MF provided in ***AppendixJ K.***

7.3 Social & Labour Management

7.3.1 Contractor Management Plan

HFE engages contractors or third-party vendors for supply of raw material, supply of equipment, machineries and manpower etc. HFE has documented a Contractor Management Plan (refer to ***Appendix L***), with a purpose to manage potential business risks associated with the engagement of contractors and contractual workers by providing a systematic approach for selection, orientation and monitoring of contractor's E&S performance. The Plan also ensures that contractors (and their deployed workforce) align their activities with HFE's requirements and as outlined in terms agreed through contract agreement between both parties. Contractor Management Plan of HFE is enclosed as ***Appendix L.***

7.3.2 Supplier Code of Conduct

HFE is unwavering in its commitment to upholding the highest ethical standards in all procurement activities. To articulate and communicate our expectations to suppliers in procurement transactions, we have formulated the Supplier Code of Conduct (SCC). This document serves as a clear and concise summary of HFE's expectations from suppliers, encompassing supplier risk mapping, due diligence, compliance verification through audits, and the onboarding process. A detailed Supplier Code of Conduct is outlined in ***Appendix M***.

7.3.3 Community Health and Safety Management Plan

HFE is committed to identifying and addressing community health and safety risks and hazards throughout the project life cycle. Mitigation measures will be implemented to effectively manage these risks and minimize the occurrence of incidents and accidents. Detailed suggestions for mitigation measures are given in ***Appendix N***.

7.3.4 Labour Management Plan

The Labor Management Plan is formulated to establish procedures for overseeing and regulating labor standards and working conditions for workers directly employed by HFE or engaged through contractors. While HFE engages contractors and subcontractors responsible for supplying human resources or labor, the project-level HR team is tasked with monitoring and ensuring compliance with working conditions and terms of employment as per IFC PS 2. A detailed Labor Management Plan is outlined in ***Appendix O.***

7.3.5 Security Personnel Management Plan

HFE is committed to enhancing project security by deploying security personnel across all its projects. A Security Personnel Management Plan has been devised to foster a secure work environment, reduce unauthorized access to project sites, and safeguard personnel, equipment, and project components from potential security threats. A detailed Security Personnel MF , is enclosed as ***Appendix P***.

7.3.6 Stakeholder Engagement Framework

The Stakeholder Engagement Framework (SEF) serves as a guiding document for stakeholder engagement throughout the project lifecycles of HFE. This framework illustrates the company's dedication to its stakeholders while adhering to the International Finance Corporation (IFC) Performance Standards requirements. Utilizing the stakeholder identification and analysis process, HFE has developed a comprehensive Stakeholder Engagement Plan. These plans will direct the engagement process with various identified stakeholder groups. A detailed Stakeholder Engagement Framework is outlined in ***Appendix Q***.

7.3.7 Internal and External Grievance Redressal Framework

The purpose of the Grievance Redressal Mechanism (GRM) is to establish a platform for internal stakeholders to express their concerns, queries, and issues related to the project. Internal grievances refer to concerns and complaints originating from internal stakeholders, including but not limited to employees, contractors, sub-contractors, and workers, including migrant workers. This mechanism offers stakeholders a dedicated channel for addressing their queries and concerns promptly, fostering trust among stakeholders and preventing the escalation of minor issues into obstacles in project activities. A detailed Internal and External Grievance Redressal Framework is outlined in ***Appendix R & S.***

7.4 Corporate Governance

7.4.1 Purpose, Values, and Culture:

The organization's mission and long-term goals define its strategic direction, providing a clear roadmap for future growth and success. Core principles shape the behavior and decision-making processes within the organization, ensuring that actions align with its values. The collective behaviors, beliefs, and attitudes of the organization create a unique culture, fostering a positive and ethical work environment that supports both individual and organizational development.

7.4.2 Board Diversity, Structure, and Oversight:

Ensuring a mix of skills, experiences, and perspectives on the board promotes better decision-making and innovation. Defining the composition and roles of the board, including committees such as audit, risk, and nomination committees, is crucial. The board's responsibility to monitor and guide the organization's management ensures accountability and alignment with strategic goals.

7.4.3 Internal Controls:

Systems and processes are established to ensure the integrity of financial reporting, adherence to laws and regulations, and effective risk management. These systems include mechanisms for monitoring and evaluating the effectiveness of these controls.

7.4.4 Risk Governance:

The framework for identifying, assessing, and managing risks that could impact the organization's objectives involves setting risks, implementing risk management strategies, and ensuring continuous monitoring and reporting.

7.4.5 Ethics and Compliance:

Establishing a code of conduct and ethical guidelines for employees and management, and ensuring adherence to legal and regulatory requirements through compliance programs and regular audits.

7.4.6 Shareholder Rights:

Protecting the interests of shareholders involves ensuring their rights to vote, receive dividends, and access timely and accurate information, while also facilitating shareholder engagement and effectively addressing their concerns.

7.4.7 Governance of Stakeholder Engagement:

Developing strategies to engage with various stakeholders, including employees, customers, suppliers, and the community, ensures that their interests are considered in decision-making processes and that there is transparent communication.

7.4.8 Disclosure and Transparency:

Providing accurate, timely, and comprehensive information to stakeholders about the organization's performance, governance practices, and financial health is crucial for maintaining transparency and trust, while also ensuring that disclosures comply with regulatory requirements and industry best practices.

8 ESG Performance Reporting Monitoring & Review

HFE approach to evaluate and improve the corporate governance of a company, including the governance attributes of key environmental and social policies and procedures—around **six** key parameters:

1. Commitment to Environmental, Social, and Governance
2. Structure and Functioning of the Board of Directors
3. Control Environment
4. Disclosure and Transparency
5. Treatment of Minority Shareholders
6. Governance of Stakeholder Engagement

HFE shall monitor and measure the effectiveness of ESG MF and structural aspects covering various stakeholders including contractors, labourers, suppliers, and the local community impacted by the project activities and associated facilities. Inspection and monitoring of the environmental and social impacts as part of construction and operation phase activities will increase the effectiveness of this system's implementation.

Through inspection, audit, and monitoring, HFE will ensure that all the requirements and conditions of the applicable framework as suggested in this manual are effectively met, including those of risk assessment checklists and action plans. The inspections and audits will be done by HFE's internal team and external agencies/experts when required. The entire process of inspections and audits will be documented. The inspection and audit findings will be implemented by the contractors too in their respective areas, wherever applicable

8.1 ESG Performance Monitoring and Measurement

HFE's monitoring program shall be overseen by the corporate ESG Manager in the organization. The purpose of monitoring for each asset level shall be:

- To verify systems in place to ensure that the company complies with its ESG policies or code of ethics and/or conduct
- To track the performance regrading periodic review and address ESG issues, including oversight over ESG at the board level, as well as corporate governance and sustainability team.
- To track performance and compare it against the established benchmarks or requirements in the ESG MF .
- To record information to track performance and establish relevant operational controls.
- To establish key quantitative and qualitative measures for social, environment, health, and safety indicators.
- To verify compliance against the national laws and regulations and investors' safeguard requirements, and progress towards the desired outcomes.
- To reflect the necessary corrective and preventive actions in the ESG MF.
- To implement the suggested mitigation measures as in the ESMP for each site

The ESG MF manager shall receive annual performance reviews of the effectiveness of the ESG MF based on systematic data collection and analysis from the site level and business level ESG MF officers. Based on the results, the ESG MF manager shall take the necessary and appropriate steps to ensure the effective implementation of the ESG MF . The performance monitoring shall be carried out monthly or quarterly during the construction phase, and half yearly or annually during operation phase at every asset level.

At a given point in time, the overall monitoring implementation shall be the responsibility of the ESG Manager at the corporate level. At the asset levels, all monitoring and reporting activities would be undertaken by the asset

level EHSS personnel during the construction phase of activities and by plant manager during the operations phase of activities.

An official review of this ESG MF document would be undertaken every three (3) years by the OHSE department and the changes to be incorporated within the document. The document may also be undertaken for review and update in case deemed necessary prior to the aforementioned time period as well.

8.1.1 Records management

The ESG MF head of HFE shall ensure that the corrective and preventive actions are implemented, and a systematic follow-up is done to ensure their effectiveness. HFE shall also undertake an internal ESG MF compliance audit of its sample assets annually as part of its management program. Sample to be chosen in such a way that all the operational assets are covered in span of three (3) years. Findings of the monitoring shall be evaluated and documented. The monitoring documents shall be maintained at the asset and corporate level. The ESG Manager at the asset level should maintain periodic monitoring records to evaluate gaps addressed and closed items of the action plan.

Periodic reporting of progress and monitoring results shall be made to ESG Manager thereafter for review and amendments, if required. Reports should furnish the information and data needed to determine compliance with relevant legal requirements and ESMP /ESAP as highlighted in **Section** Error! Reference source not found.. The f ormat of these reports should be similar at all the asset levels and should include a summary of findings and recommendations. This information should also be made availability broadly within the asset operations management as appropriate.

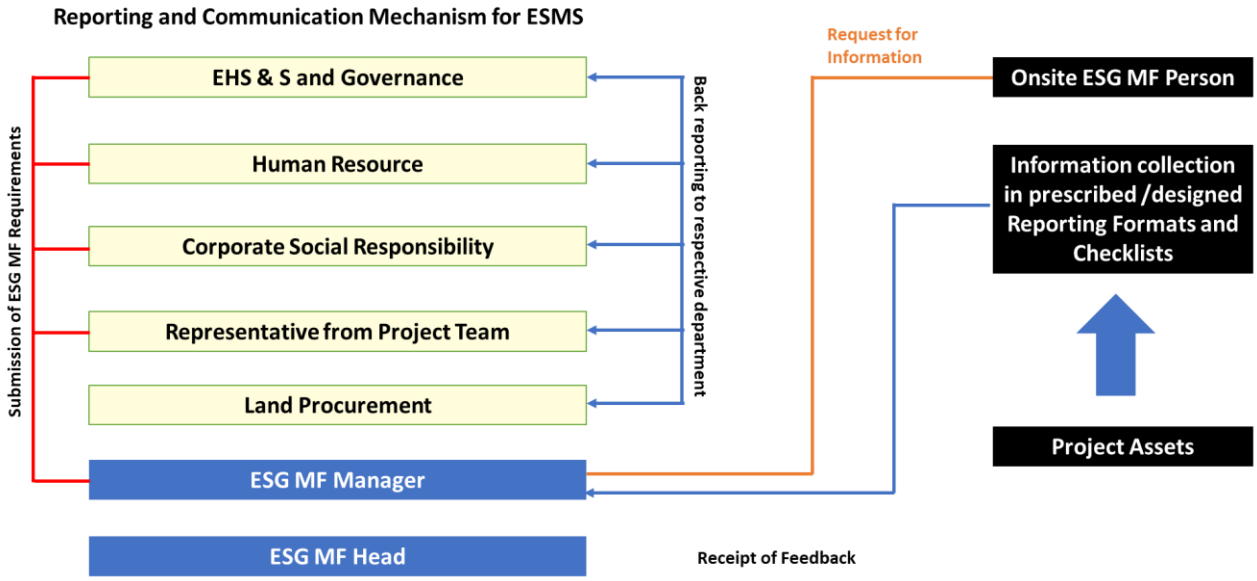
8.2 E&S Reporting & Communication

HFE will develop and implement a reporting program through all stages of the project Lifecyle. The site management & ESG Manager shall be required to fully comply with the reporting requirements in terms of timely report submission with acceptable level of details and should submit to the ESG MF manager at corporate level.

8.2.1 Internal E&S Monitoring & Reporting

An internal reporting system as illustrated in ***Figure 8-1*** is required to be established which shall meet the requirement of periodically monitoring the effective implementation of the ESG MF objectives. Inspection and audits or any other informational requirements from the asset level is required to be back communicated by the HSE Officer (or staff with similar responsibilities during operation phase) to the ESG Manager and the head at the corporate level. The communication is to be triggered by the respective department as per the specific ESG MF requirement & then communicated by the ESG Manager to the asset level to receive required input or feedback.

Table 8-1 Internal reporting and communication mechanism for ESG MF implementation



8.2.2 External Reporting

HFE will report commensurately on the significance of environmental and social impacts from its projects. The ESG Manager will prepare and get it approved by ESG Head and submit environmental and social performance report at the frequency agreed in the shareholder agreement, with respect to investments made by investors, summarizing:

- Environmental and Social Impacts of project undertaken by HFE, including progress and performance for each project as per the established Environmental and Social management Plan (as prepared part of the Environmental and Social Impact Assessment), resettlement action plan, or any other similar management plans under implementation.
- Any areas of non-compliance or other issues arising from the environmental and social safeguards, including resettlement (for each individual investment), and a description of any prospective investments where such policies may be triggered.
- Performance review of the effectiveness of the ESG MF .

8.2.3 Other External Communications

Other form of communication, including complaints, and inquiries, particularly from external stakeholders such as the community and local administration, will be handled appropriately records will be maintained in accordance with the project-specific stakeholder engagement plan (as outlined in the environmental and social impact assessment [ESIA] and aligned with the stakeholder engagement framework presented in (Management Procedures - part 2)

These records will be shared with the environmental, social, and governance management framework (ESG MF) at the corporate level on a monthly basis during the construction phase and on a quarterly basis during the operational phase. Additionally, a project-specific grievance redressal mechanism (GRM) will be developed as part of the ESIA. The GRM will adhere to the requirements of the grievance redressal framework specified in (Management Procedures - part 2).

8.3 Auditing and Evaluation Protocol

At HFE, internal audit schedules shall be planned and approved annually, quarterly and half-yearly by the ESG MF manager to determine the conformance of the assets to the requirements of the ESG MF. At each asset level, the inspections shall be physically verified by an ESG Head and recorded in the firm of a Gap assessment adding a Corrective Action Plan to be worked on. Non-conformances shall also be highlighted during the audits for each asset level for further consultation and open-ended discussions with the ESG Head.

The main aim of including these aspects is to regularize the implementation of the ESG MF at all asset levels and enhance the understanding of the activities and risks with adequate mitigation measures. Following aspects should be assessed during the audit and evaluation:

- HFE's performance on the management of critical ESG issues
- Integrated corporate strategy that includes goals and targets for ESG performancee
- ESG information align with material issues and priorities for the company

8.4 Engaging with stakeholders

It is important for HFE to have ongoing communication with stakeholders and to implement processes for addressing stakeholder interests and concerns. Open, ongoing communication is not just a one-way dissemination of information. Rather, it involves dialogue which can support an open and transparent company culture. ***Refer APPENDIX Q: Stakeholder Engagement Framework***

8.5 Disclosure

Disclosure of ESG information alongside financial information is vital for investors and stakeholders. It allows them to make informed decisions about a company and its potential long-term performance, its impact on society and society's impact on it. HFE goal is to promote good company governance and risk management.

As part of the disclosure, HFE will disclose material ESG information as part of the annual report. The report should describe a company's efforts (including policy, strategy and management systems) to maximize the social benefits and minimize the environmental and social impacts of its operations, products and services and supply chain with a focus on the material issues a company has identified.

The report should include analysis of a company's performance on each of the identified material environmental and social issues. The analysis should address the impact of E&S factors on the operational and financial performance of the company.

8.6 Documentation & Control Procedures

A documentation and record-keeping system shall be established to ensure updating and recording of requirements specified in ESG MF. Responsibilities shall be assigned to ESG Head for ensuring that the ESG MF documentation system is maintained, and that document control is ensured through access by and distribution to, identified personnel in form of the following:

- Master environment management system document
- Legal Register
- Operation control procedures
- Work instructions
- Incident reports
- Emergency preparedness and response procedures
- Training records
- Monitoring records

- Auditing report
- Grievance registers and issues attended/closed.

An individual asset-based filing system will be developed at the corporate level which will incorporate copies of the aforementioned documents which are specific to that particular asset. It will also include all forms of communication that may have occurred between the ESG MF management at the corporate level with the site level HSE officers or any other team member or external stakeholder specific to that particular project.

9 Training & Capacity Building

HFE is dedicated to ensuring the effectiveness of the Environment & Social Management System to the complete satisfaction of all stakeholders, concurrently contributing with HFE. In pursuit of this commitment, the company and its employees willingly embrace challenges inherent in the installation, commissioning, operation, and maintenance of each project undertaken. To uphold HFE 's EHS commitments without compromise, the company meticulously conducts Training and Capacity Building programs. These initiatives aim to guarantee that all employees, workers, installers, O&M personnel, including contractors' workforce engaged by or on behalf of HFE, receive training. These training courses are essential to maintain awareness of relevant EHS aspects, impacts, and risks associated with projects, along with the corresponding controls and corrective action plans.

9.1 Training Need Identification

Training Need Identification (TNI) is an ongoing process undertaken by the Reporting Manager of the respective employees and the HR Team. TNI will be assessed on the basis of skill evaluation conducted for the employees on the following main criteria-

- Basic Awareness (including Code of Conduct, Quality Policy, Time Management, Communication Sills, Defects Awareness in Products etc.),
- Technical & Process (including Job-specific/ Technical aspects),
- Safety & Behavior (including Work Permits, Adherence to safety measures etc.),
- ESG MF Awareness (including EHS Policy, E&S Management Plans & Procedures etc.)

9.2 Responsibilities

The HR teams with support of EHS Manager at project/site level will maintain Skill Matrix Format for each level. This helps to identify the type of training the employees need to effectively implement the action plans and procedures of HFE. The Annual Training Calendar will be drafted based on the training needs and recommendations along with an annual budget. The responsibility for ensuring EHS awareness among contractual workforces primarily lies with the contractor(s). Simultaneously, HFE oversees that the training aligns with the EHS commitments of the company. Ongoing project site training programs, focusing on the construction stage, continually refresh these trainings.

9.3 Training Programs

Training methods will be selected based on job descriptions, experience, and qualifications of the employee. At a minimum, all employees including new hires will receive awareness training that (as appropriate to their role and responsibilities) addressing the following, w.r.t HFE's ESG MF :

- OHSE Policy
- Quality Policy
- HR Policies and associated procedures
- Employee benefits
- Overview of the management plans and procedures developed as part of ESG MF
- Grievance Redressal Mechanism
- Primary knowledge regarding workplace health and safety hazards including fire safety and emergency preparedness likely to be encountered, and how to react such hazards or mitigate their risks or effects; and
- Any significant regulatory or stakeholder concerns that must be considered in day- to-day operations.

Table 9-1: Training Requirement pertaining to Construction & Operation phase

Sr. No.	Type of Training	Project Team	Contractors
1.	Environmental, Health & Safety	✓	✓
2.	Occupational Health & Safety	✓	✓
3.	Safety Induction	✓	✓
4.	Fire Safety and Prevention	✓	✓
5.	Electrical Safety	✓	✓
6.	Equipment Handling and Machinery Use	✓	✓
7.	Material Handling	✓	✓
8.	POSH Training and use of force by security	✓	✓
9.	Emergency Response Preparedness	✓	✓
10.	Lock Out & Tag Out	✓	✓
11.	Operational Training	✓	✓
12.	Hazard Identification & Risk Assessment	✓	✓
13.	First Aid	✓	✓
14.	Incident/Accident Reporting and Investigation	✓	✓
15.	Near Miss Reporting	✓	✓
16.	Transportation	✓	✓
17.	Spill Control	✓	✓
18.	Contractor Management Training	✓	×
19.	PPE (Personal Protective Equipment) Training	✓	✓
20.	Biodiversity conservation, water management, pollution prevention	✓	✓
21.	Stakeholder engagement and grievance management	✓	×

The specified training programs are essential and must be completed at the initial stage when an employee/ worker joins the company or project. Following this, regular monthly refresher training can be conducted, particularly tailored to the workers' skill levels. Additional relevant training will be recognized and implemented throughout the project's lifecycle based on the needs assessment. This is being done as part of mitigation measures and to enhance staff capacity.

Moreover, the project team and workers will receive environmental awareness to promote the adoption of environmentally friendly practices and compliance with project-related regulations. This initiative aims to reduce negative environmental impacts, ensure adherence to applicable standards, and achieve performance levels that surpass mere compliance.

The same degree of awareness and dedication will be instilled in contractors and subcontractors before the project commences. For subcontractors, the project's Environmental, Health, and Safety (EHS) head will conduct training and capacity-building activities. These sessions will be presented in a language and format that the target audience can comprehend. Following this, the responsibility for the specified training listed in ***Table 8-2*** will transition to the contractors' HSE personnel, supervised by the project specific HSE Lead at HFE.

Table 9-2: Training Requirement for the Subcontractors

Sr. No.	Type of Training	Training Responsibility
1.	Operational Training	Once at Induction Stage by HFE Team and regular refreshers to be provided by EPC and/or O&M Contractor EHS Personal Overlooked by HFE's ESG MF Manager and/or Project EHS officer
2.	Usage of PPE	
3.	Vehicle safety/Driver safety	
4.	Pollution Prevention, Resource Conservation and Waste Disposal (hazardous and non-hazardous)	
5.	Environmental, Health & Safety	
6.	Occupational Health & Safety	
7.	Fire Safety and Prevention, Electrical Safety	
8.	Material Handling	
9.	Spill Control	
10.	Emergency Response Preparedness	

8.3.1. ESG MF Trainings

After raising employees' basic awareness about the ESG MF during the induction training, regular training sessions shall be conducted to strengthen participants' commitment to the implementation of the ESG MF . Each training should have a specific goal related to this progression: (1) Raise awareness (2) Gain commitment and (3) Teach participants the knowledge and skills they need to implement the ESG MF .

An Annual Training Planner for the capacity building of the employees in line with ESG MF shall be prepared. The annual program will be structured in such a way that it clearly brings out the value addition and enhancement benefits of proper management of E&S issues at all HFE's project sites.

Methods of Training

Training can comprise both formal and informal training methods such as:

Formal Methods	E-Learning, power-point presentation, classroom training, workshop & exercise, etc.
Informal Methods	Mentoring, on-the-Job learning, focused discussions, leading by example etc.

Training Attendance shall be maintained by the respective trainer/ EHS Manager and HR Team.

8.3.2. Training Programs at Project Site

HFE shall ensure to carry out the following training and capacity building programs at the project sites, with active participation of the workers and contractors.

(i) Safety Event Calendar

The Safety Engineer/Supervisor appointed by the Contractor shall chalk out a safety event calendar each month for various safety events, training programmes, mock drills, demonstration, inspections, and audit etc. which shall be approved by the Site Main Controller. The Site Main Controller shall intimate the concerned people (trainers) in advance and engage external training organizations if required. This calendar shall be displayed at the project site office, and the contractor shall ensure these events are conducted as per schedule.

(ii) Induction Training (Contractual Workforce)

It is mandatory that the contractor impart induction training related to EHS concerns and prevention & corrective actions to all new workers before reporting at their place of work. The contractor shall instruct the workers on HFE's EHS Plan, safety policy, safety rules and instructions in local language understood by workers. The contractor shall impart training to workers, which shall cover probable hazards related to the work and shall explain & demonstrate use of PPEs (Personal Protective Equipment),

fire extinguishers, safety belts, safety nets, fall protection safety measures, emergency plan & assembly point. The medium of instructions shall be chosen depending on the language understood by most workers.

(iii) Refresher Training

The EHS Team shall ensure refresher training is carried out bi-annually on all the topics covered in the induction training, and case studies bringing out the past learnings from the activities at the project site.

(iv) Safety Pep talk/ Tool-box training

After the initial induction training, the Safety Engineer/Supervisor of contractor and HFE's Site EHS In-charge shall also conduct safety pep talks/toolbox training for various teams of workers daily at work-place locations. They shall arrange pep talks / toolbox training on work related topics like use of various PPEs and tools, electrical works, installation of PV (Photo Voltaic) modules and WTGs etc. and shall solicit active participation of workers in toolbox training and record shall be maintained and submit to company on monthly basis.

(v) Specialized Training & Campaigns

Specialized skilled training and Health, Safety & Environment awareness campaigns shall be arranged by HFE with the support of contractor(s) through internal or external trainers. Also, safety campaigns like National Safety Day, World Environment Day, Fire Services Day, Road Safety Day etc. shall be organized by HFE.

Employee/workers shall complete and sign an attendance sheet for all training programs attended, including the toolbox talks training in the template enclosed. Training requirements and completed training will be documented. Procedures to evaluate the effectiveness of such training will be implemented.

8.3.3. Training Impact Evaluation

Training impact evaluation is a systematic process used to assess the effectiveness and outcomes of training programs. It will help to understand whether the training has met its objectives, how it has influenced participants' skills and performance, and what improvements can be made for future programs. Training evaluation may involve to identify and assess following aspects:

- How did participants feel about the training? Was it engaging and relevant?
- What knowledge or skills did participants gain from the training?
- Did participants apply the knowledge or skills they learned in their workplace?
- Did the training lead to improved business outcomes, such as increased productivity or reduced costs?

A format ***(Refer Form A)*** has been provided, which should be filled after each training provided to analayse the effectiveness of training given to the emplyess.

8.3.4. Monitoring

HFE shall periodically monitor that all the training procedures are being implemented and followed effectively and all the employees are well aware of the ESG MF measures. The results of the training assessment shall be documented by the respective teams. This may form components of the training such as:

- Record of Training Need Identification
- Annual Training Calendars
- Training Attendance Format
- Training certificates issued, if applicable.
- Training Feedback and Effectiveness Form (Training Evaluation).

9.4 Attendance and Record Keeping

Training imparted at the Project levels will be documented. The documentary proof of training imparted will be held as hard copy at the respective Project, and as soft/digital copy at the Corporate Level. The records of each training will include the following details: (***Refer Form B)***

- Day/Date
- Name of personnel providing the training, and their designation
- Training topic and coverage
- Location
- Time and duration of training
- List of equipment used
- Name of all participants, along with signatures
- Photo log with time stamp.

Form A: Training Evaluation Form

Training Title: _____
Trainer(s): _____
Date: _____

Part 1: Participant Information

1. **Name of Trainee**: _____
2. **Department/Position**: _____
3. **Length of Service (in years)**: _____

Part 2: Training Content

1. **How relevant was the training content to your job?**
    - Very Relevant
    - Relevant
    - Somewhat Relevant
    - Not Relevant
2. **Was the content of the training clear and easy to understand?**
    - Very Clear
    - Clear
    - Somewhat Clear
    - Not Clear
3. **How would you rate the overall quality of the training content?**
    - Excellent
    - Good
    - Average
    - Poor
4. **Were the training objectives met?**
    - Fully Met
    - Mostly Met
    - Partially Met
    - Not Met

Part 3: Trainer(s) Evaluation

1. **How would you rate the trainer's knowledge of the subject?**
    - Excellent
    - Good
    - Average
    - Poor
2. **How effective was the trainer in delivering the content?**
    - Very Effective
    - Effective
    - Somewhat Effective
    - Not Effective
3. **How engaging was the trainer?**
    - Very Engaging
    - Engaging
    - Somewhat Engaging
    - Not Engaging
4. **Did the trainer encourage questions and interaction?**
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree

Part 5: Application of Knowledge

1. **Do you feel confident in applying what you learned to your job?**
    - Yes
    - No
    - Unsure
2. **How likely are you to implement the new skills or knowledge gained?**
    - Very Likely
    - Likely
    - Somewhat Likely
    - Not Likely
3. **What are the biggest challenges you anticipate when applying what you've learned?**

Part 6: Overall Evaluation

1. **Overall, how would you rate this training session?**
    - Excellent
    - Good
    - Average
    - Poor
2. **Would you recommend this training to others?**
    - Yes
    - No
3. **Please share any suggestions for improvement or additional topics you'd like to see covered in future training sessions:**

_____
_____

Thank you for your feedback!

Form B: Training Record Template

PROJECT NAME: - **DATE: -** **Training was attended by workers/ staff of M/s……** **Time Period……hrs.** **Training Topic ……**			
S. No.	**Name of workers/Staffs**	**Designation**	**Signature**
1.			
2.			
3.			
4.			
Name & Signature of Trainer:			
Attach: Photographs of training session.			