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Responsible Energy Initiative India

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Guidebook | March 2026

Building a People-centric Energy Future

The Guidebook for Responsible Deployment of Renewable Energy

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The **Responsible Energy Initiative (REI)** India is a multi-year programme that enables the renewable energy sector in India to adopt business models and value chains that are people-centric and ecologically positive. It is part of the larger international REI program that also works in the Philippines and through networks in Asia and across the global south.

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The Guidebook for Responsible Deployment of Renewable Energy

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FOREWORD

It is a matter of great pride for the Energy Department, Government of Karnataka, that our state is the third largest wind energy market, and the fifth largest solar energy market in India. Leading India's transition to renewable energy is one of the core pillars of our strong and inclusive development strategy.

As part of our commitment to a sustainable energy sector in Karnataka, we recognise that renewable energy development must be both efficient and responsible towards people and the environment. To enable this, it is important that RE projects not only account and mitigate social and ecological impacts but also contribute positively to surrounding communities and environment.

The Guidebook for Responsible Renewable Energy Deployment, developed by the Council on Energy, Environment and Water (CEEW), is a crucial document that provides practical, efficient and effective guidance to industry players to manage social, environmental and land-related risks, while also creating value for local communities. This work reflects the collaborative efforts of CEEW and the Karnataka Renewable Energy Development Limited (KREDL), whose joint engagement with industry stakeholders has ensured that these guidelines are well-aligned with the state's operational landscape. The guidebook focuses on the four critical themes of land, people and ecology, business responsibility and environment and biodiversity and identifies best practices for each theme across the project lifecycle.

I invite developers and financiers to engage with and adopt the guidebook, ensuring that the best practices it identifies are implemented in their projects across Karnataka and India. Our policies, as well as the guidebook, provide a great opportunity for developers to become industry-wide pioneers and support Karnataka's vision to become a trailblazer in India's energy transition efforts.

(K. J. George)

Gaurav Gupta, I.A.S.,
Additional Chief Secretary to Government
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10 March 2026

FOREWORD

Karnataka's leadership in India's renewable energy transition is rooted in sustained policy vision, strong institutions, and the collective commitment of communities, industry, and the state. As one of the country's leading renewable energy states, Karnataka has demonstrated that clean energy can be scaled rapidly while supporting economic growth and energy security.

As renewable energy becomes central to India's growth and climate ambitions, including the national vision for 2047, it is increasingly evident that the success of this transition will depend on how projects are planned and implemented. Large-scale renewable energy infrastructure today intersects with land administration systems, livelihoods, ecosystems, and local development priorities. When these interfaces are not managed carefully, projects risk delays, disputes, and erosion of public trust. When approached in a social and environmentally responsible manner, renewable energy can become a catalyst for inclusive growth, environmental stewardship, and regional development.

In this context, the Guidebook for Responsible Renewable Energy Deployment, developed by the Council on Energy, Environment and Water (CEEW), is particularly relevant. The strength of the Guidebook lies in its holistic approach which brings together the four critical themes of land, people and ecology, business responsibility, and environment and biodiversity and embeds them across every phase of project deployment. I am happy to share that the Karnataka Renewable Energy Development Agency (KREDL) has supported this exercise by providing the practical lens from policymakers.

The Government of Karnataka views responsible renewable energy deployment as a core enabler of successful and resilient energy systems. Practices such as low-impact siting, transparent community engagement, responsible business conduct, and proactive environmental management help reduce project risks, strengthen investor confidence, and ensure that the benefits of renewable energy are shared more equitably.

I encourage stakeholders across the renewable energy ecosystem to actively use this Guidebook while planning and implementing projects in Karnataka. By collectively adopting responsible practices, we can continue to scale renewable energy while safeguarding the social and ecological systems on which our long-term prosperity depends.

Karnataka remains committed to supporting this transition and to setting benchmarks that others can learn from. This Guidebook is an important step in that direction. I congratulate CEEW and KREDL on coming up with this much needed resource.

(Gaurav Gupta)

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FOREWORD

Karnataka has established itself as an eminent leader in India's energy transition - the state has one of the highest installed renewable energy capacities in India. With significant solar potential exceeding 200 GW and substantial wind potential across multiple wind corridors, Karnataka aims to be a leading state in contributing to India's net-zero targets. The true measure of success will not only be the gigawatts we install, but the manner in which we deploy them - responsibly, sustainably, and inclusively.

Realising this immense potential requires navigating a complex intersection of land use, community interests, and ecological sustainability. A large share of India's wind potential overlaps with agricultural landscapes—a challenge deeply relevant to Karnataka. Karnataka also has critical habitats, regions that are semi-arid with drought risks, and a high dependence on commons and agricultural land. In this context, traditional approaches to renewable development are no longer sufficient.

Karnataka is now poised to lead the next frontier: the era of *Responsible Renewable Energy*, which moves developers beyond compliance towards innovation—encouraging them to design projects that enhance biodiversity, create local value, and minimise environmental impact.

The Guidebook for Responsible Deployment of Renewable Energy is a vital tool in this mission. Developed by the Council on Energy Environment and Water (CEEW) under the Responsible Energy Initiative (REI) India, KREDL is pleased to have supported this endeavour by facilitating vital industry dialogues and deep engagement with developers. It provides the actionable blueprint we need to make this vision a reality. It empowers developers to move beyond compliance and become 'Pioneers'—innovating systems that nurture biodiversity and create genuine value for people. By offering clear guidance across the project lifecycle—from low-impact siting to ensuring the contribution of business partners in enhancing responsible actions on the ground—it ensures that every new project strengthens the social and environmental fabric of our state.

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Karnataka has consistently been at the forefront of India's renewable energy transition, with one of the country's largest renewable portfolios and a strong pipeline of solar, wind, hybrid, and storage projects under development.

We encourage developers, EPC companies, financiers, and all stakeholders in the renewable energy ecosystem to adopt the principles and practices outlined in this Guidebook. By doing so, Karnataka can continue to demonstrate that rapid renewable energy expansion can go hand in hand with environmental stewardship and community well-being.

(K.P. Rudrappaiah)
Managing Director

About REI India

The Responsible Energy Initiative (REI) India is a multi-year programme that enables the renewable energy sector in India to adopt business models and value chains that are people-centric and ecologically positive.

REI India brings together industry leaders, financiers and investors, policymakers, sub-national governments and communities to

- generate a collective understanding of the environmental and social impacts along RE value-chains and identify systemic risks in the way that the risks are managed;
- develop and champion norms and practices to support the responsible expansion of RE;
- drive on-the-ground action to innovate ecologically sound, socially just production and deployment of utility-scale RE;
- institutionalise and scale responsible RE norms, policies, business and financing models, and practices.

REI India's vision

Through a responsible energy ecosystem, REI embraces the power of nature to create, renew, and restore. The REI cohort strongly believes that the renewable energy (RE) sector must operate in harmony with planetary boundaries across value chains. Being responsible means respecting human rights and the dignity of all, adhering to principles of justice and equity, and supporting people to thrive. REI advocates for a just and equitable energy transition that enables deep positive transformation, fostering flourishing and resilient communities and society. REI India's work is inclusive, rights-respecting, and participatory, centering on the dignity and wellbeing of individuals and communities at every step. The cohort's efforts inherently address the climate emergency and biodiversity crisis within the RE sector by bringing together government bodies, businesses, financiers, and communities. REI enables the capacity of social, institutional, and environmental systems to adapt to future challenges and opportunities, aiming to ensure fairness, resilience, and vitality across generations and geographies.

About CEEW

INTEGRATED | INTERNATIONAL | INDEPENDENT

The Council on Energy, Environment and Water (CEEW)—**a homegrown institution** with headquarters in New Delhi—is **among the world's leading climate think tanks**. We use **data, integrated analysis**, and **strategic outreach** to support public policy, transform markets, shape technology, and nudge behaviour. CEEW seeks to explain—and change—the use, reuse and misuse of resources. CEEW addresses pressing global challenges through an **integrated** and **internationally focused** approach. It prides itself on the **independence** of its high-quality research and strives to **impact sustainable development at scale**.

CEEW IN NUMBERS

390+ team members
550+ peer-reviewed studies
680+ opinion articles
700+ convenings
45+ films & documentaries
12,000+ media mentions
11 Union ministries
20 state governments
115 government partnerships
400+ mn lives impacted
62,000+ livelihoods directly supported

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CEO: Dr Arunabha Ghosh

CEEW's STRATEGIC PILLARS

Clean electricity penetration
Low-carbon industrialisation & circularity
Fuels of the future
Sustainable livelihoods & green economy
Quality of life of citizens
India's story to the world

SELECT POLICY ENGAGEMENTS

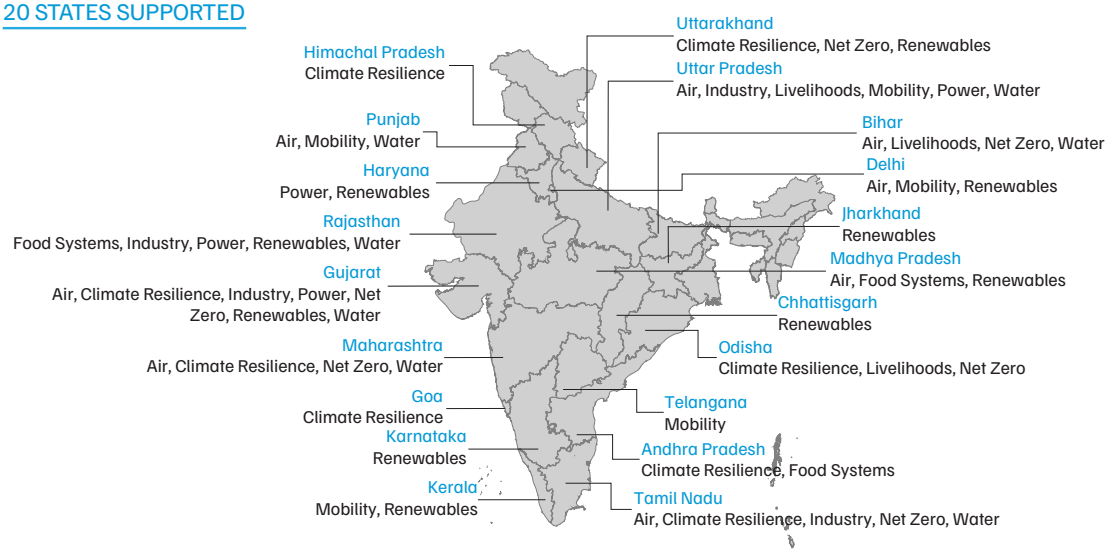
NATIONAL/INTERNATIONAL

2011 | National Water Resources Framework
2014 | 175 GW renewables target
2015 | International Solar Alliance
2016 | PM *Ujjwala Yojana*
2017 | *Saubhagya* Schemes
2019 | Climate Vulnerability Index
2021 | Net Zero by 2070
2022 | Mission LiFE
2022 | National Bioenergy Programme
2022 | E-waste (Management) Rules
2023 | G20 Green Development Pact
2023 | National Green Hydrogen Mission
2024 | Green Steel Taxonomy
2024 | PM *Surya Ghar Yojana*
2025 | National Critical Mineral Mission
2025 | Rajya Sabha guidelines on crop residue burning
2025 | National Adaptation Plan

STATE

2022 | Rajasthan Organic Farming Mission
2022 | Jharkhand Solar Policy
2022 | Uttar Pradesh *Vidyut Sakhi* programme
2023 | Rajasthan Green Hydrogen Policy
2023 | Uttarakhand Solar Policy
2024 | Net-zero roadmaps for Bihar & Tamil Nadu
2025 | Green Odisha Initiative
2025 | Maharashtra Climate Action Plan 2.0
2025 | 50 Heat Action Plans (GJ, OD, MH, TN)
2025 | Delhi Clean Air Action Plan
2025 | Delhi EV Policy 2.0

20 STATES SUPPORTED



List of abbreviations

BMC	biodiversity management committee
BSC	biological soil crusts
C&I	commercial and industrial
CA	compensatory afforestation
CEMP	*Construction Environment Management Plan*
CPCB	Central Pollution Control Board
CRZ	Coastal Regulation Zone
CSO	civil society organisation
CSR	corporate social responsibility
CTE	consent to establish
CTO	consent to operate
DPR	detailed project report
E&S	environment and social
EHS	environment, health, and safety
EIA	environmental impact assessment
EMS	environmental management system
EPA	*Environment Protection Act*
EPC	engineering, procurement, and construction
EPR	extended producer responsibility
ESG	environment, social, and governance
ESIA	environmental and social impact assessment
ESMMP	*Environmental and Social Management and Monitoring Plan*
ES	environment and social risk
FAC	forest advisory committee
FCA	*Forest Conservation Act*
FPIC	free, prior, and informed consent
FRA	*Forest Rights Act*
GIB	Great Indian Bustard
GO	government order
GP	Gram Panchayat
GRC	grievance redressal committee
GRM	grievance redressal mechanism
HTL	high tide line
IA	interlocutory applications
IEA	International Energy Agency
IFC	International Finance Corporation
IFR	*Individual Forest Rights*
ILO	International Labour Organization
INR	Indian Rupee
ISRO	Indian Space Research Organisation
KII	key informant interviews

KREDL	Karnataka Renewable Energy Development Limited
KPI	key performance indicators
LRP	*Livelihood Restoration Plan*
MEL	monitoring, evaluation and learning
MNRE	Ministry of New and Renewable Energy
MoEFCC	Ministry of Environment, Forest and Climate Change
NBWL	National Board for Wildlife
NDC	nationally determined commitments
NGO	non-governmental organisation
NGP	*National Greening Program*
NPV	net present value
NRSC	National Remote Sensing Centre
O&M	operations and maintenance
OSH	occupational safety and health
PESA	*Panchayat (Extension to Scheduled Areas) Act*
PIB	Press Information Bureau
PoC	point of contact
PoSH	*Prevention of Sexual Harassment*
RE	renewable energy
SECI	Solar Energy Cooperation of India
SGWA	State Groundwater Authority
SNA	state nodal agency
SOP	standard operating procedure
SPCB	State Pollution Control Board
WPA	*Wildlife Protection Act*
WRD	Water Resources Department

Contents

Executive summary

As India accelerates its renewable energy (RE) deployment to meet climate goals, the sector faces a critical challenge: rising on-ground concerns regarding land availability, and the potential adverse impact of RE projects on people's livelihoods and the surrounding environment.[1] It is particularly true for large-scale RE projects that require significant land, often impacting the livelihoods of local communities, and biodiversity. If not proactively managed, these impacts can lead to social and ecological challenges, potentially slowing RE deployment.[2]

While several social and environmental impact assessment frameworks are available from various international agencies[3], they are often difficult to implement thoroughly by RE project developers due to lack of local context and linkage with different phases of the RE project. Hence, more actionable guidance is needed for the RE sector so developers can plan their projects in a manner that avoids any adverse impact on people and the environment.

1. Land prices and availability are a key concern that leads to undersubscription and delay in power agreement signing (Sharma et al. 2025). Additionally, other key reasons for concerns include access to commons, legal recognition of rights and others (Land Conflict Watch & Queen Mary University of London 2024).
2. Currently, investments worth approximately INR 70,838 crore are affected due to ongoing conflicts (Land Conflict Watch 2025).
3. Examples include the IFC performance standards, Environment and Social Framework by the Asian Development Bank and others.

A successful land procurement strategy relies on transparent engagement and the implementation of measures that enhance the legal and financial awareness of the stakeholders involved in the transaction

Image: Shutterstock

The Guidebook for Responsible Deployment of Renewable Energy, developed by the Council on Energy, Environment and Water (CEEW) as part of the Responsible Energy Initiative (REI) India, serves as a practical, step-by-step manual for RE projects to manage their social and environmental impact. Inspired by the standard documents available such as Equator Principles, IFC performance standards, Asian Development Bank's Environment and Social Framework, Equitable Origin's EO100, Clean Energy Buyers Institute's Beyond the Megawatt, Securities and Exchange Board of India's Business Responsibility and Sustainability Reporting and others, it provides actionable guidance to move beyond mere legal or financial compliance towards a model of deployment that is people-centric and ecologically positive. This approach also ensures RE projects advance both climate action and biodiversity conservation in tandem, serving multiple environmental goals simultaneously.

The Guidebook's target audience includes RE developers, engineering, procurement and construction (EPC) companies, and contractors involved in RE project deployment, such as detailed project report (DPR) consultants, impact assessment agencies, and land aggregators. It provides specific activities organised across four key themes:

- **Land**: Support users in choosing low-impact land parcels for development, understanding land use patterns, and ensuring transparent and fair land procurement.
- **People and ecology**: Focuses on preventive measures for social impact mitigation, effective grievance management, and community developmen. It also includes measures for community health and safety, preservation of cultural heritage, and increased equity in project practices.
- **Business responsibility**: Aims to ensure effective coordination and alignment among all actors engaged in a RE project towards responsible practices.
- **Environment and biodiversity**: Supports projects to minimise impact on the local environment while undertaking biodiversity strengthening and site restoration after decommissioning.

The activities in the Guidebook are organised into four parts – as per the project deployment cycle, ensuring responsibility is embedded from conception to closure. These four phases are:

- **Pre-feasibility and bid approval**: Focuses on low-impact siting—selecting land parcels with minimal environmental and social risks—and conducting initial social assessments to understand local dynamics.

- **Site preparation**: Involves conducting a third-party environmental and social impact assessment (ESIA), developing an environment and social management and monitoring plan (ESMMP), and establishing a grievance redressal mechanism (GRM). It also covers stakeholder engagement and community input.

- **Construction and commissioning**: Emphasises strict adherence to labour rights, community health and safety, and responsible waste management. This phase includes implementing the ESMMP and working towards achieving biodiversity net gain.

- **Operations and maintenance (O&M)**: Focuses on long-term sustainability through ongoing community communication, development activities, monitoring of biodiversity net gain, and early planning for decommissioning and site restoration.

The Guidebook also helps companies self-evaluate and chart a path for continuous improvement. Users can evaluate their performance in a project based on the responsible activities implemented. Performance is divided into four levels:

- **Level 0: Compliant** – Adheres to existing national and state laws.

- **Level 1: Adopter** – Implements mainstream industry best practices albeit those with short-term sustenance, and ensures business integrity in the organisation/company.

- **Level 2: Leader** – Adopts international best practices, develops mechanism for medium-term community development, and ensures business integrity among partners.

- **Level 3: Pioneer** – Innovates new practices, advocates for ecosystem-wide integrity, and creates self-sustaining systems.

By adopting this Guidebook, RE developers can mitigate project risks and secure a social licence to operate. It will also help them make their projects more investor-friendly by building necessary systems within the organisation.

Responsible deployment of RE is not a choice but an imperative. It offers a synergistic pathway to meet climate, developmental, and biodiversity goals simultaneously, transcending the perceived trade-off between these priorities.

1. Introduction

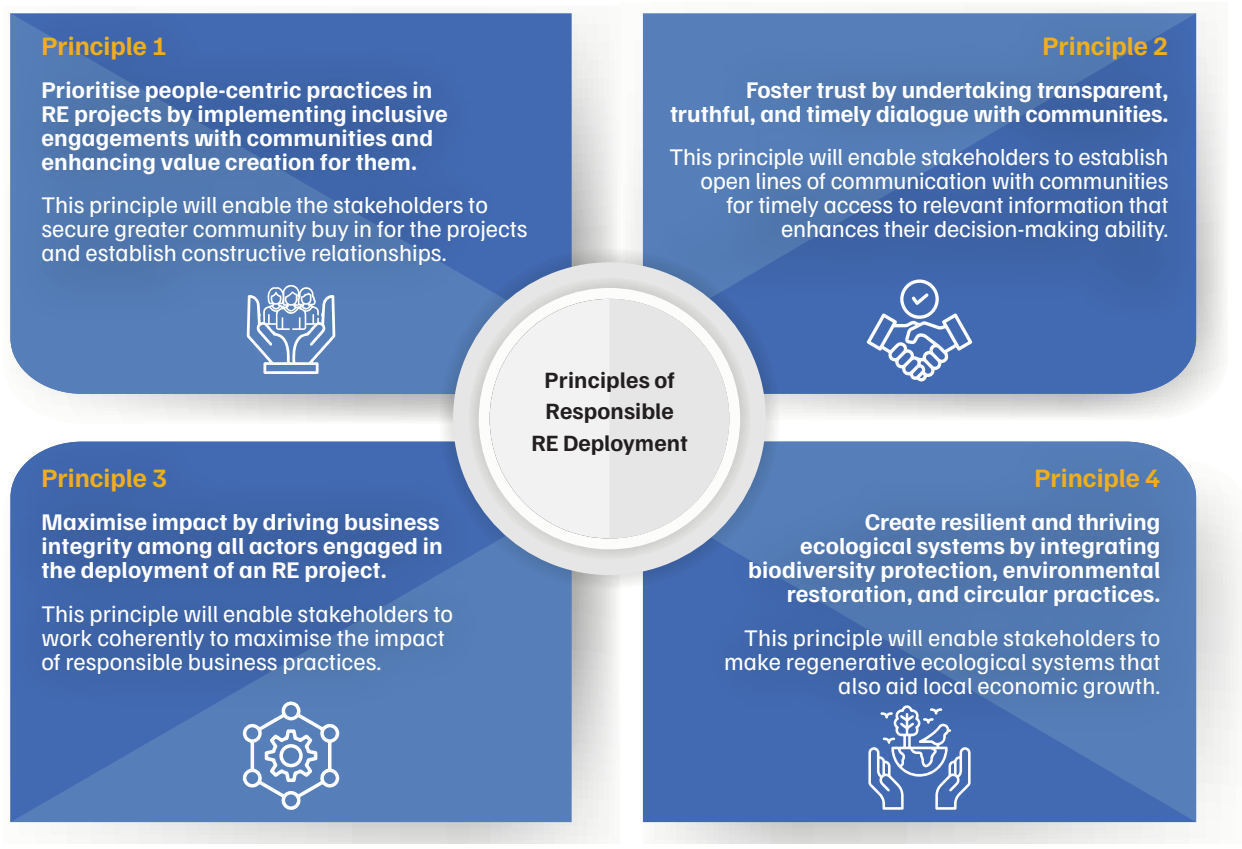
Globally, renewable energy (RE) technologies like solar and wind have emerged as a critical tool to decarbonise the electricity sector and stay on course with the 1.5°C threshold of the Paris Agreement (IEA 2023). India's Nationally Determined Commitments (NDC) also delineate the role of RE technologies in meeting the climate goals (Government of India 2022), which necessitate an accelerated deployment over the coming years.

At the same time, it is becoming imperative that the future deployment of RE technologies happens in a responsible manner that avoids any adverse socio-economic impact on and maximises the benefits to people and environment (Misrahi, Marais and Varoli 2024, Forum for the Future, TERI and WRI India 2021). Like any infrastructure project, RE technologies also require significant tracts of and this affects the nearby communities and environment. For instance, the land used for an RE project could previously be under agriculture or an open natural ecosystem with rich biodiversity value. Hence, any changes in the land use patterns could influence the lives and livelihoods of dependents, as well as the local ecology. If not mitigated in a timely manner, these impacts will make the RE sector prone to social conflicts that can derail the timely deployment of projects and attainment of our climate goals. Moreover, deploying RE without ecological considerations risks undermining biodiversity goals even as we work to meet climate targets—creating a false trade-off between two urgent global priorities. Responsible RE deployment provides an integrated approach to advance both climate and biodiversity objectives in tandem, recognising the critical nexus between land use, climate action, and ecosystem conservation. By integrating ecological safeguards from the outset, we can ensure that RE becomes a solution that serves multiple environmental goals rather than advancing one at the expense of another.

Within the RE ecosystem, the project developers have the greatest opportunity to adopt responsible deployment practices. From finalising sites for projects to being closest to the communities during the deployment phase, developers have many entry points to integrate responsibility in their day-to-day operations.

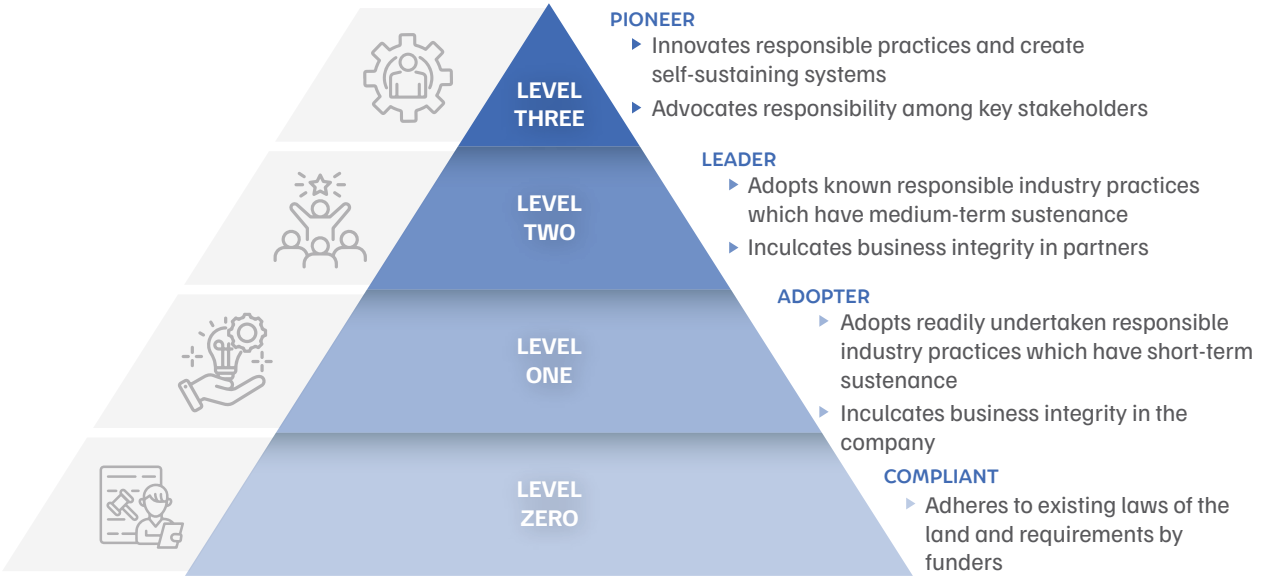
The deployment of RE projects is fairly standardised in India, as the Ministry of New and Renewable Energy (MNRE) has provided guidelines for setting up wind and solar projects (MNRE 2014). Many investors also provide guidelines to assess the social and environmental impact of RE projects (World Bank 2016, ADB 2023) . However, these documents fall short of guiding developers to integrate responsible practices. There is also a differentiated understanding of responsibility among the different stakeholders (policymakers, investors, and buyers), both in terms of scope as well as ambition. The framework for responsible renewable energy deployment published in 2025 by CEEW bridges this gap (Chowdhury, Almeida and Tyagi 2025). It serves as a standard document for different stakeholders that defines responsible deployment, outlines the guiding principles, and sets out different levels of responsibility that projects can strive for. Figure 1 and 2 show the principles and levels of responsibility as detailed in the framework.

Figure 1. The four principles of responsible deployment



Source: Chowdhury, Parineet Kaur, Nicole Almeida, and Akanksha Tyagi. 2025. How can India Enable a People-centric Clean Energy Transition? Framework for Responsible RE Deployment. New Delhi: Council on Energy, Environment and Water.

Figure 2. The four levels of responsible RE deployment



Source: Chowdhury, Parineet Kaur, Nicole Almeida, and Akanksha Tyagi. 2025. How can India Enable a People-centric Clean Energy Transition? Framework for Responsible RE Deployment. New Delhi: Council on Energy, Environment and Water.

While the principles provide the high-level guidance, it is important to translate them to tangible activities that RE developers can follow while deploying a project. This Guidebook does that by assessing how the current practices followed by developers perform on the principles of responsible deployment, and then reimagining them to integrate the principles. It also provides quantifiable indicators for each activity to help move developers up through the levels of responsibility.

The Guidebook results from a systemic methodology to ensure the guidance provided to developers is comprehensive and practical. The broad stages of the methodology are:

- Understanding the on-ground challenges in the deployment of large-scale RE projects, and their impact, through a secondary review and field work across two states in India, covering local communities and governments as well as developers
- Understanding multiple stakeholders' perspectives such as developers, state officials, lenders and investors
- Reviewing the global and domestic guidelines and compliances for RE projects
- Consultations with diverse stakeholders such as developers and their different teams (legal, land, business development, and sustainability), financiers, research organisations, and civil society organisations (CSOs)

The following chapters detail the Guidebook, beginning with its scope and layout. It ends with an assessment matrix to help developers self-assess their actions and locate their projects on the responsibility levels. Project developers are encouraged to follow this Guidebook to ensure they check all the boxes vis-a-vis business, and social and environmental responsibility goals.

Stakeholder mapping helps understand the social landscape and local dependence on the land. Here, CEEW team consults the local school principal to qualitatively assess the area.

Image: CEEW

2. How to use the Guidebook

This practitioner's guide aims to provide step-by-step, practical guidance to RE project developers to mitigate adverse social and environmental impacts of projects, and ensure their smooth implementation. This section explains four key elements: who this is for and what it covers, how activities are organised by phases, the themes addressed and why they matter, and how to navigate your journey using the path laid out in the 'levels of responsibility'.

2.1 Scope

This Guidebook is targeted at RE developers—project teams of developers (or EPC[4] firms), environment and social (E&S) risk assessment teams, and procurement teams, among others. However, it can also be referred to by policymakers, financiers, and procurers of clean energy looking to transform the process of large-scale RE project development, and make it just and equitable, while ensuring increased efficiency in operations and reduced project risks.

The guidance is divided across 'themes' that indicate the various intersection areas between communities, local ecosystems, and RE projects. These themes are broadly categorised as land, people and ecology, business responsibility, and environment and biodiversity. This guidance focuses only on project-level activities and does not cover company-wide initiatives like workforce diversity and inclusion, and corporate social responsibility.

4. Engineering, procurement, and construction

2.2 Structuring

This Guidebook is meant to be plugged to current operations of project teams in order to streamline project implementation, reduce timelines of deployment, and overcome challenges faced in this period. The guidance spans the lifecycle of an RE project (Figure 3), starting from project planning to decommissioning. Activities are listed under each phase, with the Guidebook covering the definition of each activity, how to perform it, practical tools, and relevant case studies. It also outlines the specific roles of key stakeholders, including policymakers and CSOs. A brief summary of the general phases of deployment, along with their implications on the environment and community, is provided below.

Figure 3. From bidding to decommissioning—the deployment cycle of an RE project

Pre-feasibility studies and bid approval	Site preparation	Construction & commissioning	Operations & Maintenance
• Project viability studies • Project bidding/dient acquisition • Site inapection • Legal/Regulatory and administration affairs	• Site testing • Site acquisition • Plant design • Site preparation	• Procurement • Field operations (constructions, installation, and grid-integration) • Commissioning	• Plant monitoring • Module cleaning • Maintenance of plant • Decommissioning

Source: Authors' analysis

Phase-wise guidelines aid in early detection of issues, and implementation of corrective measures in a timely manner. For example, during the site preparation phase, a particular group of individuals may highlight risks due to land use change, and its impact on the local ecosystem, or issues with land aggregation practices. Similarly, locals may highlight the loss of access routes connected to the site once the project comes up in the region. Understanding these issues during the site preparation phase itself is critical, so developers can take proactive steps to resolve them.

Thus, with a phase-wise division of activities, this Guidebook aims to highlight time-sensitive issues and provide detailed, easy-to-understand, and implementable guidance. It should be noted that some activities, such as land procurement and conversion processes, may continue beyond the confines of the primary deployment phase. The phase classification is general and the activities are indicative, and should be suited to the context and need of the project.

Pre-feasibility stage and bid approval

This refers to all activity that takes place from the time a project is conceived to the time the bid is approved by the regulatory body. This includes project bidding, land identification and procurement, legal and financial closures, and government and regulatory approvals. We assume that there is no physical construction activity during this phase such as dirt-moving operations or the start of fencing at the project site. However, the activities of the developer around the project site, such as identification of land, inquiry about prices, contracting of land aggregators and others, have a significant impact on locals. This includes speculation among land owners, and employment and developmental expectations from community members. This stage contains crucial checkpoints with multiple stakeholders, all of which are key to unlocking the responsible and smooth deployment of the project.

Site preparation

This refers to all activity from the time of bid approval to project construction. This includes site testing, land procurement, project design, and site preparation. In this phase, as the project begins to take shape, its physical ramifications on local social and ecological conditions begin to become clear. This includes clearing of land, building of access roads, and development of utilities. Displacement and relocation of individuals also occur in this phase, especially where the change in land use affects landless dependents. It is one of the most crucial phases of deployment, and when done responsibly, can mitigate a majority of the social and environmental risk of the project.

Construction and commissioning

This refers to activity conducted from the beginning of construction to project commissioning, including module/turbine installation and testing, and grid integration. This is the stage where employment generated by the project and physical movement of goods and people reach their peak. Some of these requirements are met by local contractors and community members. In addition, this is the stage where project plans are implemented, including activities related to risk mitigation.

Operations and maintenance

The operations and maintenance stage includes activities such as project monitoring and cleaning. It is followed by project decommissioning, when the project ceases to operate. This stage requires fewer workers than the construction and commissioning phase, with a reduced need for local contractors as well. Thus, investments in the local economy are solely in the form of sustaining local area development activities initiated in the previous stages. This is also when local communities and ecosystems adjust to having the RE project in their area, making its social, economic, and environmental impacts evident.

Decommissioning

Decommissioning is the final stage of a project's lifecycle, wherein it is dismantled and operations cease. It includes critical activities such as pre-decommissioning assessment, dismantling of the project, site restoration, and waste management. This stage is crucial to ensure the project site is left as it was before, ensuring ecological restoration. It is also important to ensure adequate waste management techniques are employed, like reuse of panels and recycling of salvaged material.

2.3 Themes covered

This Guidebook covers four overarching themes across the four phases of RE project deployment: land, people and ecology, business responsibility, and environment and biodiversity. These themes are designed to include parameters that can help carve a responsible path for RE deployment, one that is equitable, sustainable, and just.

Land

Spread across the four phases of project deployment, this is a key theme that emphasises inclusive engagement with communities and enhancing value creation for them, as well as fostering trust through transparent and timely dialogue with communities (Chowdhury et al 2025). The key guidelines under the theme are:

- **Siting projects on land parcels that have the lowest impact on people and the environment: low-impact siting**—Selecting sites with a low impact on the environment and community avoids concerns that may come up later and thus translates to fewer resources spent on mitigation.

- **Undertaking land use assessment to minimise loss to associated livelihoods**—Assessing land use patterns can help identify the incomes earned by the land's primary users and dependents, as well as other impacts such as threats to food security. By identifying the possible impacts of land diversion, developers can either mitigate them or decide against using the land altogether.

- **Identifying an equitable land procurement model, including a compensation process with just negotiation techniques**—Each community, based on the type and use of land, association and sentiment with the land, might prefer different models of procurement and compensation setting. Additional time and effort in deciding compensation and method of procurement leads to greater stakeholder satisfaction, and thus is an investment for smooth deployment of the project. Further, the method of deciding the rate of land for compensating landowners is critical to minimising risks to project deployment in the form of delays due to conflicts.

People and ecology

This theme emphasises preventive measures for social and environment impact mitigation, steps for effective grievance management, and community development. It also includes measures for ensuring community health and safety, preservation of culture and heritage, and increased diversity and equity in project practices. It follows the responsibility principle of *'creating resilient and thriving ecological systems by integrating biodiversity protection, environmental restoration, and circular practices'* (Chowdhury et al 2025). The key guidelines under the theme are:

- **Conducting a social assessment: assessing social dynamics and creating a stakeholder map to inform future consultations and activities**—Assessing the socio-economic characteristics of the local community aids in creating plans for community development, identification of jobs that the industry player can provide, and comprehensively gauging the impacts of the planned project. Further, understanding the key players and influencers in the project area and the vicinity can prepare the industry player to strategise on receiving buy-in from stakeholders, and understand the impacts of the project on various stakeholder groups. Such a documentation of spectral dynamics will also support responsible practices of other players if and when the project changes hands.

- **Having transparent communication of project details to enhance trust and collaboration with communities**—Transparent and timely communication of project

details enables community members to be better informed about the project that has direct or indirect impacts on their lives and livelihood. Further, inclusive stakeholder consultations and engagement can help minimise risks to projects that arise in later stages due to a lack of adequate communications with communities and missed opportunities for value maximisation.

- **Conducting an environment and social impact assessment (ESIA), developing an environment and social management and monitoring plan (ESMMP), and undertaking mitigation activities and monitoring**—An impact assessment is critical to understand the landscape of the project, its impact, and prepare mitigation strategies. It is important to prepare a plan for mitigation, with established priorities and detailed action, in order to effectively ensure minimum or no impact to the local communities and environment. Further, constant feedback from communities and effective monitoring help with timely course correction.

- **Ensuring labour rights, occupational safety and health (OSH), and community health**—This includes adherence to national laws relating to labour rights, and health and safety of workers on site. Both solar and wind energy pose safety and health risks, such as working at heights, and heat stress. Mitigation measures must be implemented, including safety training, and adjusting work schedules to avoid the hottest times of the day. Additionally, identifying impacts on community health and preparing plans to avoid or mitigate them is critical.

- **Preserving cultural heritage**—Preserving physical structures, traditional practices, and collective memory is essential for gaining genuine community support. When developers protect these cultural elements, communities feel like active partners in project development rather than passive recipients having decisions imposed upon them. It is also crucial to support indigenous groups in their role protecting and restoring nature and biodiversity, which maintains the ecosystem that benefits all.

- **Implementing a redressal mechanism to resolve grievances and disputes in a fair and timely manner**—This includes setting up relevant institutions for grievance redressal, strong access to information and processes, establishing investigation procedures, negotiation techniques and mediation practices, monitoring and evaluation of the system, and training and sensitisation within the organisation.

  A key step to effective communication and value maximisation is a robust mechanism of grievance redressal. Formal communication channels between the local communities and developers are essential for RE projects, especially where the latter is seldom present on-site due to outsourcing of EPC services, asset management and operations, land aggregation, etc. Effective grievance redressal via formalised channels and timely monitoring enables companies to build trust with communities. Further, an effective monitoring, redressal and documentation system enhances transparency and accountability, and identifies grievances that, if not mitigated, can become a risk to successful project deployment. Without effective training of monitoring officers, and a proper understanding of the key tenets of grievance redressal, the whole system is at risk of failure.

- **Creating and implementing a plan for community development activities focused on livelihood and employment generation**—This includes identifying community

needs, preparing a plan for integrating local community members into jobs created by the RE project, creating a blueprint for area development, and finally, implementing the community development plans.

Community development in project-impacted areas is critical to ensure that the entire local community benefits from the project, not only the landowners. The expectation of employment is substantial, and communication to manage expectations is critical. Additionally, area development in the form of infrastructure improvement and sustainable interventions in the community can help improve the buy-in for projects and reduce overall discontent, creating positive messaging in surrounding areas. Given large dependencies on land, such as farming, grazing of livestock and others, it is imperative for RE companies to invest in alternative forms of employment generation for impacted individuals. Implementing such plans by involving the community and building the capacities of community leaders is integral to achieving long-lasting results, and self-sustenance of measures.

Business responsibility

Business responsibility is directly related to the principle of '*maximising impact by driving business integrity among all actors engaged in the deployment of an RE project*', and it includes ensuring effective coordination and alignment among all stakeholders towards responsible practices. Business actors include every key player exerting influence over project development, within the scope of the RE developers' influence. Outside of company staff, this can include contracted material suppliers, land aggregators, and EPC and O&M firms. The following guidelines, spanning the different project deployment phases, are a part of the theme:

- **Selection and contract setting of business actors ensuring commitments to responsibility**—By ensuring that all players, especially those on the ground, follow responsible practices, risks to the environment and communities are mitigated, community dissatisfaction or reasons for contention are reduced, and project deployment is smooth.

- **Capacity building in responsible business practices and monitoring of contractors**—Responsible practices might be new to some or all of the key ecosystem partners. Capacity building can help ecosystem players understand the need for responsible practices, the tools to inculcate them, and help them feel empowered to undertake such measures for harmonious project deployment. Further, while these actors are to be trained and incentivised, monitoring ensures a carrot and stick system is set up for the proper implementation of responsible practices.

- **Incorporating responsible practices in project bidding and reports**—Responsible practices such as additional community engagement, training of various actors, and community development can be added to project documents to enable cost estimation and secure finance or responsible deployment.

Environment and biodiversity

The final theme covered in the Guidebook is in line with the responsibility principle of '*creating resilient and thriving ecological systems by integrating biodiversity protection, environmental restoration, and circular practices*'. It looks at the different ways in which an RE developer can minimise impacts to the local environment, and undertake strengthening of biodiversity and restoration of project sites after decommissioning. The following activities across the different project deployment phases are a part of the theme:

- **Minimising project impacts on environment and biodiversity and aiming for adoption of best practices in project deployment**—While large-scale wind and solar are classified as 'white category industries[5]' in India, it is critical for the industry to reduce both the carbon as well as the biodiversity-loss footprint of projects—from minimising their impact on local forests and

  natural ecosystems to responsible land use, and utilising energy-efficient construction technology. Further, industry players can move beyond carbon reduction to preserve local biodiversity in an endeavour to add value to local ecosystems.

- **Enforcing mitigation plans—**Heavy machinery and other equipment used in constructing RE projects can disrupt local ecology functions. A strict enforcement of the mitigation plan by all the players concerned will help reduce the impact.

- **Responsible waste management—**RE projects can have associated environmental pollution due to various activities, particularly during the construction and decommissioning phase. It is important to responsibly manage this waste and minimise project impact on local ecosystem.

- **Planning for decommissioning—**Decommissioning of RE projects requires detailed planning for waste management, impact assessments, ensuring that the land is restored to its original state, providing clarity regarding land use by communities' post decommissioning, and ensuring workforce reallocation. This is important to manage community expectations, enable a circular economy, and ensure satisfaction of all stakeholders.

2.4 Different levels of responsibility

Inculcating responsibility in deployment is not a binary classification wherein companies are responsible or not responsible. Instead, it is a spectrum of activities and interventions, with scope for new responsible practices at every step of the journey. There are four levels of responsibility based on the leadership scope demonstrated by the RE actors and the sustainability of the practices (Chowdhury et al.,2025). These are compliant, adopter, leader, and pioneer. These levels include specific activities and chart a pathway for companies to evolve into pioneers and visionaries in responsible practices (Chowdhury et al.,2025).

5. Industries are classified as red (highly polluting, stringent regulatory control, and requires most clearances), orange, green, and white (minimal/negligible pollution; most lenient category)

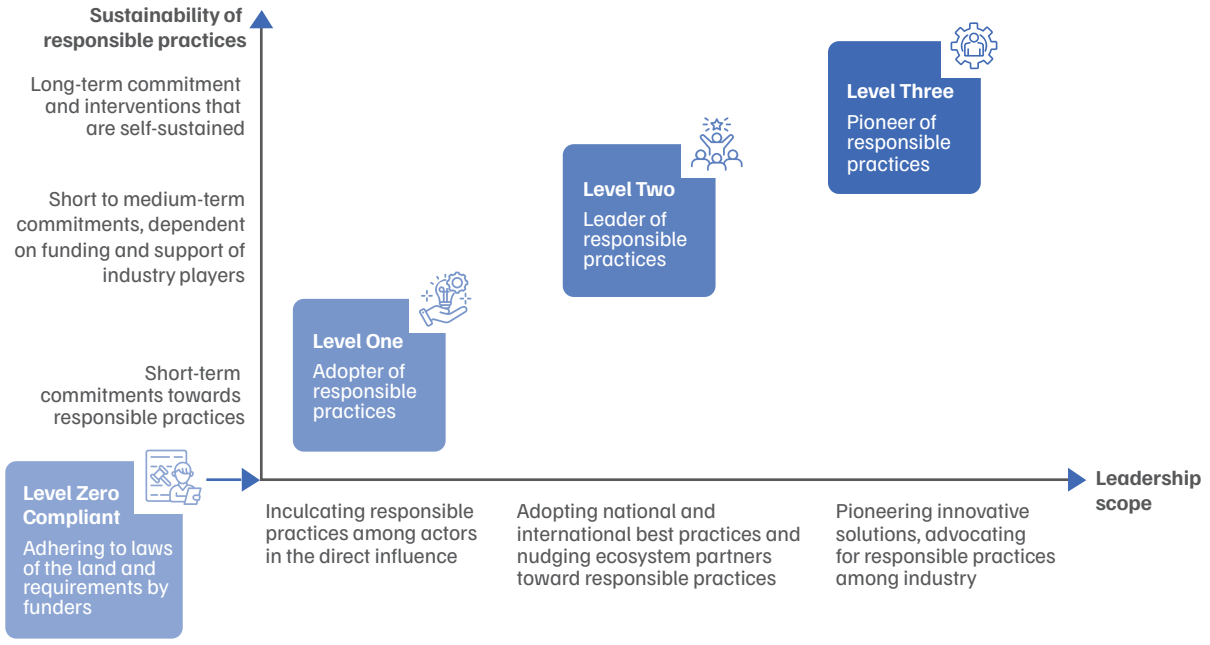
After each project phase, activities are summarised and organised into different responsibility levels. The activities under each level provide a systematic path for developers to make their projects reach the highest level of responsibility. This allows companies to continuously improve and expand their responsible practices over time. Further, developers can evaluate their projects by reviewing what activities they have completed, and comparing their performance against the responsibility scale. This will allow developers to assess where they are on the responsibility spectrum.

Table 1. Four levels of responsible business practices

Level	Description
Compliant	Complies with existing national and state laws and regulations, which all RE developers are assumed to be already following
Adopter	Adopts commonly undertaken responsible actions and practices. Even though the activities are short-term, companies attain an organisation-wide culture of responsibility, indicating that everyone within adheres to this culture.
Leader	Undertakes best practices and ensures that they and their business partners follow them. Responsible practices are no longer short-term, but medium-term in nature.
Pioneer	Innovates new practices, reshapes norms, sets precedents, and uses their influence to advocate for responsible practices in the broader RE ecosystem (policymakers, investors, procurers, etc.). Responsible activities are long-term, designed to be sustainable even without the active intervention of developers.

Source: Authors' analysis

Figure 4. Responsibility is a spectrum spread across four levels



Source: Chowdhury, Parineet Kaur, Nicole Almeida, and Akanksha Tyagi. 2025. How can India Enable a People-centric Clean Energy Transition? Framework for Responsible RE Deployment. New Delhi: Council on Energy, Environment and Water.

How do you decide at which level you are placed?

RE developers are encouraged to self-evaluate. The matrix established at the end of every phase of project deployment is designed to guide project developers to evaluate their positioning in the levels of responsible practices. RE developers are encouraged to develop quantitative metrics as per the context of the project for better evaluation. These metrics are to be developed based on the incremental value addition of each level. For instance, a project developer that is a 'leader' in responsible practices will necessarily need to meet all metrics under 'compliant' and 'adopter', in addition to the requirements under 'leader'.

How to move up the levels of responsibility?

The purpose of this document is to provide guidance to developers and allied players on moving up the levels of responsibility and aiming to become a pioneer of responsible practices across its portfolio of RE projects. The activities mentioned, supporting tools, and case studies also provide evidence to gauge the realm of possibilities.

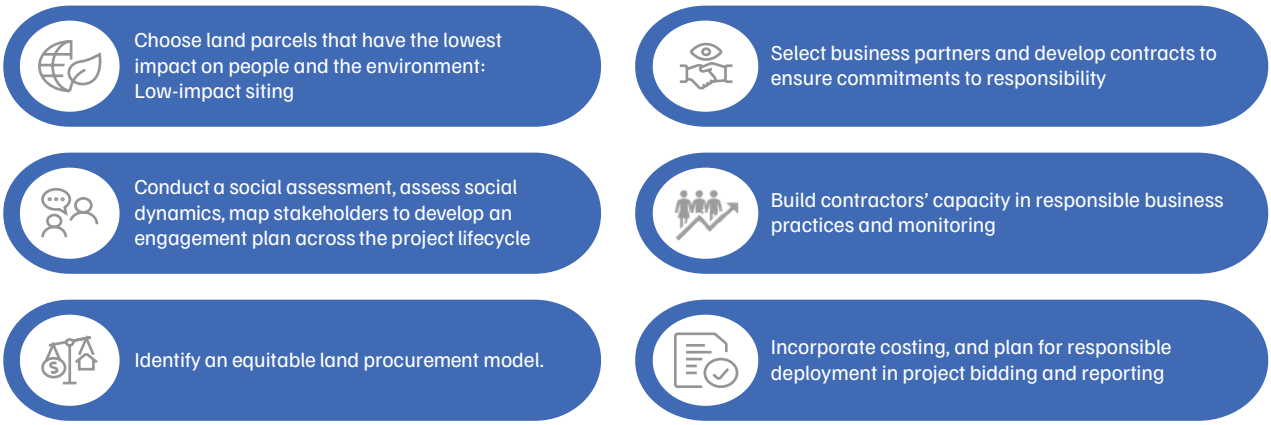
Across the phases of project deployment, the levels show incremental ambition that will enable RE companies to establish higher benchmarks of responsible deployment, minimise project risk, and achieve higher reputational standards. Thus, the journey of moving up from one level of ambition to another involves dedicated and incremental commitment of senior management and on-ground implementation staff, and a strong resonance of responsibility in company culture.

Image: iStock

3. The pre-feasibility and bid approval phase

Phase 1 of a project deployment cycle includes site selection, pre-feasibility Environment and Social Risk (ESR) checks, assessing availability of grid infrastructure, etc. These assessments inform bid participation. Post successful bidding and project allocation, the site is finalised, and efforts begin to understand land availability.

Figure 5. Responsible activites to be carried out during Phase 1 of RE deployment



Source: Authors' analysis

3.1 Choose land parcels that have the lowest impact on people and the environment: Low-impact siting

What does this involve?

Low-impact siting is selecting a site where the RE project will have minimum or no social and environmental impacts. It is done by avoiding lands with cultural or religious significance for communities, biodiversity-rich areas and buffer zones, and exposure to extreme climate events such as floods, typhoons, and earthquakes.

How to do this?

Collect information on the various environmental and social aspects of a potential site, and its vulnerability to extreme climate events, and assess their level of impact on the project. Developers can use Site Right tool, an open-source tool developed by The Nature Conservancy and available for low-impact siting. Some useful resources, such as a list of low-impact parameters and pre-screening assessment questions to ask stakeholders, is attached in Annexures 1 and 2. The list of parameters and resources is provided below. This is divided into two criteria: (i) exclude—where land siting should be excluded at all costs, and (ii) avoid—areas that should be avoided whenever possible, but if no alternatives exist, used with a clear mitigation roadmap.

Environmental and jurisdictional parameters

- Exclude
    - Areas protected under the Wildlife Protection Act, 1972 (sanctuaries, national parks, conservation reserves, community reserves) and wetland areas protected under the Wetland Conservation and Management Rules, 2017.

- Avoid
  - Forest areas[6], eco-sensitive zones[7], wildlife corridors (such as elephant corridors), migratory bird routes (especially those of critically endangered species).
  - Areas prone to floods, cyclones, and high seismic activity. Resources include: PIB list of areas with high seismic activity, NRSC and ISRO's repository of flood-prone areas, Mohapatra et al., 2021 data on cyclone-prone areas, and tools such as Earthmetry can be used.
  - Areas that facilitate connectedness of biodiversity such as wildlife corridors and riparian networks. Refrain from clearing native forests and grassland (Kalies and Hartung 2019).
  - Areas that increase resilience to climate change—such as wetlands and floodplains (act as natural sponges, absorbing excess water during heavy rainfall, reducing flood damage and slowly releasing it during droughts) (Darpan 2025), topographically diverse landscapes (that create varied microclimates and habitats, offering species more options to adapt to climate change) (Lawrence et al., 2021).
  - Avoid siting in floodplains and steeply sloped areas that require extensive grading, which increases the risk of severe soil erosion and environmental damage.
- Engage with
  - The district's chief conservator of forest, or the principal chief conservator of forest at the state level to ensure areas that are shortlisted for the project have cleared the above mentioned environmental parameters. Data resources include the protected area gazette notification database, migratory bird patterns, wetland areas and elephant corridors, sources for which are mentioned in Annexure II.
  - If implementation is unavoidable in forest villages under Forest Rights Act or Indian Forest Act, ensure consent of relevant authorities is taken at the siting stage itself.

Social parameters

- Exclude
  - Filter out population centres, buffer zones, sites of cultural and religious significance, agricultural land with multiple cropping, through tools such as SiteRight.
- Avoid
  - Avoid land parcels where more than 30 per cent of individuals (farmers, landless labourers, grazers and other dependents) impacted stand to lose their only source of income[8]. Assume that landless labourers and grazers only have one income source. If the selection of such a site is unavoidable, ensure alternative livelihood and benefit-sharing mechanisms are in place for the people who lose their sole source of income.

6. While RE projects are allowed in forests conditional on clearances, developers should avoid forest areas due to felling of trees for the project and for roads, disturbances to communities protected under Forest Rights Act, and irreversible negative impacts on biodiversity
7. Ecosensitive zones are buffer zones used to safeguard areas protected under the Wildlife Protection Act, 1972. While the guidelines published by the Ministry of Environment, Forest and Climate Change allow renewable energy projects in ecosensitive zones, developers should avoid these areas due to biodiversity impacts.
8. The LARR Act, or the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, requires 70 per cent public consent for public-private projects and 80 per cent for private projects. Assuming that at least 70 per cent of stakeholders will benefit from an RE project, guidance is provided to avoid parcels where it is not favourable to more than 30 per cent for livelihood reasons.

- Avoid sites where projects can result in significant adverse impacts on cultural heritage. The site identification process should include recognising cultural heritage of all three kinds[9], and prevent deployment in such areas

- Factor in proximity to habitations, and, based on the wind turbine specification, ensure that noise levels do not surpass the Noise Pollution (Regulation and Control) Rules, 2000, which lays down a threshold of 45dB at night time (10 pm to 6 am). Ensure the sites selected have less or no shadow flicker, or adjust wind turbine location to eliminate shadow flicker.
- Avoids land that requires resettlement of land owners or informal settlers.

- Engage with
  - Get in-principle consent from de jure and de facto dependents on land for land procurement and its use for energy infrastructure. It is critical to get consent early on—before finalising the land parcel. This can be done through consent forms, minutes of meeting, audio or video recordings, etc. Additionally, consent should be:
    - **Continuous**: Regular engagement throughout all phases
    - **Informed**: Communities receive updated information as projects evolve
    - **Free**: Without coercion, intimidation, or undue time pressure
  - Use of online tools alone is insufficient to identify a low-impact site. Field visits are integral. Developers should undertake a quick assessment to inform land siting. If this assessment is not possible at this stage, developers should conduct key informant interviews (KII) with at least one representative from the following groups
    - Village elders
    - Panchayat officials
    - Women
    - Landless labourers
    - Land owners
  - These KIIs should be conducted to assess the following
    - The social and economic dependencies on land such as livelihood and food security.
    - Historical land conflicts or legacy issues in the area (so lands over which there are conflicts, due to family issues, or acquisition problems with the government, etc., may be avoided)
    - Other concerns—environmental or biodiversity concerns of the community, religious or cultural significance, and other factors.

For a detailed tool regarding pre-screening criteria, see Annexure 2. For a list of pre-siting questions, please see Annexure 3.

9. Tangible cultural heritage, unique natural features or tangible objects that embody cultural values, and intangible forms of culture. For more details, refer to IFC's performance standards or the section on 'Preserving cultural heritage' in phase 2

Role of other stakeholders

Policymakers

Create a public database of resources to ensure developers can access information on upcoming public projects such as highways, airports, and railways, areas of cultural heritage, etc. Each district can publish this information online.

Identify and publish state-specific maps of 'go' and 'no-go' zones[10] for active signalling to industry.

Create mechanisms for coordination between various departments during project approval. This may include having a representative from the district, revenue department, or forest department to ensure that land approved for projects is not being used or planned for use by different departments.

Tendering agencies can include this as a non-price criterion in selecting tenders and give weight to low-impact siting.

Civil society organisations

Collaborate on joint research for low-impact siting criteria, facilitate dialogue between communities and companies, advocate for clarity in zoning and for governments to share information, especially on upcoming public projects.

Financial institutions

Verify that projects have conducted thorough social and environmental assessments of the site based on the criteria specified above.

10. No-go zones: reserved forests, areas with endangered species, biodiversity hotspots, areas that have migratory birds, tiger corridors, protected areas (sanctuaries, national parks, conservation reserves, community reserves) and other areas the government may think to be No-Go (sites of religious significance, certain animal corridors, etc.) Go areas: well-defined pieces of land with no or low potential for social and environment impacts, may be identified through calling for Expression of Interest or other means.

Box 1. Case study – balancing technical, social, and ecological needs in renewable energy land siting

Eden Renewables LLP, a leading renewable energy developer in India, has 1047 MWp of operational capacity and 1.05 GWp under development, with a strong presence in Uttarakhand, Rajasthan, and Madhya Pradesh. Unlike many developers who typically conduct environmental and social impact assessments (ESIA) only to meet funders' requirements and secure finance, Eden integrates impact considerations much earlier in the project cycle. The company follows a rigorous, sustainability-driven land selection process, beginning with an internal E&S screening tool complemented by SiteRight to identify ecologically sensitive areas and ensure responsible siting decisions.

The land selection process is collaborative, with inputs from the engineering, environmental, and social teams, and is aligned with global frameworks such as the IFC Performance Standards, World Bank ESF, and Equator Principles (EP4). Guided by these standards, the company conducts a low-impact siting and screening exercise prior to land selection, evaluating five to six potential parcels before finalising the site. This process uses a combination of mapping tools, site visits, and inputs from their trained land acquisition team to stay close to the ground and address issues early. Sites are evaluated across technical, environmental, social, health and safety, and community engagement parameters, with the lowest-impact option selected. The outcome of this early screening is then embedded into the EPC contractor's planning and execution, ensuring responsible, risk-aware, and sustainable project development.

Identifying critical habitats and local biodiversity before finalising land acquisition is essential to mitigate risk and optimise project siting

Success factors

1.Evaluating multiple land sites to then select lowest impact land parcels
2. Contracts clearly mention EPC contractors' responsibilities to undertake responsible deployment

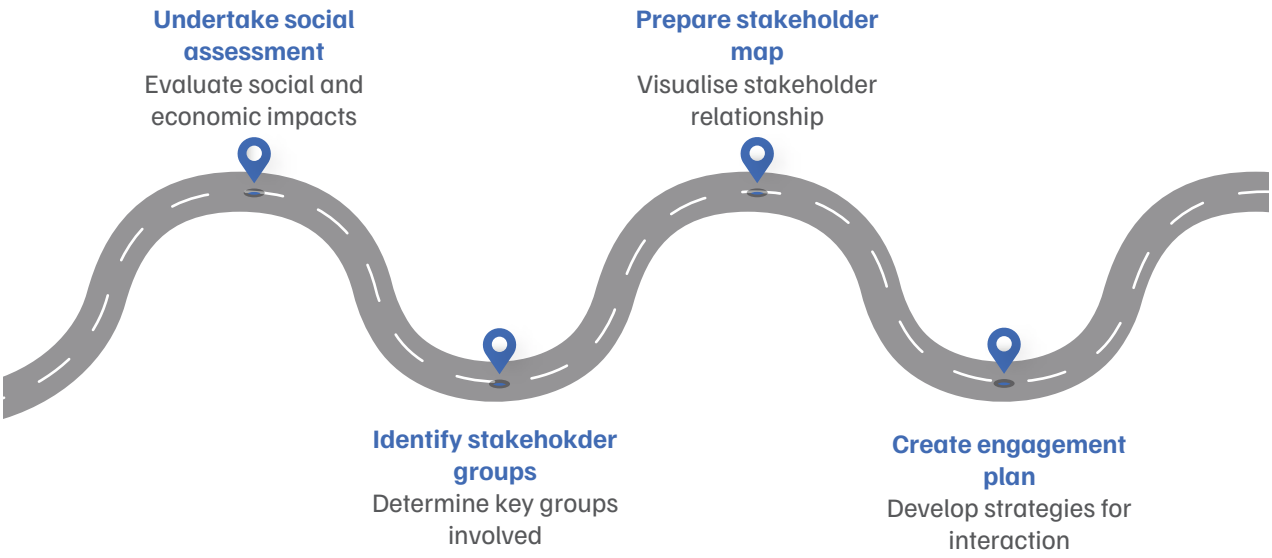
Source: Rohit Singh, Eden Renewables, email message to authors, 4 November 2025

3.2 Conduct a social assessment, assess social dynamics, map stakeholders to develop an engagement plan across the project lifecycle

What does this involve?

This includes conducting a social assessment to understand the socio-economic fabric and power dynamics of the local area, identifying stakeholder groups, and mapping stakeholders. Using this information, a stakeholder engagement plan should be created. The social assessment and stakeholder mapping focuses on collecting information about current societal and economic conditions. Annexure 3 includes relevant questions to ask key informants. **The information collected here will be included in the environmental and social impact assessment (ESIA) and related mitigation plans in subsequent stages of the project.**

Figure 6. Critical requirements to plan a successful stakeholder engagement strategy



Source: Authors' analysis

How to do this?

- **Undertake a social assessment and livelihoods impact assessment**
    - Undertake a detailed study to understand the social baseline of related villages in the shortlisted area. This can be done by conducting at least one interview with a member of the gram panchayat. The number of people required to collect all the information might be context-specific.

- It might be possible that interviews need to be done with more than two people to collect all the information. The information includes
    - Population
    - Income and share of population in each income brackets
    - Population characteristics (age, share of vulnerable communities, education levels)
    - Source of income and livelihood, especially for women and marginalised communities,
    - Access to and quality of healthcare, education, and sanitation
    - Archaeological and cultural sites, indigenous communities
    - Vulnerability assessments based on socio-economic status, caste, and gender to avoid exacerbating inequalities and promote inclusive decision-making
- Assess the local workforce by collecting information on education characteristics (such as highest level of education and specialisation), skill profile, persons with technical diplomas/education/experience in fields relevant to wind or solar deployment.
- Include an analysis of cultural sensitivities, legacy issues, etc. This can be done by collecting information on celebrated festivals, key local politicians, any contested pieces of land, cultural heritage sites, common areas used for festivals or gatherings, etc.
- Additionally, consult with local authorities such as district administration, and gram panchayats of surrounding villages to understand the local area.

• **Identify stakeholder groups**

Adopt a top-to-bottom strategy of stakeholder identification with the following key stakeholder groups to be covered in the identification strategy and areas of enquiry:

- State nodal agency, state and national bodies
- Local administration: district collector (DC) office followed by revenue/forest department (basis land type), zila panchayat and any other local administration as advised by these departments. Further, draft an area of influence in consultation with these departments to understand the villages impacted.
- Local government bodies: Utilise gram panchayat, panchayat development officer, village accountant in the shortlisted area to understand the structure of land holdings, land owners, preparation of social baseline, etc.

- Landowners: Identify large, medium, small and marginal landowners; consult with them to further identify any land dependents like agricultural labourers, forest dwellers, arrangements with grazers, etc.

- Landless dependents: Prepare a map of key land dependents, understand their dependence on land, potential areas of impact, as well as alternatives and potential income impact.

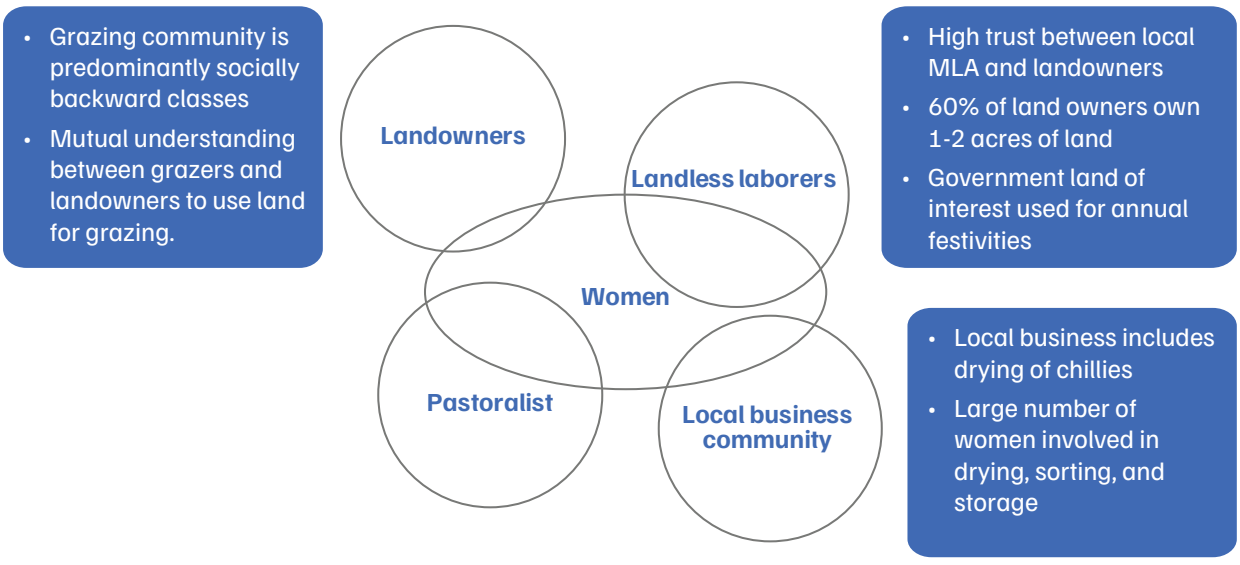
- Vulnerable groups: Identify categories of individuals who are specifically vulnerable, such as members of SC/ST, women, etc. and understand the impact of the project on their livelihoods.

- Conduct initial enquiry about the stakeholder groups in the areas through surveys, interviews, snowball sampling, etc. By interviewing key persons in the areas, underlying social dynamics and nuances can be identified.

- **Prepare a stakeholder map**

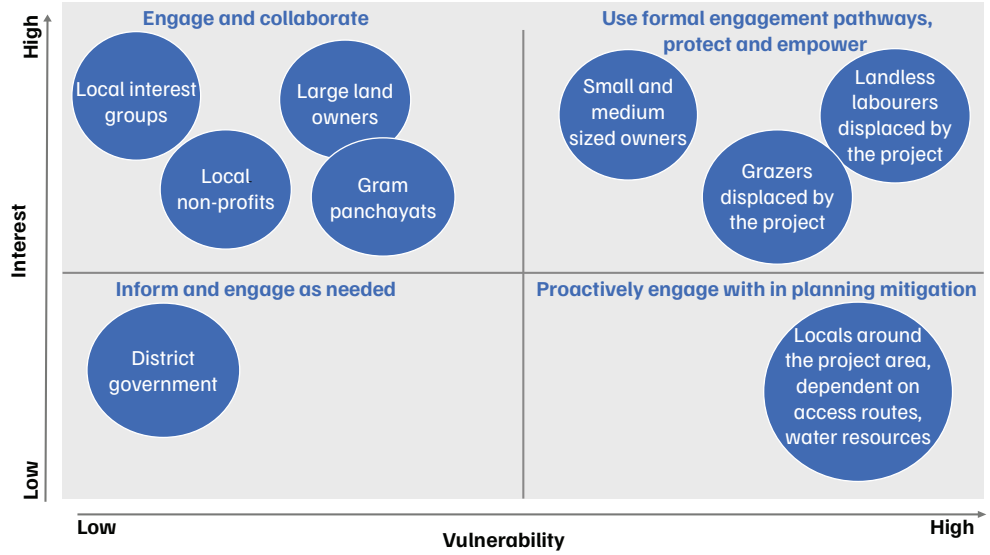
  - Utilise tools such as a stakeholder analysis matrix to categorise stakeholders based on their interest, influence, impact on the project, and extent of vulnerabilities. Assess power dynamics and relationships between stakeholders to understand their roles, interests, and potential conflicts (like caste, gender, religion, etc.). An indicative Venn diagram maps social dynamics, and the matrix provides an indicative illustration of the engagement strategy that can be used to formulate an engagement plan (Table 1).

Figure 7. Social dynamics and intersections of stakeholder (indicative)



Source: Authors' analysis

Figure 8. Assessing local dynamics to identify vulnerabilities and interest of key stakeholders



Vulnerability includes livelihood, health and other impacts on socio-economic vulnerable groups

Interest includes interest in project due to impacts (positive and negative) and possibility of financial gain

Source: Authors' analysis

- Identify high, medium, and low-priority groups for targeted engagement strategies.
- Reach out to local government agencies, NGOs, and community groups to involve them in preparing the stakeholder map.

- **Create an engagement plan**
  - The plan should include who needs to be engaged with, when, how frequently and for what.
  - Data from the KII used before siting can enable this. **The ESIA in phase 2 will be used to strengthen and finalise the stakeholder plan**.

Table 2. Template to create an engagement plan to engage with stakeholders

When?	Phase 1	Phase 2	Phase 3	Phase 4
What to cover? (consultation, ESIA, community development, etc.)				
Who to include?				
How often to speak to during the phase?				
Who will lead the engagement? (Developer/ EPC player)				

Source: Authors' analysis

Role of other stakeholders

Civil society organisations

Local NGOs are crucial in facilitating dialogue and making it easier for locals to share information.

3.3 Identify equitable land procurement Identify an equitable land procurement model

What does this involve?

Identifying equitable land procurement models includes conducting due diligence on the methods of procurement and compensation-related guidance by the states, and consultation with communities on the preferred models of procurement. Compensation through lease payments or sale is just one factor that only compensates the landowner. Companies at this stage should also factor in landless labourers, grazers and others dependent on land that do not possess ownership.

How to do this?

- Conduct an analysis of national and state laws to understand options available to use land for RE projects. Refer to the supporting document in Annexure 1.
- Identify the dependencies on the land based on the stakeholder analysis conducted.
- Identify possible monetary and non-monetary that might work in the particular context of the community. Use the next phase to plan the details of these benefits in a collaborative manner with community stakeholders. This includes creating shared value through employment, community development and other activities.
- If land procurement begins before GO order or prior to winning the bid, please refer to the section **'Inclusive compensation setting processes'** in the next phase.
- This process may have significant differences based on the ownership of the land parcel on which the project is to be constructed. Table 3 highlights the differences between private and common lands.

Table 3. Differences in procurement for private and common land

Parameter	Private land	Common land
Assessment of land dependencies	Identify landowners and dependent households associated with the privately owned parcel.	Identify de facto users of the land, including pastoralists, landless households, and seasonal users dependent on common land resources. Mapping of dependencies should also include sociocultural and ecological dependencies of communities on the common lands
Consent and consultations	Obtain consent from landowners and directly affected dependents.	Obtain Gram Sabha consent and separate consent from de facto users and communities dependent on the land, even where legal ownership rests with the government.
Procurement / land use process	Land is procured through negotiated sale or lease agreements with individual landowners.	Land is accessed through administrative allotment or lease from the competent authority, subject to statutory approvals.
Compensation	Direct compensation to landowners, supplemented with support for land-dependent groups.	Measures to compensate for loss of access to commons, including creation of compensatory assets and livelihood support. These assets should be targeted towards commons dependent communities, such as creation of solar-powered fodder growing units for pastoralists
Resettlement	Avoids lands that require resettlement.	Avoids land that has inhabitants but no tenure. If unavoidable, develops plan to rehabilitate through long term employment, community benefits, etc. Provides compensation based on structures developed on the land.

Source: Authors' analysis

Role of other stakeholders

Policymakers

Policymakers play a critical role in streamlining land procurement by clarifying processes and reducing complexity. Addressing structural challenges is equally important, particularly digitalising land records and raising public awareness about the importance of keeping these records current and accurate.

Civil society organisations

Local CSOs are well placed to provide information about the community, dependents, possible development activities, etc.

Box 2. Case study – community members earning sweat equity: Insights from a project in South America

Meliquina, a company based in Argentina and Colombia, is developing an 18 MW solar project in Argentina with the indigenous Mapuche Millaqueo community as co-developers and Sustentar Energía as technical partner.

The project inverts the conventional development process. Rather than selecting sites first and then approaching communities for land access, Meliquina began by proposing the project concept and ownership structure directly to the community. Crucially, the relationship is built on free, prior, and informed consent (FPIC), which is viewed not as a one-time approval to be "secured", but as an ongoing process of engagement and collaboration throughout the entire development lifecycle. Following the community's initial agreement, it worked collaboratively with them to identify suitable land parcels, which comprise 42 hectares of the community's total 9,500 hectares of landholding.

Recognising that meaningful ownership requires genuine understanding, Meliquina organised capacity development workshops to help community members comprehend the proposal's terms and implications. The project structure explicitly rejects passive ownership models. The community receives equity only through active co-development, such as helping expedite regulatory licensing, identifying potential power purchase offtakers, and inviting equity and debt investors to join the project.

Thus the community earns 'sweat equity' as co-developers. The community can acquire greater equity in the project by contributing the net present value (NPV) of 20-year lease and/or securing an equity loan. The Patagonia project offers a replicable template for more equitable RE development across the world.

Public hearing on the environmental impact assessment.

Success factors

1. An organised community with visionary leaders willing to take risks
2. Corporate partners willing to invest more time and money upfront to build the project together and strengthen community capacity to participate as partners; no free handouts. The community earns its equity position in the project.

Source: Jaun Dumas, Meliquina, email message to authors, 23 October 2025

3.4 Select business partners and develop contracts to ensure commitments to responsibility

What does this involve?

The selection of business partners and finalising the terms of the contract must factor in the requisite conditions of responsible activity and actions. Only those actors should be selected for project deployment activities who agree to responsible actions and are contractually bound to do so.

How to do this?

- Define clear, enforceable roles and responsibilities in contracts with trackable metrics and compliance strategies. Draft bid documents should include detailed task requirements, frequency of requirement, expected outputs, and mitigation measures.
- Use enforceable contractual language with compliance strategies, avoiding incentives that promote irresponsible actions.
- Ensure contractors and partners (including upstream manufacturers and suppliers) adhere to national and international human and labour rights.
- Include the following in the contracts
    - **For land aggregators**
        - Mandatory communication standards: All communications with landowners must be accurate, complete, and transparent.
        - Misrepresentation penalties: False inducements, including unguaranteed employment promises or exaggerated project benefits, shall result in immediate contract suspension and financial penalties.
        - Ethical negotiations: Coercive tactics, including but not limited to undue pressure, intimidation, or exploitation of landowners' circumstances, are strictly prohibited.
    - **For EPC contractors and others**
        - Obligation to participate in grievance redressal mechanism.
        - Maintaining regular communication and coordination with the environmental and social officer.
        - Clearly state impacts of the project that need to be mitigated by the contractor.
        - Clearly include requirements to mitigate adverse impacts and conduct activities to improve biodiversity. The contractor should be obligated to ensure there is no net loss of biodiversity as a result of the project. This means any negative impacts must be fully offset by positive actions, such as restoring a larger area of a habitat than was disturbed.
        - Clearly state labour, health, and safety standards required.
        - Requirement to produce a site-specific construction environment management plan (CEMP).

- **Suppliers of materials and components**: These include manufacturers and suppliers of equipment, materials and machinery
    - Source clean energy technologies from manufacturers that adhere to reputable international standards. Further, developers should choose suppliers that provide low-carbon construction technologies and equipment to reduce emissions and implement energy efficiency measures.
    - Ensure that sourced materials are climate resilient and are durable in cases of strong winds, heat waves, transportation, etc.
    - Selection of suppliers should evaluate past performance and ideally require testimonials from previous engagements.
    - Ensure suppliers can provide documentation for traceability of components.

- **Select only those contractors and suppliers who commit to responsible deployment** and have a strong performance record. For EPC contractors and suppliers, this includes answering questions such as
    - Do you have an established environmental management system (EMS)? Is it certified (e.g., ISO 14001)?
    - What measures do you have in place to prevent air and water pollution? How do you manage and dispose of waste, including hazardous materials?
    - What strategies do you use to reduce water and energy consumption on-site? How do you ensure resource efficiency?
    - Have you received any fines, penalties, or non-compliance notices for environmental violations in the past? If so, what corrective actions were taken?
    - What are your policies on wages, working hours, and benefits? How do you ensure these standards are met?
    - What are your occupational health and safety policies and procedures? How do you identify, assess, and mitigate risks for your workers? What is your accident and injury record for the last three years?

Roles of other stakeholders

Policymakers

The state can mandate requirements that contractors such as land aggregators need to follow. This is important to create a level playing field and establish accountability mechanisms across different categories of business actors. Policymakers should consider creating a list of land aggregators for RE projects. By doing this, some aspects of training can be conducted by the state nodal agency (SNA) instead of the developer.

3.5 Build contractors' capacity in responsible business practices and monitoring

What does this involve?

Taking steps for effective capacity building of business partners to ensure they are integrated into the paradigm of responsible deployment, and act as key stakeholders in the project lifecycle. Capacity building is essential to ensure all business actors understand and implement responsible. This is crucial to complete the lifecycle of activities geared towards making project deployment more responsible and inclusive. Further, adequate monitoring capabilities and mechanisms need to be established in order to ensure adherence

How to do this?

- **Capacity building: Built capacity of partners and contractors**.
    - Establish standard operating procedures with details on contactor performance, required activities related to waste management, conduct towards local communities, etc.
    - Develop and conduct training programmes spanning at least four to five hours with on-ground contractors such as land aggregators, EPC firms, and company project staff as mandatory requirements.
    - Include guidance on the importance of transparency, accurate communication, etc. in training programmes. Ensure that training programmes are designed to communicate the responsible actions expected of contractors as well as the intent and goal of project risk reduction.
    - Gear training towards understanding the requirements, with clear establishment of priorities and goals. This includes understanding the impact of compliance, cost of compliance, level of technical and soft capacity required to act responsibly, communicating the kind of capacity expected to be built by contractors, etc.
    - Organise workshops for contractors, particularly land aggregators, on transparency and truthfulness, focusing on clear communication, ethical behaviour, and fair stakeholder engagement and negotiation tactics.
    - Ensure a mandatory training for all on-site staff and contractors prior to project execution, covering roles and responsibilities, waste management, health and safety protocols.
    - Outline contractor requirements and monitoring protocols as part of capacity building workshops.
- **Monitoring: Monitor contractors and ensure adherence to responsible actions as set in contracts**
    - Establishment of clear roles and responsibilities within the organisation, clarifying who is responsible for defining parameters to assess responsibility, how to respond to violations, who is responsible for monitoring, etc.

- Define parameters such as waste disposal practices, local employment generation, etc. to be monitored, and the verification frequency and monitoring responsibilities.
- Appoint a full-time environment and social (E&S) officer and form a dedicated task force to oversee contractor compliance, including regular meetings and site visits.
- Ensure that contracts allow for random checks at the site to ensure compliance and adherence to responsible practices.
- Conduct at least one visit during the land aggregation or procurement phase to monitor and verify the communication techniques used by land aggregators.
- Ensure at least monthly reporting on environmental and safety issues across all activities.
- Simplify contractor reporting on performance and responsibility parameters through joint inspections and checklists.
- Take strict action, such as imposing fines or other penalties stated in the contract, in case of any grievance, false communication, or unrealistic expectation setting.
- Conduct intermittent training of internal monitoring teams to ensure high quality of supervision over contractors.

Roles of other stakeholders

Financial institutions

Financiers should incorporate requirements for responsible practice into their financing conditions. By doing this, financiers can establish accountability frameworks that ensure consistent environmental and social standards flow from financing agreements, through primary developers to all subcontractors, creating unified oversight across the complex web of project partners.

3.6 Incorporate costing, and plan for responsible deployment in project bidding and reporting

What does this involve?

This includes proactive planning, documentation and disclosure, and financial integration. Developer should budget for and declare specifics of community development, employment generation, etc. at the stage of project finalisation and bidding. This will enable developers to commit to responsible activities from the get-go, and secure channels of funding to fulfil this commitment. Further, it will enable the establishment of structural processes to institutionalise responsible activities, and seek funding for the same.

How to do this?

- Conduct assessments to understand the estimated amounts to be invested in activities such as community development initiatives[11], employment generation opportunities (direct, indirect and alternative employment generation on project site), other activities. With institutional capability and experience, it is estimated that acceptable benchmarks will emerge and repeat assessments will not be necessary.

- Ensure disclosure—The bid document should be accompanied by a short description on initiatives for community development, biodiversity conservation and restoration, and risk mitigation activities. Further, details regarding employment generation should also be disclosed for effective signalling and gaining trust of policymakers and investors.

- Have estimated costs ready—Estimated costs should be assessed, and a budget developed, for conducting these activities and signalled in all project documentation.

- Plan for sustenance—Prioritise self-sustaining financial models, such as creating a community development fund to ensure long-term viability.

Roles of other stakeholders:

Policymakers

Policymakers have a key role to play in institutionalising the disclosure of social and environmental development parameters in project documentation and applications. Regulators should consider introduction of non-price criteria in bidding. This includes criteria for environmental and social aspects of the project, instead of just allocating the bid to the company with the lowest tariff. Environment and social criteria should include biodiversity protection, impact mitigation, community development, proper management of waste, resource use, and conservation.

Financial institutions

Investment needs to be prioritised towards projects with higher commitment to social and environmental betterment via project deployment. This requires national and international financiers to commit to providing access to responsible finance to the best performers. Financiers should require developers and RE companies to adopt responsible practices as per the Guidebook.

Civil society organisations

With the institutionalisation of responsible deployment, public scrutiny will play a crucial role to raise the levels of ambition and meet higher social and environmental standards.

11. While exact activities of community development will only be clear following interaction with the community and ESIA, at this stage, based on the social assessment the developer should include the cost of these activities in project documents and indicate as much to the financier.

Table 4: Moving up levels of responsibility in Phase 1

Responsibility	Compliant	Adopter	Leader	Pioneer	Key indicators
Choose land parcels that have the lowest impact on people and the environment: Low-impact siting	Ensures sites are not situated in protected areas and comply with state-level land use policies and regulations	Avoids areas with endangered species, and migratory bird habitats, areas as well as regions susceptible to extreme weather events, and areas of cultural and religious significance. Avoids forest areas, eco-sensitive zones and wetlands. Takes free and informed consent of landowners. Avoids land that requires resettlement of land owners or informal settlers.	Additionally, avoids areas where more than 70 per cent of individuals impacted don't have alternative sources of income. Takes free and informed consent of de facto and de jure dependents of the land parcel in question	Additionally, avoids areas where more than 50 – 70 per cent of individuals impacted don't have alternative sources of income[12].	1.Data on extreme weather events, environment and other parameters is collected (Y/N) 2. Social assessment undertaken (Y/N) 3. Based on data collected, site with lowest impact on community and environment is selected (Y/N)
Conduct a social assessment, assess social dynamics, map stakeholders to develop an engagement plan across the project lifecycle		Undertakes social assessments through interviews with relevant stakeholders, identifies key stakeholders, and creates an engagement plan	Maps dependencies on the project site to assess impact of project on livelihoods, and creates an engagement plan	Collects deep insights on social dynamics relating to economic class, caste, local politics, power, cultural sensitivities	1.Dependencies on land are identified (Y/N) 2. Stakeholder map developed 3. Social dynamics and cultural sensitivities identified (Y/N) 4. Engagement plan developed (Y/N)

12. Alternative income includes income through the sale or lease of land for the project.

Responsibility	Compliant	Adopter	Leader	Pioneer	Key indicators
Identify an equitable model of land procurement	Identifies a method of fair compensation to land owners. Beneficiary group: Land owners	Identifies stakeholders dependent on the land for livelihood apart from the landowner, and identifies fair compensation Beneficiary group: Land owners and individuals who depend on the land (landless labourers, grazing community, others)	Accounts for and works towards identifying activities such as employment opportunities, community development, and others that benefit the entire community and local area Beneficiary group: Land owners and other individuals who depend on the land (landless labourers, grazing community, others), other community members in the village	Performs the activities suggested for 'Leader' and advocates for adoption by other industry peers	1. Fair compensation method identified for landowners 2. Compensation identified for dependents other than landowners (proportion of landless dependents to be compensated)
Select business partners and develop contracts to ensure commitments to responsibility		Creates Standard Operating Procedure (SOP) for all contractors	Selects only those contractors who agree to clear terms and conditions with respect to responsible actions such as mitigation efforts, and transparent communication with communities. Includes legally binding clauses for responsible activities in contracts	Creates a code of conduct that outlines acceptable practices for non-certified business actors like land aggregators. Advocates for high contractor compliance in the industry and regulatory circles, to ensure institutionalisa-tion and stan-dardisation. Applies responsible processes through contracts to component suppliers	1. Processes established for contractor selection 2. Establishment of contracts for different business actors 3. Creation of Standard Operating Procedure 4. Applies responsible processes through contracts to component suppliers

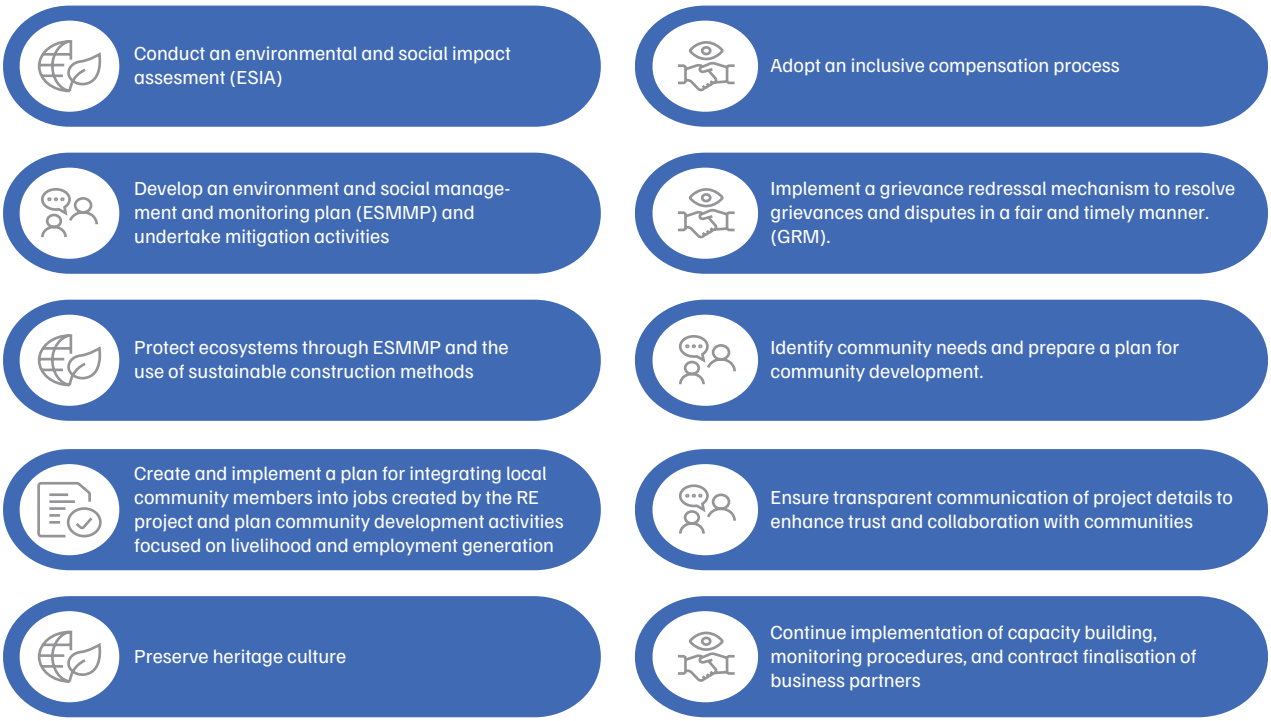
Responsibility	Compliant	Adopter	Leader	Pioneer	Key indicators
Building contractors' capacity in responsible business practices and monitoring of these practices	Undertakes monitoring to ensure that the deliverables are executed	Undertakes minimum of two training programmes or capacity building sessions Monitors initiatives to include random checks at the site, and appoints a full-time environment and social officer	Ensures that monitoring procedures allow for corrective processes, to ensure timely course correction	Leads the formulation of a dedicated task force to oversee contractor compliance on responsibility parameters	1. Minimum 2 trainings undertaken across all business partners (Y/N) 2. Officer dedicated for monitoring of business partners (Y/N) 3. Corrective process in place and enforced (Y/N) 4. Dedicated task force created to ensure compliance by business partners/ contractors (Y/N)
Incorporating costing, and planning for responsible deployment in project bidding and reporting	Formulates project documents while factoring in cost parameters such as price of materials, land procurement, jobs, etc.	Includes the cost of responsible deployment from the bidding stage itself	Includes details regarding activities such as community development, employment generation, etc. in the detailed project report itself	Conducts detailed assessments on the cost of responsible project deployment and establishes industry benchmarks for early adopters and leaders, making such information available in the public domain.	1. Cost of responsible practices added in bidding documents and proposals (Y/N) 2. Cost assessments published for use by other developers

Source: Authors' analysis

4. The site preparation phase

Phase 2 of the project deployment cycle includes land acquisition, site preparation, project design and pre-construction activities. Proper preparation in Phase 2, leads to fewer concerns arising during the project construction. Similarly, in terms of responsible activities, Phase 2 is critical as it lays the foundation for activities and systems that will continue throughout the lifecycle of the project.

Figure 9. Responsible activities to be carried out during Phase 2 of RE deployment



Source: Authors' analysis

4.1 Conduct an environmental and social impact assessment (ESIA)

What does this involve?

This involves an environmental and social impact assessment conducted by a third party to document baseline data, identify the environmental and social risks and impacts, mitigation methods, and analysis of alternative measures to mitigate all risks, among other aspects. ESIA's are not mandated by law in India. Developers generally conduct ESIA's to mitigate risks. It is recommended that large solar and wind projects conduct an ESIA.

How to do this?

- Use inputs from the social assessment conducted in the previous phase to supplement the ESIA.
- Developers may refer to ESIA guidance provided by the Solar Energy Cooperation of India (SECI) as part of the Environment and Social Management Framework (Page 59).
- Verify recommendations of the ESIA (since it is commonly conducted by a thrid party) to ensure recommnedations are implementable.

- ESIA should follow the TIME approach:

  - **Timely**: Conduct ESIAs **immediately following bid award**, and confirm that the selected site presents the lowest impact among available options. Delaying ESIAs risks overlooking critical land-related concerns or issues, potentially compromising the timely and effective implementation of mitigation measures. Early assessment ensures comprehensive identification of potential impacts and allows sufficient time for developing appropriate mitigation strategies.

  - **Implementability of recommendation**: ESIA should yield actionable recommendations that become the basis of an impact management plan.

  - **Monitoring of implementation**: ESIA should be followed by a implentable plan (ESMMP, as discussed in the next section) that is closely monitored.

  - **Empowering of communities**: Communities play an important role to identify, develop local solutions and monitor impacts. Approach the ESIA as a rights-based process, not just an end product, ensuring meaningful representation and participation of local stakeholders through genuine dialogue and consultation opportunities, overcoming language barriers.

Through consultations with communities, mitigation pathways can be developed by drawing on their indigenous knowledge of local environmental conditions.

Box 3. Case study – effective stakeholder identification and analysis in the Kairouan Solar Project ESIA, Tunisia

In Tunisia's Kairouan 100 MW solar project, effective stakeholder mapping transformed the environmental and social impact assessment process. By systematically identifying key groups such as community leaders, local authorities, NGOs, women, and pastoralists, the project team gained crucial insights into local power dynamics and socio-economic contexts. Through targeted engagement in the El Alem and Metbasta sectors, including focus groups and participatory meetings, the team collected essential baseline data while surfacing potential concerns before they became obstacles. This mapping exercise enabled the creation of tailored communication strategies for each stakeholder group. The results were significant: enhanced project inclusivity, reduced community resistance, and meaningful participation from vulnerable populations (AMEA Power 2022).

Consultation with local population in Metbasta, Kairouan.

Success factors

1. Effective stakeholder identification and mapping
2. Targeted engagement and participatory method like focus groups
3. Enhanced project inclusivity due to participation from vulnerable populations

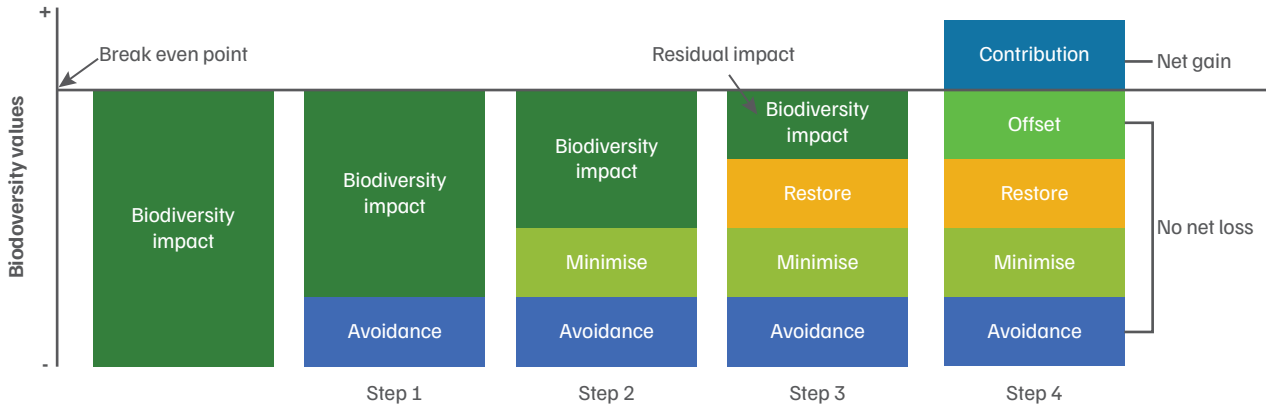
Source: AMEA Power. 2020 "Environmental and Social Impact Assessment (ESIA) for the 100 MW Photovoltaic (PV) Plant in Kairouan, Tunisia". African Development Bank Group.

4.2 Develop an environment and social management and monitoring plan (ESMMP), and undertake mitigation activities

What does this involve?

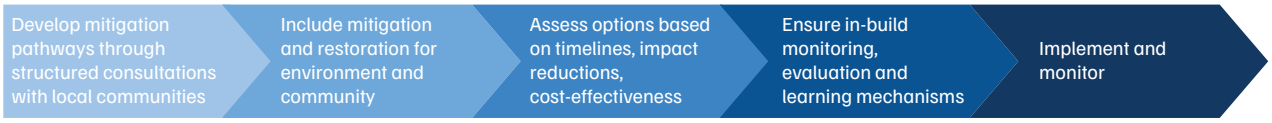
In order to effectively ensure minimum or no risk to local communities and the environment, it is important to prepare an environment and social management and monitoring plan, with mitigation strategies and timelines. By ensuring no risks and harm, delays to project deployment in the subsequent phases can be avoided. The first step of the biodiversity loss mitigation hierarchy is 'avoid', which can be applied to social aspects too. Under the plan, the developer must also plan for biodiversity management. Annexure 7 includes a list of actions and tools that can be used for effect biodiversity management.

Figure 10. The biodiversity loss mitigation hierarchy can be applicable to social aspects



Source: IRENA Coalition for Action. 2025. "Nature-positive Energy Principles: Environmental Siting and Permitting of Solar, Wind and Grid Infrastructure." Abu Dhabi: International Renewable Agency.

Figure 11. Process for developing an environment and social management and monitoring plan



Source: Authors' analysis

How to do this?

- **Use the ESIA to**
    - Develop mitigation pathways through structured consultations with local communities, leveraging their indigenous knowledge of environmental conditions.
    - Assess mitigation options based on impact reduction potential, implementation timelines, and cost-effectiveness.
    - Conduct thorough cost-benefit analysis of mitigation strategies identified before finalising the plan. Ensure the plan outlines the issues, strategies to mitigate them, timeline for mitigation, and frequency of monitoring, and identifies the figure responsible for the activity.
    - Establish formal monitoring, evaluation, and learning (MEL) mechanisms to understand the efficacy of the mitigation plan, including data collection on key indicators, mid- and end-point evaluation of the activities undertaken and impacts, and lastly, engagements with communities to gain their insight on the efficacy of the risk mitigation strategies and the project's impact on their daily lives and livelihood. Ensure plans are adaptive and learn from Monitoring & Evaluation (M&E) results. Additionally, plan for long-term monitoring from the start as short-term monitoring fails to capture long-term population changes, and the compounded effects of the project when interacting with other regional stressors, among other factors.
    - Clearly define who is responsible for implementation and supervision at every level of the project.
    - The plan should track specific, measurable indicators to assess success, such as the tree survival rate or restoration status of borrow pits.
- **The plan should include biodiversity management**
    - Use the mitigation hierarchy approach. Aim to be net positive, meaning a contribution to biodiversity.
    - Maintain appropriate distance from ecological buffer zones and ensure siting is responsibly done.
    - Use inclusion planning that brings together communities, wildlife scientists, landscape architects, and ecologists to inform better deployment design and mitigation strategies.
    - Make adequate changes in project design to account for wildlife, such as using wind turbine dimensions to reduce collision with birds (Schaub et al. 2025).
    - Manage tree cover by avoiding felling of trees, or compensate through measures such as planting of native species.

- Re-route or bury transmission lines to eliminate collision and barrier effects. Whenever feasible, utilise micro-siting—adjusting the project layout to avoid ecologically sensitive areas. Furthermore, incorporate wastewater management and water conservation facilities, and deploy dry or hybrid cooling systems in preference to traditional wet cooling methods (Bennun et al 2021).

- Adjust the scheduling of decommissioning and construction activities to avoid disturbing biodiversity during sensitive periods, such as breeding seasons (Bennun et al 2021).

- **The plan should address impacts on physical environment**

  - Minimise excavation footprints for foundations

  - Implement sustainable water usage protocols for construction and operations

  - Ensure proper storage and handling of equipment and materials

  - Design for climate resilience against cyclones, strong winds, heat waves, and other extreme weather events

- **The plan should include social impact mitigation**

  - Safeguard community resources and infrastructure

  - Preserve or create alternative access to traditional travel routes

  - Ensure project boundaries don't obstruct local access pathways

  - Provide alternative resources when common property resources are affected

  - Social risks such as impact on livelihoods, loss of common property resources, impact on natural drainage, influx of migrant construction workers, and pressure on local resources should be adequately mitigated. Further, possibilities of cultural conflicts, spread of diseases, gender-based violence, and health hazards due to lack of sanitation should be addressed.

  - Plan mitigation strategies that can be incorporated into project design. For instance, alternative grazing land near project sites, creating alternative access routes to water supply facilities that might be blocked due to project construction, etc.

  - Begin implementation of mitigation strategies for risks related to community health and safety, use of common resources, etc to start with.

- **The plan should include implementation and compliance**
    - Adhere to all national and state-level guidelines regarding project siting and resource usage
    - Conduct on-site verification to ground-truth spatial maps before finalising installation coordinates
    - Co-create final project design with community input on boundaries and mitigation measures
    - Identify resources for implementation and compliance

Additionally,

- Ensure the plan is spread across various phases of deployment, and each stakeholder is aware of their responsibilities over the project lifecycle.

Role of other actors

Civil society organisations

CSOs can play an active role in advocating for developers to undertake timely ESIAs, and develop mitigation and monitoring plans. CSOs can be actively involved in choosing mitigation pathways. This can be done through interactions with local CSOs on the likely impacts, mitigation pathways, and the possible role they can play.

Box 4. Case study – using the mitigation hierarchy to manage impacts at the BayWa r.e. plant in France

The BayWa r.e. 17-hectare (14.6 MW) ground-mounted solar park in France was developed at a former military site, with careful attention to ecological concerns under the World Bank's Environmental and Social Framework. Applying the mitigation hierarchy, the project first prioritised avoidance by protecting irreplaceable habitats, notably, dry lawns crucial for the large blue butterfly, and designating set-aside conservation zones. Minimisation strategies included scheduling construction during autumn and winter to avoid disrupting breeding seasons, and limiting soil disturbance to promote quick vegetation recovery and prevent erosion. In the mitigation phase, strict biodiversity protection protocols were enforced for construction personnel, alongside continuous ecological monitoring. Although compensation/offset measures were not prominently required, the project's proactive habitat conservation approach effectively minimised the need for extensive offsets. This structured application of the mitigation hierarchy ensured that the solar park development balanced RE goals with the protection of sensitive species and habitats (Eurelectric n.d.).

The project developers used the 'mitigation hierarchy approach' to manage impacts.

Success factors

1. The project systematically prioritised avoidance, minimisation, and mitigation of ecological impacts
2. Careful site selection

Source: Eurelectric. n.d."BayWa r.e. 17ha (14.6 MW) Ground-Mounted Solar Park of Fontenet 2." Eurelectric Power Plant. Accessed October 24, 2025.

4.3 Adopt an inclusive compensation setting processes

What does this involve?

This involves developing a methodology, conducting assessment, and holding negotiations in a collaborative manner to provide fair compensation and share benefits with the local community.

How to do this?

- Tailor methodology to context and incorporate relevant factors such as state policies while determining lease/sale amounts, etc.
- Engage all stakeholders (de jure and de facto), including land owners and users, indigenous groups, and tenants.
- Gather comprehensive information on the key parameters for valuing land. This includes detailed land and asset information such as ownership status, current and potential uses, location, parcel size, and any on-site improvements like buildings or crops, combined with reliable market data drawn from recent comparable transactions via registries or local intermediaries.
- Apply appropriate valuation methods such as income, cost and market-based approaches. Use income-based approaches where productivity/rental data exists, or cost-replacement methods when market comparables are limited. Key considerations for valuers can be found in Annexure 3.
- Deliver a detailed report to landowners/communities, explaining how rates were determined, including the valuation approach, key assumptions, relevant legislation, and any limitations. This transparency enables both parties to negotiate mutually acceptable rates and provide a logical basis to variation in rates.
- Include each social group separately during negotiations, to ensure greater participation and open communication as this might not be possible in larger groups.
- Ensure compensation to de jure and de facto land dependents.
- Ensure compensation is provided to de facto stakeholders.
- Strengthen legal protections and financial transparency in land procurement
    - Enhance financial awareness and transparency regarding land compensation amount, compensation for assets on land, etc.
    - Ensure complete legal disclosure of contract, access to legal help, availability of key legal documents such as the lease agreement in local language, etc.
    - Create awareness regarding the record of tights document to ensure that ownership transfer is accurately reflected for all tenants on the land.

Role of other stakeholders

Policymakers

While state RE policies provide valuation guidelines for private and government land, there is a lack of clarity in some states that rely on district committees or case-by-case negotiations. Further, there is a cost disparity between private and government land, without proper guidance on de facto land dependents. States can work towards providing clarity, and make it a requirement for developers to disclose responsible procurement practices as part of the application process.

4.4 Ensure transparent communication of project details to enhance trust and collaboration with communities

What does this involve?

Developers should reach out to community members through various means—gram sabhas, or by posting pamphlets on the notice boards of the relevant gram panchayats—to communicate the details of the project, including its timelines (which areas will be cordoned off/fenced, when construction will begin, heads-up on any change of hands across project deployment), the points of contact (E&S officer), the grievance redressal system, the impacts to the community, and planned mitigation and monitoring mechanisms, and the support that will be needed from the local community.

How to do this?

- Stakeholder communications should include information on the following:
    - Local employment creation: How many jobs will tentatively go to the locals. Targets should be realistic, and false promises or inflated numbers should not be shared.
    - Local development needs: How the developer plans to consult people on developing a community development plan
    - Land procurement and compensation amount: What is the range of compensation amounts, and the method to calculate this
    - Project details related to timelines, activities of different firms, impact on local communities, identified mitigation strategies and monitoring plans

- Collaborate with communities to decide the use of common resources, in cases where their use for the project is necessary and unavoidable.
- Organise 1-2 meetings for all community members (use stakeholder maps to ensure all groups are represented) towards the mid-point of land procurement but after project approval. Provide a point of contact that locals can reach out to in case of any questions or concerns. Other ways of communication include using gram sabhas, pamphlets, posters, brochures, fact sheets, etc. Ensure that the information is accessible by making it available at community centres, government offices, and other public places.
- Ensure the information is available in local languages.
- Key points to remember during execution
    - Ensure correct and transparent communication about development activities and employment creation
    - Ensure diverse representation of voices and recording of preferences as per different groups
    - Develop strategies to reach out to the maximum number of individuals in the area of influence for communication and consultations on the project development activities

Role of other actors

Policymakers

Local and district governments can release information on the project and its timeline online, as well as through government notice boards.

Box 5. Case study – fostering local acceptance through early engagement at Vattenfall's Pen Y Cymoedd wind farm in Wales

The Pen Y Cymoedd Wind Farm with a total capacity of 228 MW is one of the largest onshore wind farms in Wales, developed by Vattenfall. From the onset, the developer recognised the importance of community engagement and involved local communities throughout the development process with various methods to ensure transparency, address community concerns, and foster a sense of ownership among locals.

Community engagement began well before the submission of formal planning, thus allowing early identification and mitigation of potential issues. The developer worked closely with local planning authorities to ensure regulatory requirements were met and community engagement aligned with local guidelines and expectations. Public meetings, information sessions, and workshops were conducted for residents to express views and receive detailed information about the project. A dedicated community liaison officer (CLO) was appointed to act as a point of contact between the developer and the community. The community engagement strategy implemented resulted in several positive outcomes, and increased acceptance and support for the project, with the feedback leading to enhanced project design and socio-economic benefits for the community (Aitken, Haggett & Rudolph 2014).

After two years of community consultation involving over 3,000 residents, groups, and organisations, Vattenfall developed a vision to guide the creation of a sustainable, long-term funding vehicle that would best serve the community. The priorities of the community were released in a prospectus. The priorities inlcuded local jobs, transport, safety, community spaces, environment, tourism, culture and others. The priorities were further broken into ambitions and potential, with the box below showing an example on the ambition on Safety.

Source: Pen y Cymoedd Wind Farm Community Interest Company. 2016. "Pen y Cymoedd Community Fund Prospectus". Pen y Cymoedd Wind Farm Community Interest Company.

School students visit the Pen Y Cymoedd wind farm in Wales, showing continued engagement.

Another concern was Pen Y Cymoedd's peatland and bog ecosystems, which were affected by the wind farm (Campaign for the Protection of Rural Wales 2025). Peatlands are natural carbon sinks and are essential for flood management. The drying of the bogs resulted in the escape of the carbon captured in them. In 2019, two years after the wind farm became operational, Vattenfall attempted to reverse the process, investing GBP 3 million to restore and manage 1,500 hectares of peatland ecosystems (Dickson 2024).

Success factors

1. Early and proactive community engagement
2. Transparent and inclusive communication
3. Dedicated community liaison

Source: Source: Vattenfall. 2016. "Pen y Cymoedd Community Fund Prospectus". Vattenfall.

4.5 Implement a grievance redressal mechanism to resolve grievances and disputes in a fair and timely manner.

What does this involve?

A grievance redressal mechanism (GRM) is a formal framework to address complaints or concerns raised by project-affected persons. It aims to facilitate voluntary agreements between parties rather than using legal or state mechanisms. It also serves as a detection mechanism that can alert developers regarding issues that can potentially escalate. An effective grievance redressal mechanism must prioritise accessibility through language options and convenient locations, while ensuring all stakeholders understand the process through clear communication. To function properly, it must establish trust by guaranteeing protection from retaliation for complainants, operate through a dedicated redressal committee, incorporate robust monitoring systems to track resolution progress, and invest in capacity building to strengthen the skills of those managing grievances.

Figure 12. Process for setting up a grievance redressal mechanism

Source: Authors' analysis

How to do this?

The development and implementation of a formal grievance redressal mechanism (GRM) should include the following steps:

- **Setting up relevant institutions for facilitation and implementation**

    - **Grievance redressal committee**: The grievance redressal committee (GRC) should include representation from the on-ground project team, the local community, the gram panchayat, and from a third party/NGO. The key roles of the committee include investigating grievances, taking decisions, and communicating the same to the stakeholders concerned.

    - **E&S officer**: An E&S officer serves as a focal point for people around the project site to lodge their grievances, or for information about the process. An indicative list of the officer's roles is provided in Annexure 6. Their key role in the GRM is to:

        - Acknowledge grievances through an identification number and a timeline for redressal
        - Convene the committee for redressal
        - Formally communicate the outcome
        - Ensure actions towards resolution of the grievances
        - Track all grievances, status of grievances, and time taken to address them

    - **Gram panchayat**: Members of the gram panchayat (GP) often hold information and knowledge about the local communities and legacy issues, and might be able to assist other committee members in case of investigations. However, members of the gram panchayat often have relations with locals, and this should not bias the committee's decisions.

- **Access to and information about the grievance redressal mechanism**

    - Facilitate in-person grievance registration through existing local infrastructure such as gram panchayat offices or project site facilities.

    - The complaint can be filed via post, phone, WhatsApp, complaint boxes (at project gate, gram panchayat office), through local offices or during meetings (verbal registration).

    - Appoint local grievance coordinators (from the local community) to assist community members, particularly those who may face barriers in accessing formal grievance channels. They can write complaints in case of verbal registration by capturing key elements and inform the E&S officer.

    - Create a dedicated toll-free hotline and user-friendly online platforms for registering complaints, with features to track status.

    - Ensure that grievance forms are available in local languages, and are simple to understand; train local community representatives to assist stakeholders in registering grievances.

- **Investigation, negotiation and mediation**

  - Investigate and assess the problem/complaint, the impacts on various stakeholders (complainant, project, community, public image, etc.). It is critical to investigate the problem by visiting the site and cross-checking facts. Upon receiving the grievance, provide a receipt with an identification number.

  - After assessing a complaint, present facts to the committee. The committee should formulate a response and communicate to the complainant, with clear reasoning, whether it is accepted or rejected. Provide specific next steps, the expected timeline for resolution, and any additional documentation needed for investigation.

  - It is necessary to formulate a response and choose an approach to resolve the grievance.

  - Develop and publicise clear criteria and procedures for managing complaints as well as escalation pathways for unresolved grievances, ensuring stakeholders know whom to contact at each stage.

- **Training and sensitisation**

  - Effective grievance management training should include a procedure for building awareness in the community, besides those for complaint registration, investigation, dispute resolution, and monitoring and evaluation. Training should include problem-solving and dispute resolution techniques, and interpersonal skills for those with community-facing roles. It is important to offer specialised training modules for different roles involved in grievance handling, such as the E&S officer, community leaders, and grievance coordinators.

  - Monitoring and evaluation: Set clear targets for response times and resolution to ensure timely handling of grievances, and establish a fast-track process for urgent grievances to ensure quick resolution, particularly those related to health, safety, and non-compliance during the construction process.

  - Ensure adequate record maintenance and communication of grievance redressal measures to individuals concerned. Follow transparent practices in record keeping and information dissemination.

  - Conduct regular feedback sessions on GRM as part of existing community meetings to assess its functionality and identify areas for improvement.

  - Regularly communicate grievance resolution outcomes to maintain community trust and transparency.

- Additional tools for grievance management in infrastructure projects include the IFC's Guidance for Projects and Companies on Designing Grievance Mechanism (2009) and the ADB's guidance document on handling complaints in development projects (2011).

Role of other actors

Civil society organisations

NGOs can enhance grievance resolution by serving as neutral facilitators, advocating for marginalised groups, and providing technical expertise while ensuring accountability. NGOs can help with creating awareness and building local leadership capacity.

Policymakers

Grievance redressal is a key role of the state, and institutional processes need to be strengthened to uphold the rights of local communities. Grievance registration and redressal processes need to be streamlined and strengthened at all levels of local governance—gram panchayat, zilla panchayat, and district administration—and a strong system of community feedback enabled. This requires training and preparedness of local officials, gathering adequate information on RE projects and maintaining documentation, and ensuring due diligence in grievance redressal processes.

4.6 Develop and implement a plan to integrate local community members into jobs created by the RE project, alongside livelihood and employment-focused community development activities

What does this involve?

Based on social impact assessments, RE project developers should prioritise employing local community members, with special consideration for individuals whose livelihoods have been directly affected by the project's development. It is critical for developers to earmark some roles in projects that can be locally sourced without training, and a few roles to be filled by locals after some training. The ability to directly employ local residents or train them for project roles varies depending on both the community's existing skill base and specific project requirements. Nevertheless, developers should make employing local community members a priority whenever feasible, even when this requires additional investment in skills training programmes or being flexible when contracting services. Further, developers should create community development plans that focus around livelihood generation for those impacted by the RE project.

Figure 13. Employment should cover integration of communities in the project as well as alternative livelihood generation

Integrate local community members into jobs created by the renewable energy project	• Earmark certain share of technical and non technical roles within the project site for local members • Conduct recruitment drives and skills training workshops • Provide logistical support for employment of women on plant site • Partner with accredited institutions to provide certification for completed training programs.
Plan for alternate Livelihood generation under community development initiatives	• Identify avenues for livelihood generation and partner with local NGOs • Partner with relevant organisations: for providing skills, procurement of equipment to boost incomes, etc • Provide opportunities for skilled individuals, through funding for start-ups, ventures, assistance in job search, etc

Source: Authors' analysis

How to do this?

Assess and absorb locals impacted by providing employment/livelihood in the RE project: Developers can do this based on the social baseline and skills mapping in Phase 1.

- Assess the local workforce by collecting information on education characteristics, number of persons with diplomas, technical education, and people who have skills/ training/experience in fields relevant to wind or solar deployment.
- Prepare a plan of activities under employment generation such as jobs on site and skill development.
- Earmark a certain share of technical roles for the ITI level, and graduates from the local communities.
- Earmark a certain share of non-technical roles for locals.
- Conduct recruitment drives within local communities to fill construction-related positions and offer training programmes to prepare local workers for these and other roles. Partner with accredited institutions to provide certification for completed training programmes.
- Ensure vulnerable groups, such as women and pastoralists, receive due consideration.
- Provide logistical support, such as transportation and childcare, and ensure site is safe for women to work.
- Ensure that all actors in various phases continue to employ locals, including women
- Consider a procurement strategy to maximise local benefits. Make it easier for local contractors to participate by removing financial barriers like bond requirements, ensuring quick payments, and allowing separate bidding for materials and labour.
- Ensure diversity of workforce in terms of gender, caste, economic disparities and differently abled. Actively take actions to ensure all groups in the community have an equal opportunity to benefit from the project.
- Move beyond providing jobs to those who leased/sold land, and include other community members.

Plan community development activities that focus on livelihood creation, skilling and employment

- Premised on the social assessment, identify avenues for livelihood generation based on existing skills, local resources, and existing livelihood and income-generating activities. This can also be done by engaging with a local NGO to identify avenues for livelihood generation.
- Ensure that all groups are represented in consultations (as per the groups identified in the social mapping) and in the development of the plan. Use social assessment to amplify the voices of vulnerable individuals and those lacking social capital. Be mindful of existing power dynamics to avoid reinforcing inequalities.
- The process should be inclusive and focused on economic empowerment.
- Employment generated should include women, and have components of skills training as a means; partner with local governments to realise these projects and ensure self-sufficiency.
- Partner with relevant organisations: for providing skills, procurement of equipment to boost incomes, facilitation of livelihood generation activities.
- Additionally, provide opportunities for skilled community members through funding for start-up ventures, assistance in job search, etc.

Role of other actors

Policymakers

State governments can encourage local employment by requiring developers to provide employment numbers (local and total) during project development. States may encourage jobs for locals depending om education characteristics of the population, availability of workers in the state,etc.

4.7 Identify community needs and prepare a plan for community development

What does this involve?

Identifying community needs includes building on the social assessment and taking time to identify local challenges that can be addressed. This includes consulting diverse stakeholders, coming to a consensus on the development imperative, and ensuring clear communication on what the community development plan can deliver.

How to do this?

Identify community needs

- Use the stakeholder matrix developed during the social assessment to discuss and consult various groups of people.
- Use information collected in the social assessment to develop solutions or test development activities during interactions with communities.
- Ensure diverse representation of voices and recording of preferences as per different groups.
- Develop strategies to reach out to the maximum number of individuals to communicate about, and consult on, the project development activities.
- Ensure correct and transparent communication about development activities

Prepare a plan

- After collecting the required information, move towards consensus on what is the vision of the plan. For example—is it to fulfil needs of food, shelter, education, or health? And, if yes, which one of these? Or is it to create livelihoods? Other visions can include themes of climate resilience, infrastructure development, skilling, public health and sanitation, energy access, etc.
- Once the vision has been decided with representatives of various community groups, the solution or intervention can be discussed with the community.
- Once this is finalised, develop a plan that includes the target area, the timeline and period, the target group, the development vision, the objective, and the activities to achieve the objective.
- Identify the partners required to do this, such as local NGOs along with community leaders who can act as a point of contact (PoC), and the required funding.
- Plan the project in a manner that it can be self-sustainable without support or funding from the developer. For example, training of community leaders to work with NGOs to continue the development activity, or training of communities to maintain the infrastructure, etc.

Role of other actors

Civil society organisations

Civil society should demand greater transparency in existing funds. For example, the community development fund for Pavagada solar park is managed by the district commissioner.

Financiers

Financiers should assess how companies have been able to give back to the local area in the past. This requirement serves as an incentive for developers to give back to the community as whole, and not just to landowners, who benefit from lease or payment on sale of property.

Procurers

Similar to financiers, procurers should assess how companies have undertaken compensation and other responsible activities.

Box 6. Case study – assessing community needs for effective community development: learnings from Spain

The Los Naranjos and Las Corchas solar park is a set of two solar projects with a combined capacity of 100 MW, located in Seville, Spain, and developed by Endesa, a subsidiary of Enel Green Power. The project was one of the first to fully implement the Enel creating shared value (CSV) policy designed to make engagement with communities more inclusive and mutually beneficial.

The CSV plan for the project was created after engaging with 23 local authorities, institutions and key stakeholders, including small businesses, farmers, and vulnerable communities. These engagements continued during the construction and commissioning phases, and a further 14 consultations were held during the project's O&M phase. In addition to in-person meetings, continued communication occurred via email to identify the key concerns as well as the key developmental needs of the community.

The community development initiatives implemented by the project developers included programmes to train locals for employment in the project, to ensure that at least 20 per cent of the project work force was sourced locally; development of solar facilities for local beekeepers, such as solar apiaries, which combined solar energy production with beekeeping; implementation of the agro-voltaic model for local farmers; setting up of EV charging points; rainwater storage tanks of 40,000 litres' capacity, etc. (CAN Europe 2025).

Enel's project creating shared value through multiple use of land.

Success factors

1. Early and inclusive stakeholder engagement
2. Investment in sustainable and locally-relevant community development initiatives

Source: Enel Green Power. n.d."Los Naranjos and Las Corchas Solar Plants, Spain." Enel Green Power. Accessed December 31, 2025.

4.8 Protect ecosystems through the ESMMP and use sustainable construction methods

What does this involve?

The project-level impacts on the environment and biodiversity include local ecosystem disturbance due to land diversion, construction activities, loss of natural habitat, etc. Further, there is a need to inculcate climate resilience in RE technologies to ensure long-term sustenance and growth of the generation system. Thus, minimising impact to the ambient environment, biodiversity and ecosystem is critical to undertaking responsible RE deployment.

For Phase 2, this means procuring low-carbon materials, planning for environment-friendly construction, and implementing safeguards for biodiversity protection. It also includes developing solutions for ecological regeneration and restoration, in addition to prevention and mitigation of harm.

How to do this?

- **Use low-carbon technologies and ensure energy efficiency**
    - Use low-carbon construction technologies and equipment to reduce emissions at various stages of project deployment.
    - Source climate-resilient material. Developers should evaluated the cost-benefits of using climate resislient technology such as cyclone-resistant wind turbines and high-heat-resistant solar panels (Smart Energy Answers 2024, Murayama and Sheldrick 2021).
    - Implement energy efficiency measures, such as using energy-efficient machinery and optimising construction schedules to reduce emissions.
    - Identify and work with material suppliers who have demonstrated commitment to implementing waste minimisation strategies such as reducing plastic packaging.
- **Use of sustainable construction practices**
    - To minimise soil disturbances, deploy terrain-following racking systems and reduce native vegetation clearing to the greatest extent possible. Implement mitigating measures such as re-seeding removed native vegetation and installing silt fences to control runoff (Black and Veatch 2025).
    - Develop a robust water conservation strategy for both operational and cleaning requirements. This should involve water management techniques like establishing artificial recharge ponds and rainwater harvesting pits. Additionally, deploy high-efficiency cleaning systems, such as robotic cleaning or high-quality water spray pumps (Mahindra Susten 2025).

- **Regional environment and biodiversity preservation near project site**

  - Through the ESMMP, explore opportunities for carbon offset projects, such as reforestation, grassland restoration as carbon sequestration in arid regions, investing in decentralised renewable systems for local communities such as mini grids and community solar.

  - Use environmental baseline mapping to develop strategies for preserving and protecting local natural ecosystems including biodiversity. These strategies can look like installing perches and artificial nests to protect bird populations, and enhancing species reproduction, among others (Farias et al. 2020).

  - Move one step beyond protection and look at active regeneration and restoration of local ecosystems and biodiversity using a combination of local knowledge and environmental experts. Examples include utilising techniques such as structure piling without concrete and the avoidance of herbicides to protect the environment (Eurelectric 2024). Actively collaborate with local residents to understand patterns of ecology, and undertake restoration and regenerative measures, as well as sustainable interventions.

  - Guidance should be sought from local governance bodies like gram panchayats and biodiversity management committees (BMCs) to find the correct individuals for advice on measures to preserve regional biodiversity and nature.

  - Consultations to be conducted with individuals whose lives and livelihoods depend on common resources such as water, agriculture, forest picking, grazing, etc. to understand regional land and weather patterns, and biodiversity hotspots. The number of people required to collect all the information might be context-specific.

  - Prepare plans for environment conservation and biodiversity preservation, to be verified by ecological experts to ensure longevity and practicality.

  - Based on the environmental assessment and stakeholder consultation, the project design and planning must preserve natural habitats through the following measures:

    - Design should exclude areas that are animal corridors
    - The placement of project materials and construction should not obstruct the movement and lives of animal and avian populations

  - Strategically plan activities to strengthen biodiversity and additionally benefit the project. Table 5 provides techniques to protect and enhance biodiversity, and possible benefits to the project. This is adapted from IRENA Coalition for Action 2025, page 24.

Table 5. How strengthening biodiversity benefits RE project operations

Area of benefit	Approach/technique and benefit to the RE project
Ambient Temperature	Improved panel efficiency: Maintaining low-stature plants can positively influence the microclimate, reducing ambient temperature and increasing humidity, which counters the 10-25 per cent output reduction seen with rising temperatures. Outputs in integrated PV-green roof systems have been recorded to increase by up to 8 per cent (IRENA Coalition for Action). Projects can limit environmental impact by either keeping existing vegetation in place and managing its height through methods like slashing or rolling, or by preparing sites through clearing and then restoring native plant cover once infrastructure is installed.
Dust management	Protecting existing short-local vegetation and biological soil crusts (BSC) provides natural dust suppression by binding soil surfaces, which protects both equipment performance and air quality for surrounding communities.
Weed management	Reduced maintenance requirements: Retention of native vegetation significantly reduces the growth of weeds, which can otherwise overshade panels or pose a fire hazard when dry.
Biodiversity	Ecosystem services for solar farms: Installing panels with inter-row vegetation zones maintains habitat connectivity for ground-dwelling species. These animals provide operational advantages including enhanced water permeation through burrowing activity and improved soil structure from biological decomposition processes.
Drainage and erosion	Site stability and flood mitigation: Low vegetation cover, a healthy BSC, and wildlife improve soil drainage and reduce water-based erosion, which is increasingly important with more intense rainfall events.

Source: IRENA. 2025. "Nature-Positive Energy Principles: Environmental Siting and Permitting of Solar, Wind and Grid Infrastructure". Abu Dhabi: International Renewable Energy Agency (IRENA). Nature-Positive Energy Principles: Environmental Siting and Permitting of Solar, Wind and Grid Infrastructure. Abu Dhabi.

Role of other actors

Policymakers

Governments and policymakers have a key role in regulating the industry to ensure carbon emissions offsets, and setting standards for sourcing climate-resilient materials. Further, local governments are key to assisting developers to understand local ecology, and developing restoration strategies. This includes active participation by gram panchayat members in sourcing local expertise and understanding.

Civil society organisations

Academic and subject experts, non-government organisations, environmental advocacies, and citizen groups need to come together to enable sustainable development that lifts local ecology and protects and nurtures biodiversity. The civil society has a key role to play in shaping the environment, and biodiversity preservation in landscapes around project sites via interventions such as supporting developers to co-create project plans, understand the local landscape and cultural heritage better, and enable platform creation to bring together different stakeholders.

Box 7. Case study – Tata Power's ecosystem-sensitive solar development in Anantapur

Tata Power successfully commissioned the NTPC's 100 MW solar power plant in Anantapur, Andhra Pradesh, completing the project three months ahead of schedule. Spread across 500 acres, the development demonstrates how large-scale RE infrastructure can be designed to work with, rather than against, natural landscapes.

The site presented significant challenges—heavy undulation, rough terrain, natural streams, and hillocks covered with dense vegetation. Rather than clearing and levelling the land in line with conventional construction practices, Tata Power designed the project layout to preserve the ecosystem. Natural streams were left undisturbed to maintain water flow patterns, whilst dense vegetation and hillocks remained intact throughout the construction area.

This approach required careful engineering to adapt solar panel placement and access roads to the site's natural contours. The project design prioritised minimising ecological disruption whilst maintaining technical efficiency and project viability. By working within the constraints of the existing landscape rather than transforming it, Tata Power demonstrated that utility-scale solar development need not come at the cost of the local environment.

Tata Power's terrain tracking solar plant resulting in reduced ecological impacts.

Success factors:

1. Working with existing landscape
2. Landscape-related aspects incorporated at the design stage

Source:Tata Power Solar. 2025. "100 MW NTPC Anantapur, Andhra Pradesh." Tata Power. Accessed October 23, 2025.

4.9 Continue implementation of capacity building, monitoring procedures and contract finalisation of business partners

What does this involve?

Specific to Phase 2 of responsible deployment, business responsibility entails measures geared towards the effective implementation of procedures elaborated on in Phase 1, including selection of contractors, contract setting, capacity building, and monitoring.

Although detailed guidance is provided in Phase 1, it is important to understand that these procedures are the same for every project, and become significantly easier to implement with institutional experience and memory. Thus, although initial investment in terms of effort, human capital, and financial resources may be high, it is a one-time fixed cost to the firm.

How to do this?

- Ensure that the contracts of ecosystem partners and their selection is undertaken in a manner that requires them to act responsibly, and propagates independence from incentives to act in a dubious manner, as elaborated in Phase 1.

- Project and bid documents should be formulated in a manner that discloses the exact plans for responsible deployment, with detailed costing requirements, timelines, and scope of impact or influence.

- Continue undertaking all required capacity building activities with contractors and explore establishing a standard operating procedure and code of conduct for responsible action, as mentioned in Phase 1.

- Establish effective monitoring procedures for ecosystem partners, with plans to conduct frequent visits on the ground, timely reporting, and training, as per Phase 1. While the frequency of on-ground monitoring can vary depending on the extent and complexity of the partners' scope of work, consider planning a minimum of two scheduled and one surprise ground visit. These ground visits should include extensive engagement with the local community, including all the stakeholder groups identified previously.

4.10 Preserve cultural heritage

What does this involve?

This activity aims to ensure that local cultural heritage is protected, to minimise adverse impacts, and to implement restoration measures that ensure maintenance of the cultural heritage, including protection of ecosystem processes. The definition of cultural heritage can be taken from the IFC's Performance Standards wherein it is defined as (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

How to do this?

- **Based on the IFC's Performance Standard 8, the following activities are proposed**

  - In addition to minimising the siting of projects in areas with cultural heritage (as detailed in Phase 1), developers must undertake active consultations with communities in this phase to understand any unintended consequences of project development on the local cultural heritage.

  - Consultations should also aim to identify cases where project development impacts the communities' access to sites of cultural heritage. If the project impacts access to a culturally significant site (e.g., a pilgrimage route), create and maintain a safe and accessible alternative path.

  - At sites where local cultural heritage is impacted, developers should undertake consultations to understand and identify ways of preventing adverse impacts. Further, relevant local bodies may also be consulted to identify impact mitigation measures. Adjust the layout of solar panels, access roads, or transmission lines to steer clear of sensitive areas.

  - Install barriers or fencing to protect cultural sites from construction traffic and equipment.

  - Developers should also actively aim to encourage preservation of local cultural heritage, and create avenues for its replication and development.

  - Establish a formal protocol for what to do if an archaeological artefact or cultural site is unexpectedly discovered during construction. This involves halting work, consulting experts, and documenting the find.

Role of other actors

Civil society organisations

Local NGOs have a crucial role to play in identifying practices and structures of cultural heritage, ensuring its preservation and active replication. They may work with individuals in the community with living memory of activities and practices of shared cultural heritage.

Box 8. Case study – Cultural collaboration and heritage preservation throughout lifecycle of project at the Hornsdale Wind Farm in Australia

The Hornsdale Wind Farm is a 315 MW farm located in South Australia. The developer devised cultural heritage management plans in consultation with the indigenous groups to ensure the protection and respect of cultural sites and practices throughout the project lifecycle. The developer engaged with the local Ngadjuri and Nukunu peoples, the traditional custodians of the land, to integrate their cultural heritage into the project. This was done via commissioning of local Indigenous artists to create murals on two wind turbine towers, depicting stories and symbols from their culture. The artwork serves as a visual acknowledgment of the deep connection between the indigenous communities and the land, symbolising the harmony between RE development and cultural preservation. This is an example of RE co-development and local heritage preservation.

The wind farm faced a critical challenge following the storms of September 2016, which resulted in large-scale power outages due to wind farms across South Australia shutting down. To prevent such outages in the future, the project also developed a 100 MW battery storage system (Global Infrastructure Hub 2019).

Artwork serving as a visual acknowledgment of the deep connection between the indigenous communities and the land

Success factors

1. Proactive engagement with traditional custodians
2. Co-development of cultural heritage management plans

Source: Global Infrastructure Hub. 2019. "Hornsdale Power Reserve Project: Tesla's Largest Utility-Scale Battery." Sydney: Global Infrastructure Hub.

Table 6. Moving up levels of responsibility in Phase 2

Responsibility	Compliant	Adopter	Leader	Pioneer	Indicator
Conduct an environmental and social impact assessment (ESIA), (ESMMP), and undertake mitigation activities		Conducts an ESIA. Develops a plan in consultation with communities that details pathways for environmental and social impact mitigation, and ensures compliance. Includes mitigation strategies in project design.	Has in house experts to verify if recommendations stemming from ESIA are implementable.		1. ESIA conducted immediately after project approval 2. ESMMP prepared with a detailed list of activities for mitigation and timelines 3. Number of consultations conducted for developing ESMMP 4. In house experts verify implementability of ESIA
Adopt an inclusive compensation setting processes		Gathers information on valuation of land; uses appropriate methods of valuation, conveys methodology to landowners, and comes to consensus with them through active engagement Compensates landless land dependents	Provides financial and legal information to those benefitting		1. Compensation amount 2. Per cent of dependents compensated
Ensure transparent communication of project details to enhance trust and collaboration with communities		Organises at least one meeting in each village with land dependents to communicate project details	Additionally, organises at least one meeting in each village with all community members	Creates and trains community representatives to voice community needs	1. Number of meetings organised 2. Number of community leaders trained

Responsibility	Compliant	Adopter	Leader	Pioneer	Indicator
Implement a grievance redressal mechanism to resolve grievances and disputes in a fair and timely manner.	Company-level grievance redressal mechanism (GRM)	Sets up a GRM that includes representation from the community, the developer and local CSOs.	Ensures the GRM includes periodic monitoring and evaluation. Creates a mechanism to include feedback from the community in the GRM	Creates community leaders to drive awareness, assist and monitor the GRM	1. Time taken to set up the GRM after project approval (in days) 2. Representation from different stakeholders in establishment of GRM, monitoring, and feedback
Create and implement a plan for integrating local community members into jobs created by the RE project, and plan community development activities focused on livelihood and employment generation	Employs locals on a need basis	Earmarks 30 per cent of all roles (technical and non-technical) for members from local communities. Undertakes skill development initiatives for employed individuals	Earmarks 40 per cent of roles (technical and non-technical) for members from local communities. Undertake skill development initiatives aimed at community members	Earmarks 50 per cent of roles (technical and non-technical) for members of local communities. Supports skilled community members through funding for entrepreneurship initiatives, assistance in job search, developing market linkages, etc.	1. Percentage of job roles earmarked for individuals from local communities 2. Number of people targeted by skill development initiatives
Identify community needs and prepare a plan for community development		Assesses needs through discussions with representatives from various groups and stakeholders	Plans to ensure most vulnerable groups are positively impacted	Plans for sustained community development throughout the project lifecycle	1.Per cent of groups consulted of total existing groups to understand community needs 2. Including self-sustaining of development activities in the community plan

Responsibility	Compliant	Adopter	Leader	Pioneer	Indicator
Protect ecosystems through the ESMMP and use sustainable construction methods		Uses baseline mapping and stakeholder consultations for developing mitigation strategies.	Moves one step beyond protection and looks at regeneration of natural ecosystems. Conducts consultations with members from local communities, governance bodies, environmental experts, local NGOs	Establishes self-sustainable systems of ecosystem regeneration, led by community Integrates low-carbon technologies, energy-efficient design, and sustainable construction practices across project lifecycle.	1. Number of consultations held with locals to understand and map impacts on environment, and devise mitigation strategies 2. Plan to not just mitigate but also contribute to biodiversity 3. Per cent of locals involved in implementing nature-positive actions
Preserve cultural heritage		Excludes sites that have heritage structures or are culturally relevant	Ensures access to important sites remains unimpeded	Actively preserves local cultural heritage and creates avenues for its replication and development	Sites with cultural heritage excluded (Y/N) Access provided to sites of importance (Y/N)

Source: Authors' analysis

5. The construction and commissioning phase

Phase 3 encompasses the construction of the project, during which communities witness physical construction activities and an influx of people and vehicles in their localities. Often, construction is contracted out, placing importance on the role of contractors to adhere to responsible practices.

Figure 14. Responsible activities to be carried out during Phase 3 of RE deployment

- Implement, monitor and course-correct social and environmental mitigation strategies, and other efforts to contribute towards the environment
- Undertake responsible waste management
- Ensure community health and safety measures and adhere to labour laws
- Implement mechanisms for grievance redressal, employment and skilling-related activities. community development initiatives, and continued engagement with community members

Source: Authors' analysis

5.1 Implement, monitor, and course-correct social and environmental mitigation strategies, and other efforts to contribute towards the environment

What does this involve?

It involves implementing risk-mitigation activities, actively monitoring and assessing their effectiveness, and implementing conservation and restoration efforts.

How to do this?

- Continue the implementation of risk mitigation strategies as per the environment and social management and monitoring plan (ESMMP).
- Establish a feedback loop with the community to gather input on the effectiveness of the risk mitigation strategies.This can be done at already scheduled gram sabhas. Based on feedback and monitoring results, adapt and refine support programmes to ensure they remain effective.
- Document regularly inputs from communities and data to monitor effectiveness.
- Establish a construction schedule to minimise interference with local activities. This construction schedule should include the expected date of completion, number of people involved through the construction phase, etc. This should be communicated to members of the community and shared with the panchayats in the area.
- Train selected community members to participate in monitoring activities and report any grievances. After training community members, form joint monitoring teams consisting of project staff and community representatives.
- Establish a regular monitoring schedule with the joint monitoring team that monitors aspects such as:
    - Construction does not exceed the agreed boundary
    - Use of community resources is only as per the agreed-upon plans
    - Effectiveness of mitigation strategies
- Modify responsible construction practices based on feedback and monitoring data.

- Ensure roads used for transportation are repaired towards the end of construction, and not left in a worse condition than before.

- Clearly signpost any diversions, as public access to construction areas will be prohibited for safety reasons. Temporary diversions may be implemented where construction activities cannot avoid existing rights-of-way. All temporary changes should be reversed upon project completion, with original routes fully reinstated.

- Towards pre-commissioning, create an impact mitigation report to share with investors, funders, buyers of RE.

- Undertake nature-positive activities as per the ESMMP. Such practices include:

    - Installing perches and artificial nests to protect bird populations and enhance species reproduction. For example, the developers behind the Ituverava Solar Plant in Brazil installed 40 perches and 45 artificial nests.

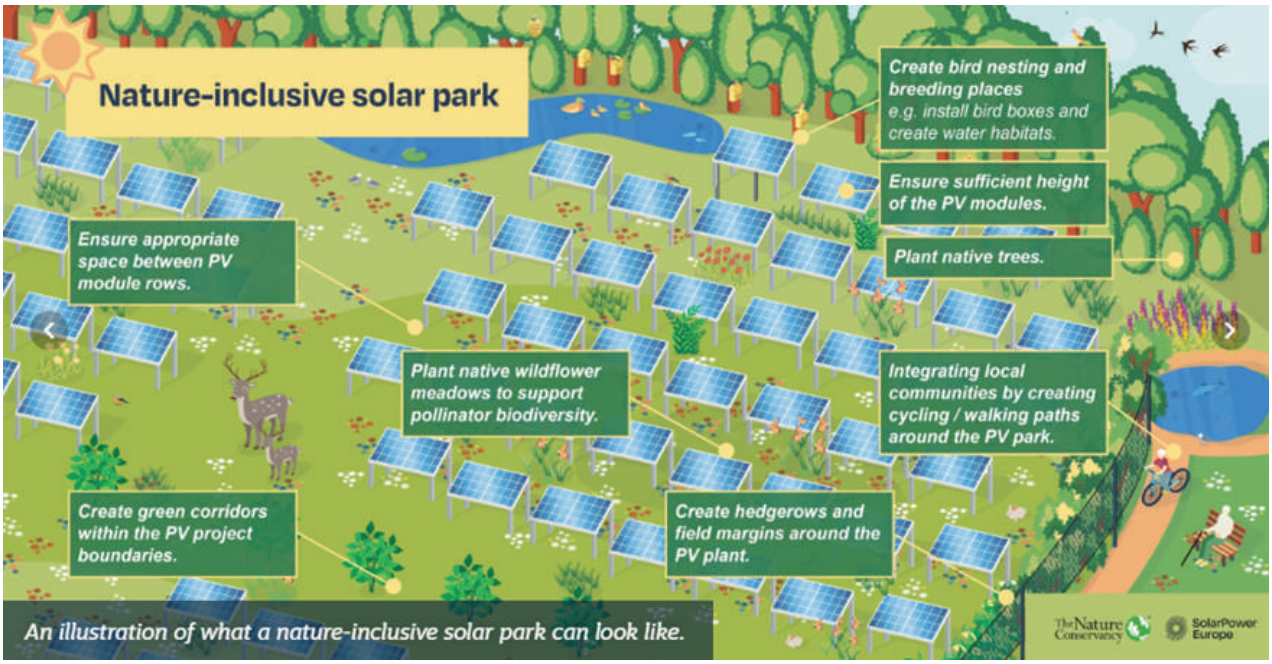
    - Creating favourable conditions for local wildlife with features like wildflower meadows, water bodies for frogs, and thick hedgerows.

    - Creating mixed-habitat solar projects that can enhance local biodiversity and increase bird populations. These projects include taller vegetation, reduced mowing frequency around panels, and strategic placement of hedgerows or trees along boundaries. Research demonstrates that solar farms designed thus support significantly higher avian diversity compared to conventional installations with short swards and no woody perimeter (Copping 2025).

    - Using community feedback for interventions that utilise traditional knowledge and skills. For example, at the site of the Ituverava Solar Plant in Brazil, community knowledge was used for native plant reseeding, and sheep grazing for vegetation management, minimising the need for chemical interventions.

    - Measure and monitor biodiversity net gain. This should be done by collecting data before and after the interventions mentioned above. For example, SSE Renewables quantifies nature-positive actions and measures impact through an in-house-developed tool which has been made publicly available.

Figure 15. Meadows to green corridors: When nature takes centre stage at RE plants



Source: The Nature Conservancy, SolarPower Europe, and Metabolic. 2024. "Rewarding and Incentivising Nature Inclusive Solar through EU Policy".The Nature Conservancy, SolarPower Europe and Metabolic

Role of other actors

Policymakers

Local authorities such as the gram panchayat and the zilla parishad should play an active role in the monitoring of mitigation efforts. Changes in access routes due to construction, construction timelines, etc. can be communicated through platforms and meetings that the gram panchayat organises. To encourage more projects are biodiversity net positive, tendering agencies can include this as a non-price criterion.

Civil society organisations

CSOs that have expertise in restorative practices can be looped in when designing a restoration plan.

Box 9. Case study – Philippines' Burgos Wind Farm maximising co-benefits of project development

Burgos Wind Farm is a 150 MW project located in Ilocos Norte, Philippines, designed with best practices related to environment impact mitigation measures, community skill enhancement, and responsible water and waste disposal. It was developed and is operated by EDC Burgos Wind Power Corporation (EBWPC), a subsidiary of Energy Development Corporation (EDC), a private company. The project was financed through a combination of equity and debt, including a $20 million loan from the Asian Development Bank (ADB).

As part of the National Greening Program (NGP), the project entered into contracts with three people's organisations—the Saguigui Tribal Council, Bacsil Upland Farmers Association, and the Paddagan Upland Planters Association—to reforest denuded areas. At the project site, women were organised into the Association of Burgos Agri-based Entrepreneurs (ABA-Entrep) to reinstate the vegetation lost when the wind farm was constructed. To mitigate the negative impact of land acquisition on economically vulnerable families, the project developed a livelihood restoration programme in consultation with the affected families. As part of this programme, 10 households that lost more than 10 per cent of their productive land received cattle from the project to breed and raise (ADB 2023).

The project also collaborated with village/barangay and municipal government officials to plan and execute activities under the corporate social responsibility (CSR) programme. Twice a year, community-wide consultations were organised to update the affected residents on the project's operational status and its compliance with national laws and standards (ADB 2023).

These and multiple other initiatives in responsible project management led to the Burgos Wind Farm becoming a symbol of local innovation and environmental stewardship (ADB 2023). As of 2022, ABA-Entrep has led the planting of 1,504 seedlings at four sites inside the wind farm areas. In 2022 alone, host communities and local government units received a combined amount of USD 18,980 (~ INR 17 lakh) for development and livelihood funds (DLF), and reforestation, watershed management, health and/or environment enhancement funds (RWMHEEF) (ADB 2023).

The 150 MW Burgos Wind Farm located in Ilocos Norte, Philippines.

Success factors

1. Partnerships
2. Twice a year, community-wide consultations
3. Development fund
4. Women-led restorative practices

Source: ADB. 2023. "Managing Risks and Increasing the Co-benefits of a Wind Project." Development Asia, October 26, 2023

5.2 Ensure community health and safety measures and adhere to labour laws

What does this involve?

This involves adhering to relevant international standards, frameworks, and statutory regulations during project deployment to establish robust environment, health, and safety (EHS) practices, protect labour rights, and secure emergency preparedness.

How to do this?

This section is divided into occupational health and safety of workers on site, and community health and safety. The two can be interrelated, thus it is critical to follow both.

Occupational health and safety

- Ensure compliance with codes such as the *Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996,* the *Contract Labour (Regulation and Abolition) Act, 1970,* the *Minimum Wages Act, 1948,* and *Code on Wages, 2019, the Factories Act, 1948, the Occupational Safety, Health, and Working Conditions Code, 2020, Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 (PoSH), Employees' State Insurance Act, 1948, & Employees' Provident Funds and Miscellaneous Provisions Act, 1952, Equal Remuneration Act, 1976, and Child Labour (Prohibition and Regulation) Act, 1986,.*

- Adopt globally recognised standards. This includes

    - ISO 14001—Environmental management system (EMS). While the primary focus is environment, this ISO connects to occupational safety and health (OSH) through its focus on identification of pollutants that might impact worker and community health, emergency preparedness in environment-related emergencies, and processes to handle hazardous material that can impact both environment and people.

    - ISO 45001—Occupational safety and health management system. Here, the approach is preventive and risk-based, with a focus on leadership commitment, worker involvement, and integration with overall business processes.

    - Other guidelines and standards include ILO-OSH 2001 and ISO 31000.

- Further, developers may choose to get the projects audited by the National Safety Council of India.

- Developers should also refer to industry-specific trainings, such as those by the Global Wind Organisation. Developers should implement comprehensive training programmes for all those on site.

Community health and safety

- Identify risks: Any risks to the local community should already be identified under the ESIA, and mitigation plans put in place through the ESMMP. During construction, the developer must again revisit this and evaluate the risks and potential impacts to the health and safety of the local community, and establish preventive and control measures. They should ensure hazards and risks are identified by reviewing construction activities such as vehicular movement, handling of equipment, etc.

- Risk mitigation plans: Risk mitigation plans should be developed to prevent community exposure to hazardous materials and diseases linked to project activities. It should be ensured that emergency procedures, resources, preparedness measures (including drills and training for locals), and recovery protocols are established and regularly maintained.

- Monitoring and audits: Periodic audits and monitoring should be conducted to ensure compliance, and identify areas for improvement.

Role of other actors

Policymakers

Policymakers must establish robust feedback mechanisms to ensure codes and regulations are appropriately updated and reflect evolving industry standards and practices.

5.3 Undertake responsible waste management

What does this involve?

Comprehensive waste management compliance requires adherence to national regulations, including *Solid Waste Management Rules, 2016*, *Hazardous Waste Management Rules, 2016*, and *Electronic Waste Management Rules, 2022*, while implementing international best practices like zero-waste construction commitments.

How to do this?

- Follow all national waste management frameworks and international best practices.
- Ensure that no dumping occurs on community property, and that damaged panels, turbines, and other equipment is properly treated. This can include repurposing, recycling, and other circular strategies.
- Train community members on key aspects of construction monitoring, such as environmental impacts, safety standards, and social safeguards, and develop a framework for community-based monitoring, including regular reporting mechanisms and feedback to project management.
- Manage PV modules damaged during transportation and project operations based on the extent of the damage. Modules with minimum damage can be used for second-life applications. Developers should assess the utility of panels in the community, for example, rooftop solar systems at facilities such as community centres and schools, as well as homes. Modules that are damaged or beyond repair must be sent to registered e-waste or solar waste recyclers authorised to handle the CEEW14 (consumer electrical and electronics and photovoltaic panels) EEE (electrical and electronic equipment) category, in accordance with the *E-Waste Management Rules, 2022*.

Box 10. Case study – ERG's social purpose solar revamping, a circular economy success story

Italian energy supplier ERG has transformed solar waste into social impact through its innovative Social Purpose for Solar Revamping programme, with the fourth project now operational in Limestre, Tuscany. This initiative addresses a critical challenge in RE: what to do with functional solar panels replaced during facility upgrades.

Rather than disposing of approximately 4,000 solar modules from four revamped solar parks, ERG identified an opportunity to extend their lifecycle. These panels, still delivering significant power output, are being redeployed at minimal cost to support communities across Italy and countries in Africa. The programme aligns with ERG's ESG commitments while demonstrating practical circular economy principles.

Through partnerships with organisations like MSC Foundation and Comunità Sant'Egidio, ERG has created a scalable model that transforms corporate asset refreshing into community empowerment, proving that sustainability and social responsibility can be seamlessly integrated.

Solar panels set aside for reuse as part of ERG's Social Purpose for Solar Revamping initiative (Illustrative purpose only)

Success factors

1. Circular economy approach
2. Strategic partnerships with MSC Foundation & Comunità Sant'Egidio

Source: ERG Group. n.d.

Role of stakeholders

Policymakers

The MoEFCC should implement clear guidelines for collecting and storing solar waste.

Civil society organisations

CSOs can facilitate networks between stakeholders such as developers, producers, and contractors who manage solar waste.

Other stakeholders

The *Extended Producer Responsibility (EPR) Rules of 2018* require manufacturers to manage their products' end-of-life disposal. Manufacturers must establish dedicated collection centres and storage facilities specifically for solar waste (MNRE; CEEW 2024).

5.4 Implement mechanisms for grievance redressal, employment, and skilling-related activities, community development initiatives, and continued engagement with community members

What does this involve?

Continue activities initiated in Phase 2. If not yet initiated, set up systems of grievance redressal, assess possibility of employing locals, invest in activities for boosting employment or incomes of locals and communities impacted by the project, and assess the community's needs to undertake the right type of community development activity. After assessing the needs of the community, ask whom would it benefit and ensure the most vulnerable groups benefit from the project. Additionally, the developers should ensure continuous communication with the local leaders and communities.

How to do this?

Implement plans and mechanisms for employment, community development, and grievance redressal. Developers and EPC companies on the ground are to continue engagements on key aspects such as changes in access routes and diversions and any deviation in construction plans.

Project communication with community and it shoulf take the same formatting as Emplpyment (belwo)

- Adhere to the agreed project design and communicate deviations, with mechanisms built in for feedback.
- Provide updates on construction progress and timelines.
- Provide details on changes in access routes, impact on community resources, etc. and about the associated mitigation strategies.
- Adapt engagement plans to emerging stakeholder needs.
- Gather and integrate feedback from stakeholders regularly to improve communication strategies and project transparency.

Employment

- Meet hiring targets from the local workforce as established in Phase 2.
- Track employment generation and establish monitoring mechanisms to ensure compliance.
- Enable the creation of an ecosystem to hire women for construction and related activities, by providing for toilets and safety procedures; target a certain percentage of women to be hired to minimise isolation, etc.
- Ensure skills training through dedicated programmes or on-the-job training of locals to suit requirements for construction and operation roles. Partner with accredited institutions to provide certification for completed training programmes.
- In this phase, prepare a plan for hiring locals for operation and maintenance (O&M)-related activity based on relevant skills, and provide the necessary training.

Community development

- Ensure the completion of high-priority projects like roads, schools, and water systems, and hand over completed infrastructure to the community.
- Continue implementing other programmes, focusing on adapting to evolving community needs and ensuring sustainability throughout the construction phase.
- Develop a comprehensive monitoring framework for social support programmes, focusing on key performance indicators (KPIs).
- Conduct regular reviews of efforts to ensure they meet community needs and expectations, and provide regular reports.
- Build the community's capacity and create leaders (including women, teachers, etc.) to continue local development through partnerships with NGOs and other organisations in education, health, sanitation, etc.

Grievance redressal

- Institute a fast-track process for urgent grievances to ensure quick resolution, particularly those related to health, safety, and non-compliance during the construction process.

Ensure proper record maintenance and communication of grievance redressal measures to individuals concerned. Follow transparent practices in record keeping and information dissemination. Communicate grievance resolution outcomes to maintain community trust and transparency. This can be based on discretion, keeping in mind the privacy of the petitioner.

- Conduct regular feedback sessions with different community groups to assess the GRM's functionality and identify areas for improvement.

Role of other stakeholders

Civil society organisations

CSOs can actively work to facilitate the training and monitoring activities, assess development, employment creation and grievance redressal activities.

Table 7. Moving up levels of responsibility in Phase 3

Responsibility	Compliant	Adopter	Leader	Pioneer	Indicators
Implement, monitor and course-correct social and environmental mitigation strategies and other efforts towards contributing to the environment	Ensures roads used for transportation are repaired towards the end of construction. This applies to any infrastructure that might be impacted.	Provides regular updates to the community regarding the project, employment opportunities, etc.	Establishes a feedback loop with the community to gather input on the effectiveness of the risk mitigation strategies, and adapt strategies accordingly.	Trains selected community members to participate in monitoring activities and reporting any grievances Undertakes restorative and environment-friendly practices	1. All (100 per cent changes) are offset. This includes roads, dust levels, the number of trees, and habitat, and other impact areas as mentioned in the ESIA. 2. Feedback from the community included in mitigation strategies (percentage of feedback incorporated) 3. Training of community members in monitoring activities (number of trainings completed)

Responsibility	Compliant	Adopter	Leader	Pioneer	Indicators
Ensure community health and safety measures, and adherence to labour laws	Complies with relevant regulation related to labour, health, and safety	Adopts and gets certified in globally recognised frameworks. Conducts periodic audits and monitors impact on community health (shadow flicker, noise, etc.)			1. Certified in relevant ISO certifications 2.Total recordable incident rate (TRIR): Total recordable incidents per year 3.Safety inspection frequency (per month) 4. Emergency response time: Average response time to on-site incidents in minutes 5. Mitigate impact on community health such as shadow flickers from wind turbines.
Undertake responsible waste management practices	Complies with national regulations on waste management. Ties up with vendors or producers to manage solar PV waste	Follows international best practices of waste management such as committing to zero waste	Reuses solar PV for community needs, depending on the extent of damage	Trains community members in key aspects of construction monitoring.	1. Kilo metric tonnes of waste reduced on the project site 2. Per cent of solar PV eligible for second life used (MW used for other purposes/total MW PV waste) 3. Number of monitoring days over the total number of construction days

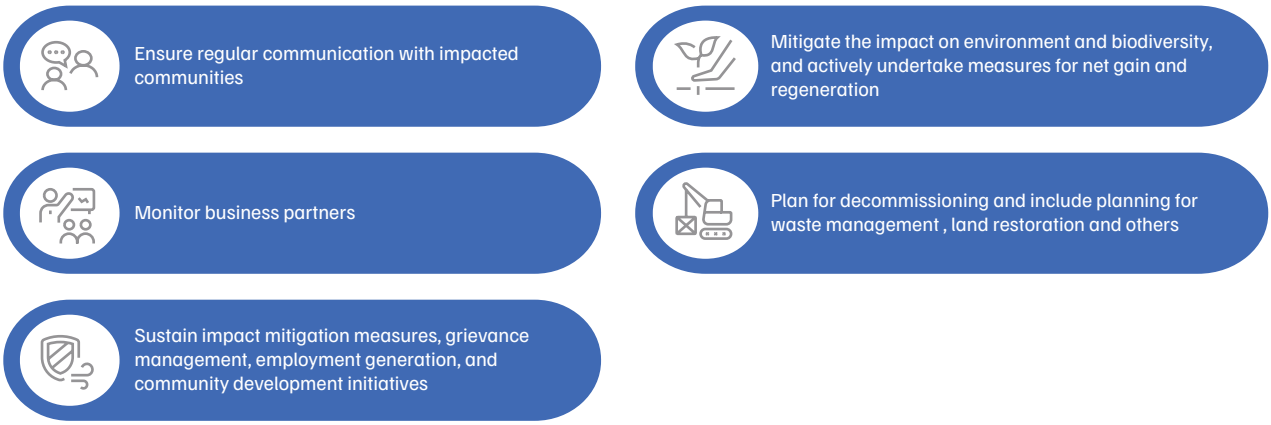
Responsibility	Compliant	Adopter	Leader	Pioneer	Indicators
Continued engagement with community members	Adheres to the agreed project design, and communicates deviations, with mechanisms built in for feedback	Provides updates on construction progress and timelines.	Adapts engagement plans based on emerging stakeholder needs	Regularly gathers and integrates feedback from stakeholders to improve communication strategies and project transparency	1. Number of community engagements during construction (at least one in each panchayat area) 2. Per cent of feedback incorporated
Implementation of mechanisms for grievance redressal	Institutes fast-track process for urgent grievances to ensure quick resolution, particularly those related to health, safety, and non-compliance during the construction process.		Conducts regular feedback sessions with different community groups to assess the functionality of the GRM and identify areas for improvement.		1. Number of feedback sessions held 2. Percentage of feedback incorporated in GRM
Implementation of employment and skilling-related activities	Evaluates and plans for hiring locals for operation and maintenance	Meets hiring targets as established in the second phase. Monitors and tracks compliance. Additionally, enables creation of an ecosystem to hire women for construction and related activities	Ensures on-the-job training of locals for both construction and operation roles. Partners with accredited institutions to provide certification		1. Number of people impacted via employment or skilling initiatives 2. Average percentage increase in incomes of those participating in the skilling initiatives
Implementation of community development initiatives		Ensures completion of setting up the community development activities by the end of construction.	Develops a comprehensive monitoring framework	Builds the capacity of the community, and mentors locals as leaders to sustain the development effort through partnerships with NGOs.	1. Monitoring and evaluation of the activity every 2 years 2. Per cent of community population benefited 3. Long-term funding secured for the sustenance of the community development engagements

Source: Authors' analysis

6. The operations and maintenance phase

Phase 4 encompasses the operations and maintenance of the project, which is the longest period of deployment. Here, new actors come in, such as asset management companies who manage the project until its completion.

Figure 16. Responsible activities to be carried out during Phase 4 of RE deployment.



Source: Authors' analysis

6.1 Ensure regular communication with impacted communities

What does this involve?

Regular communication entails maintaining contact with impacted communities throughout the project operations, via various channels. This includes communication regarding land use, project progress, available employment opportunities, among other things.

How to do this?

- Provide regular updates to keep the community informed about the progress of revenue-sharing agreements and compensation commitments in case of land lease, shared ownership, equity holding, etc.
- Ensure transparency in communication regarding employment opportunities at the project site, and inform them about grievance redressal measures. This is critical because, with changing asset management firms being deployed on the ground, there might be confusion regarding the responsible individuals for grievance redressal. There should also be updates on the status of community development activities and skill development initiatives.
    - Communication channels may include regular bulletins, newsletters, message alerts, and other digital and print media.
    - Conduct an annual meeting in each village around the project for the first two years after project approval. The meetings can then happen every other year for the purpose of ensuring awareness among community members regarding project updates, employment opportunities, status of community development initiatives, among other things.

- Empower community leaders who can represent the community and raise awareness regarding RE projects and the potential benefits of responsible deployment to areas surrounding the prospective site.

- If the project is handed over to an asset management company, the latter should continue regular communication with the local community.

Role of other actors:

Local government

Local government bodies such as gram panchayats have a key role to play in ensuring adequate communication, bringing together the community, and allowing equitable access to opportunities. Partnerships between developers on the ground and gram panchayats are crucial to correctly identify stakeholders and disseminate information.

Civil society organisations

Local NGOs are also critical in creating awareness and ensuring that there is transparency and truthfulness in communication and intent. They can proactively seek partnerships with developers on the ground to implement communication plans and provide assistance in breaking language and cultural barriers.

6.2 Sustain impact mitigation measures, grievance management, employment generation, and community development initiatives

What does this involve?

Activities related to impact mitigation, grievance management, employment creation, and community development need to be continued and sustained throughout the project's lifecycle. This includes ensuring the smooth functioning of procedures implemented in the previous phases, adequate monitoring, and corrective measures.

How to do this?

Create a monitoring report on impacts mitigated, GRM, employment generated, and the development activities undertaken, and discuss the results with the relevant gram panchayats and the community. Pioneer companies can aim to supplement internal monitoring with a baseline-midline assessment report through external evaluators, which will help build trust.

- Continue the following key activities undertaken in Phases 2 and 3 of project deployment
    - Impact mitigation measures
        - Risk mitigation strategies prepared in Phase 2 should be adequately implemented at this stage. Monitor the progress of the interventions, channels for receiving feedback on interventions, and take corrective action in case of any deviation.
        - Community health and safety measures should continue to be in place and monitored from time to time.
    - Grievance management
        - The grievance registration processes established in Phase 2 should continue, with a strong mechanism for reaching developers. This can include ensuring that the on-ground staff (of developers or asset management companies) has adequate access to project developers at the corporate level.
        - Continue the processes established for grievance redressal documentation and communication with local communities.
    - Employment generation and community development initiatives
        - Support community leaders in continuing development activities via adequate skilling, and improved access to infrastructure knowledge and expertise. Loop in local NGOs that can support capacity building of locals.
        - Prioritise locals living around the project for O&M jobs and other long-term jobs. Provide upskilling programmes for workers moving from construction to operations and maintenance (O&M) roles, focusing on technical maintenance (e.g., electrical, mechanical) and safety standards such as electrical safety, personal protective equipment (PPE) use, risk assessments, and emergency preparedness plans.
        - Track the status of initiatives such as community development projects, livelihood programmes, and employment quotas regularly, and address any shortfalls. Monitor the efficacy of interventions and ensure that they are self-sustainable, with a potential for impact creation beyond the life of the project. A third party may be considered to conduct an evaluation.
        - Formalise agreements with local authorities on the management of infrastructure developed as part of the community development plan, such as roads, water conservation systems, or irrigation systems, and provide training to local authorities on infrastructure maintenance.
        - Offer apprenticeship in company offices to skilled individuals and enable job creation.

Role of other actors

Policymakers

Grievance redressal is not only a function of the company but a key role of the state, as mentioned previously. These processes need to be strengthened to ensure equitable development and further community interests. Local government also play a key role to play in the handover of community development projects, grievance redressal systems, and ensuring matching of individuals for employment generation in close collaboration with developers to realise these goals.

6.3 Monitor business partners

What does this involve?

Handover of critical activities to business partners should be complete by this phase. Only monitoring and compliance are a part of this phase. This mainly focuses on asset management companies that oversee the operations and maintenance of the project site, and act as the sole point of contact for local communities.

How to do this?

- If the asset management firms are onboarded on a rotational basis, the developer should ensure that the new incoming firms and personnel undergo all the required training and are aware of contractual obligations for responsible deployment, as mentioned in Phase 1 of project deployment.
- The asset management firms should also be trained in grievance registration, and the formal channels of grievance registration should be communicated to them.
- The asset management firms should maintain proper documentation so that, when the project changes hands, the handover of local employment generation, community initiatives, and the grievance management system can be completed smoothly.
- Transparency should be ensured in all internal processes of documentation, communications, and contract management.
- The asset management team or company should appoint an officer to oversee grievance management and community engagement activities.
- The asset management firms should be contractually obligated to follow the decommissioning plans prepared by the developers.

6.4 Mitigate the impact on environment and biodiversity, and actively undertake measures for net gain and regeneration

What does this involve?

Throughout the project's lifecycle, the developers and the contracted asset management firms should continue to ensure that the environmental impact mitigation plans are functional, and that initiatives for ecological net gain and regeneration continue to be undertaken.

How to do this?

- Ensure minimum impact during the project lifecycle. This includes measures for waste management at project site, such as no dumping of faulty panels, and recycling initiatives.
- No new borewells should be dug without permission and adequate consultations with the local communities. All mitigation plans for water use to be implemented, especially in water-scarce and fertile agricultural regions.
- There should be no development in project areas that can potentially hinder or undo the measures implemented to mitigate adverse impacts on the environment.
- All net-gain activities undertaken in previous phases should be continued, with adequate local capacity building and handover in this phase.
- Developers may refer to the principles and corresponding actions outlined in Eurelectric's Electrify in Harmony with Nature Guidebook for further guidance on ensuring harmony between energy deployment and biodiversity protection during the operations phase (Eurelectric 2024, pp. 56–60).
- Develop an impact report to measure net gain and share it with the community.
- Deploy **continuous monitoring systems** to track key environmental variables, including air quality, water quality, and noise levels. This should involve adopting **technology-driven platforms** capable of predicting potential environmental impacts and enabling real-time parameter surveillance (McCall 2024). Evaluations can be done by independent evaluators and not merely by internal calculations.

Role of other actors

Local government and NGOs

Gram panchayats and NGOs can work with local communities in environmental management and net gain, and learn from their knowledge and expertise. Further, signals of degradation or improvement should be monitored in partnership with local communities, especially in areas with rich natural ecosystems.

Box 11. Case study – conservation of biodiversity, while ensuring community benefit

The Ituverava Solar Plant developed by Enel Green Power Brasil Participacoes is a 254 MW project commissioned in 2017, located near Tabocas do Brejo Velho, Bahia, Brazil. Beyond energy production, the project supports local biodiversity by installing perches and artificial nests to protect bird populations, enhancing species reproduction.

The Biodiversity Dissemination Project monitors various species, demonstrating the project's positive impact on wildlife. Ituverava has also embraced circular economy practices, including water recycling, agroforestry systems, and emissions reduction through the circular economy Compostar project. Additionally, 18 unused solar panels were donated to power a water pump for 39 local households, replacing a diesel-powered system.

A study conducted to evaluate the direct and indirect influence of the project found that, after one year of operation, the project had not negatively impacted the local biodiversity, which includes medium-sized and large mammals, including bats. (Enel Green Power 2021).

Extensive land use significantly alters local ecosystems; therefore, prioritising biodiversity preservation is essential to mitigate ecological harm

Success factors

1. Second-life use of panels for community purposes
2. Monitoring and evaluation of impacts

Source: Enel Green Power. 2021. "A Sustainable Solar Plant in the Brasilian Sertão." Enel Green Power Stories, June 17, 2021.

6.5 Plan for decommissioning

What does this involve?

Decommissioning requires intensive planning and coordination to minimise the adverse impacts of change in land use, waste generation, and project closure. This should be done in an appropriate timespan to ensure smooth transition and reduced complexities at the time of decommissioning.

How to do this?

- The decommissioning plan should be created 1–1.5 years in advance, factoring in the following elements:
    - A technical evaluation of parameters such as project performance, land patterns, and growth of invasive species, and an infrastructure survey.
    - An assessment of potential safety risks during the decommissioning process, and implementation of strict safety protocols.
    - Creation of a plan for workforce reallocation in other company projects, or to aid alternative employment access for long-term workers.
    - Adequate recognition of soft and hard skills gained at the job to improve the job prospects of displaced workers.
    - Plans for dismantling of project materials and waste management should be created a year before decommissioning. This should include details about waste management partners (recycler, refurbisher etc.), transportation, and other related activities.
    - Preparation of a land restoration plan aiming to return it to its pre-project state; and implementation of strategies such as vegetation cover or landscaping to minimise soil erosion and protect water quality.
    - Projects often become a temporary part of local ecosystems given their long duration of operation. Decommissioning should thus be preceded by an assessment of its impact on the local ecosystem, and plan for habitat restoration such as identifying sensitive species, planting native vegetation and implementing wildlife corridors to reintegrate displaced animals. Collaborate with environmental experts and local communities to develop a comprehensive habitat restoration plan catered to the local ecosystem.
    - Closer to decommissioning, prepare model contracts to clarify the land rights of owners in case of land leasing when the land is being reused or redeveloped. Further, considerations of land fertility reduction or change in land topography need to be considered while creating these contracts and deciding compensatory amounts.
    - Establish new social and environmental baseline and management plans for decommissioning, with high engagement with landowners. Prioritise securing high-value biodiversity features, retain records, and evidence the outcomes.

- Create a monitoring strategy with an equivalent of a social and environment officer to monitor plan creation and compliance. This should include checklists containing all the activities mentioned above, and the desired outcomes.
- In cases where developers are not the manufacturers of modules, they should ensure that the solar waste generated is sent to authorised recyclers after the project gets decommissioned.
- Ensure the plan is communicated ahead of the decommissioning or repowering process to community members and locals.
- Cost analysis of decommissioning should include the following key factors (The Solar Recycling Company 2025).
    - Site characteristics, which include location, land cover, size of the project (in MW), size of plant, site history, etc.
    - Regulatory requirements such as waste management rules, site restoration standards, etc.
    - Type of technology, ancillary structures, and type of technology to be used for decommissioning.
    - Extent of restoration activities and local ecological protection measures to be undertaken.
        - Restoration and protection activities must be based on specific, time-bound, and measurable targets, such as **acreage restored, survival rates of planted native vegetation** (e.g., 75per cent survival after 3 years), and **quantifiable biodiversity benchmarks** (e.g. an increase in the site's native species over a 10-year period.

Role of other actors

Private sector, local government, and CSOs

Waste management and recycling will be possible at decommissioning with increasing uptake by recyclers and creation of a formal and informal economy of RE waste aggregation and segregation. The role of the private sector and civil society organisation is crucial for this. Further, local NGOs and authorities will also play a key role in the preparation of workforce relocation plans, access to alternative employment, and land restoration activities.

Box 12. Case study – decommissioning planning that includes commitments to land restoration and waste management

The Statkraft Talayuela 2 is a 300 MW solar project located in Spain that has been operational since 2023. Its developer, Eurelectric, has prepared a detailed decommissioning plan, with an aim to restore the land completely to its original state, including reestablishment of the original runoff, maintaining the original land topography, and returning the land to its pre-project vocation (Eurelectric 2024). Further, plans for dismantling and removal of debris and waste will be overseen by an authorised manager, and it has committed to completing all these activities within nine months of decommissioning.

Further, it aims to create and submit a restoration plan one year before the end of the project, detailing the different actions that will allow the land to be left in its original state. This plan aims to be approved prior to its execution by the environmental body, which will carry out modifications as it deems necessary (Eurelectric 2024).

Renewable energy development can coexist with landscapes when efforts are made to restore native trees and vegetation.

Success factors

1. Strategic partnerships
2. Comprehensive decommissioning and restoration planning
3. Circular economy and upcycling innovation

Source: Eurelectric. 2024. "Power Point 2.0: A Guidebook to Electrify in Harmony with Nature." Brussels: Eurelectric.

Table 8. Moving up levels of responsibility in Phase 4

Responsibility	Compliant	Adopter	Leader	Pioneer	Indicators
Ensure regular communication with impacted communities		Provides regular updates to the community regarding the project, employment opportunities, etc.	Holds bi-annual or annual meetings with the local community to provide updates on project progress	Mentors community leaders and builds their capacity to represent community needs	1. Number of updates provided on a yearly basis 2. Number of community meetings held per year with documented attendance 3. Average number of trained community leaders per village actively representing community interests
Sustain impact mitigation measures, grievance management, employment generation, and community development initiatives		Develops a monitoring report on mitigated impacts, employment generated, and community development activities undertaken	Shares and discusses the monitoring report with the relevant gram panchayats	Shares and discusses the report with community members. Hires third-party evaluators to assess results of impact mitigation and other responsible activities.	1. Create a monitoring report 2. Report shared with gram panchayats (per cent of gram panchayats covered) 3. Report discussed through at least one engagement with community (per cent of villages covered)
Monitor business partners	Ensures transparency in all documentation, internal processes, and communication with communities	Trains the personnel of incoming asset management firms in grievance management, maintaining documentation, and contractual obligations related to responsible deployment	Ensures the asset management company appoints an officer to oversee grievance management and community engagement activities		1. Personnel of the asset management team are trained 2. Officer appointed to oversee the responsible practices of the asset management team
Mitigate the impact on the environment and biodiversity, and actively undertake measures for net gain and regeneration		Continue all activities as mentioned in previous phases	Assess the impact of interventions to ensure nature-positive impact	Improves biodiversity significantly (biodiversity has increased by 1.2 times pre-project levels)	1. Assess impact to verify 1:1 gain 2. A monitoring report is developed and shared with the community after construction.

Responsibility	Compliant	Adopter	Leader	Pioneer	Indicators
Plan for decommissioning		Decommissioning plan created 1 –1.5 years before project decommissioning.	Actively communicates the plan and future of the project to locals and those benefitting from the project		Decommissioning plan developed Developer's repowering plan (if any) and future of the project are actively communicated to locals and those benefitting from the project

Source: Authors' analysis

Table 9. Summary of activities across phases

	Phase 1	Phase 2	Phase 3	Phase 4
Land	• Site on low-impact lands • Identify procurement model • Conduct a social assessment, map stakeholders, and understand social dynamics	• Implement Fair and just procurement of land	• Ensure timely compensation disbursement and regular communication	
ESIA and ESMMP		• Conduct an ESIA • Develop an ESMMP	• Implement and monitor ESMMP • Undertake responsible waste practices	• Evaluate impact and incorporate community feedback

	Phase 1	Phase 2	Phase 3	Phase 4
Communication		• Communicate project details • Train community leaders to voice concerns • Have a social and environment officer	• Gather feedback on grievance redressal mechanism (GRM), community development, employment, etc. and communicate updates on construction • Train community leaders in monitoring the GRM, ESMMP, community development activities	• Provide clear updates yearly/ bi-yearly regarding project status, employment opportunities, GRM, etc.
Health and safety			• Adhere to H&S regulations and secure ISO certification	
Business Responsibility	• Select contractors willing to undertake responsible practices • Ensure contracts bind actors to undertake responsible activities • Build capacities of partners on responsible actions • Factor in cost of responsible activities in project document and financing	• Develop procedure to monitor partners	• Monitor partners	• Ensure asset management team has a social and environment officer as a POC for the community • Ensure asset management company/ team is trained in responsible activities • Monitor partners

	Phase 1	Phase 2	Phase 3	Phase 4
Community development		• Prepare a community development plan	• Implement the plan • Train leaders to undertake activities and ensure long-term funding	• Evaluate impact • Monitor activities and ensure long-term sustenance through long-term funding, partnerships, etc. • Continue implementation
Grievance redressal mechanism (GRM)		• Develop and implement GRM • Train community to facilitate, assist the GRM	• Implement the GRM	• Monitor the GRM • Continue implementation
Employment		• Identify stakeholders and plan to integrate local community in project roles • Identify local community development activities relating to skills development, entrepreneurship, and employment	• Undertake employment and skilling activities at project site • Implement employment generation plans	• Evaluate impact
Nature-positive practices		• Use low-carbon technologies, plan and implement restorative practices	• Implement strategies for nature-positive practices aimed at biodiversity net gain	• Evaluate impact • Continue implementation

Source: Authors' analysis

Annexures

Annexure 1 – Legal Register for applicable laws and regulations

This legal register provides an overview of the various environmental and social (E&S) compliances mandated by the central government that are applicable for the development of wind power projects and ground-mounted and floating solar PV projects (referred to as RE projects hereafter). This includes central laws and regulations pertaining to E&S, health and safety, land and labour. Since, there is large variability in state-level laws, especially around land use, these have not been covered. Similarly, the register does not include the various technical compliances, such as those specified under the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007. The register concludes by providing a brief overview of some landmark verdicts of the Supreme Court as well as the Rajasthan High Court. This register is provided solely for guidance to assist developers, and does not constitute legal advice. Users should consult qualified legal experts for any legal matters connected hereto.

Environmental laws and RE projects

The current policy paradigm as it relates to the applicability of environmental laws to RE projects is that of blanket exemptions (Pratap, Pillai, and Muthu 2019; Kohli and Menon 2021) in most areas—except management and disposal of solar panel waste, which is regulated by the *E-Waste Management Rules, 2022*. This section will briefly scrutinise the applicability of various environmental laws and regulations to RE projects.

Environment impact assessment

The *Environment Protection Act (EPA)*, 1986, is the overarching environmental legislation in India. The law, under Section 3, provides broad powers to the Union government to enact subordinate legislation regulating specific activities and geographical areas (Kohli and Menon 2021, 161). The Environmental Impact Assessment (EIA) notification, first issued in 1994, is one such instrument. The EIA establishes the procedure through which the environmental impact of various industrial and other activities is evaluated. Solar PV, solar thermal power plants; development of solar parks, on-shore wind, and mini hydel (up to 25 MW) power plants are exempted from requiring an EIA (Ministry of Environment, Forests and Climate Change 2017).

Pollution control and prevention

The regulatory framework for polluting activities is based on the *Water (Prevention and Control of Pollution) Act, 1974*, and the *Air (Prevention and Control of Pollution) Act, 1981*. Regulatory power is shared between state pollution control boards (SPCBs) and the Central Pollution Control Board (CPCB). The two statutes require industries to obtain two types of prior consent from SPCB: Consent to Establish (CTE) and Consent to Operate (CTO) (Kohli and Menon 2021, 138-139).

The process and duration of granting these consents are governed by classifying industries as red, orange, green, and white. The CPCB harmonises the classification across states using a pollution index score and routinely notifies revised classifications to SPCBs (Kohli and Menon 2021, 139). In 2016, the white category was created for non-polluting industrial activities, such as solar PV, wind and mini hydel (up to 25 MW) power projects. (Central Pollution Control Board 2017) As per the CPCB, white category industries are exempt from applying for CTE/CTO under the Air and Water Acts, though state-level SPCBs may still impose reporting requirements or compliance oversight. (Kohli and Menon 2021, 139). However, although RE projects may be exempt from requiring consents, developers could still be liable for damages or bank guarantees for potential environmental harm under SC jurisprudence in Delhi Pollution Control Committee (DPCC) v. Lodhi Property Co. Ltd.

Forest conservation

The primary law regulating forests in India is the *Forest Conservation Act (FCA), 1980*, which allows the union government to regulate the non-forest use of forest lands. The law requires that the diversion of forest lands must be offset through compensatory afforestation (CA). However, considering the poor implementation of CA, the Supreme Court in 2005 instituted the collection of a Net Present Value (NPV) amount from the body using the forest land (Kohli and Menon 2021, 101-102).

The NPV quantifies the tangible and intangible future benefits of the forest that will be lost following diversion. In 2008, the Supreme Court granted a 50per cent exemption on NPV to Wind Power (Central Empowered Committee 2008, 3)**.** Besides this, in 2004, the MoEF released specific guidelines for the diversion of forest land for wind power projects (Ministry of Environment, Forests and Climate Change 2004).

These guidelines suggest that wind projects should not be sited within eco-sensitive areas, such as wildlife sanctuaries, national parks, etc. It also requires that wind projects be developed at least 300 meters from highways and village settlements; windmill rotors are also required to be painted bright orange to avoid bird collisions. Finally, in addition to CA and NPV funds, wind projects diverting forest lands must pay a lease amount. Table 6 below summarises the various clearances generally required for the development of RE projects:

Table A1. Overview of clearance procedures for RE projects

Areas	Legal instrument	Type of clearance	Granting institution
Environmental clearance	*EIA Notification, 2006*	Exempt	NA
Air and water pollution	*Air Act, 1981; Water Act, 1974*	RE projects classified as white category industries by the Central Pollution Control Board (CPCB). White category industries exempted from requiring Consent to Establish and Consent to Operate. Intimation to SPCB is required.	State Pollution Control Board (SPCB)
Wildlife conservation	*Wildlife Protection Act (WPA), 1972*	RE projects are required to take approval from the standing committee of the National Board for Wildlife (NBWL) if the project uses land in any area notified as protected under the WPA, such as national parks, wildlife sanctuaries, and conservation reserves.	National Board for Wildlife
Groundwater	*Environment Protection Act, 1986* State-level groundwater statutes and regulations	NOC is required if the project uses groundwater	State Groundwater Authority (SGWA) Central Groundwater Authority (for those states that do not have SGWAs)
Land acquisition	*Land Acquisition Act, 2013;* *Forest Rights Act (FRA) 2006;* *Panchayat (Extension to Scheduled Areas) Act, 1996;* State-specific RE and industrial policies	The type of clearance varies according to the type of land and the nature of the acquiring body. For example, under FRA, consent is required from gram panchayat even if clearance is provided by the forest department.	Varies according to the type of land and acquiring body.
Surface water	*Environment (Protection) Act 1986;* State-specific irrigation/ water management laws	Approval from state water resources departments (WRDs) and panchayati raj institutions (PRIs) to draw water	WRDs and Gram Panchayats

Areas	Legal instrument	Type of clearance	Granting institution
Forest diversion	*Forest Conservation Act, 1980*	Approval by the Ministry of Environment and Forests (MoEF) and state forest department. Payment of compensatory afforestation and net present value (NPV) funds. 50 per cent NPV exemption given to wind projects	Forest advisory committee (FAC), MoEF, State Forest department
Coastal zone clearance	*Coastal regulation zone (CRZ) notification, 2011 and 2019*	CRZ clearance	MoEF and State Coastal Zone Management Authority
Hazardous waste	*E-Waste Management Rules, 2022*	E-waste recycling targets not applicable to solar PV waste. Solar PV manufacturers required to store solar PV waste until FY 2034-25 and file annual reports using the CPCB's e-waste portal. CPCB to issue guidelines for the handling and management of solar PV waste. As of August 2025, draft guidelines have been issued.	Central Pollution Control Board (CPCB).

Source: Manju Menon. 2021. "Development of Environmental Laws in India." New Delhi: Cambridge: Cambridge University Press and Pratap, Abhishek, Priya Pillai, Arundhati Muthu, Kanchi Kohli, and Manju Menon. 2019. "Powering Ahead: An Assessment of the Socio-Economic and Environmental Impacts of Large-Scale Renewable Energy Projects and an Examination of the Existing Regulatory Context" . New Delhi: Heinrich Böll Stiftung India / Asar Social Impact Advisors Pvt. Ltd.

Laws regulating land acquisition and use in RE projects

Land laws in India are complex, since states enjoy primary jurisdiction over the matter and each state has a diverse set of laws responding to its unique political economy of land. However, certain national-level laws do apply in various contexts, which are analysed here. A RE developer has multiple modes of land procurement available to them, as shown in Table 7, each of which attracts a different set of laws.

Table A2. Modes of Land procurement for RE Projects

Type of land	Acquiring body	Relevant laws and policies
Revenue lands, including wastelands	Public	State-specific RE and industrial policies; policies on the use of government land. These policies generally give preference to public sector acquiring bodies.
Forest land	Public/private	Forest Conservation Act, 1980 Forest Rights Act, 2006
Panchayat land	Public/private	The respective panchayati raj acts and rules of various states
Land in Tribal Areas (5th schedule areas under the constitution)	Public/private	The Panchayat (Extension to Scheduled Areas) Act, 1996; Forest Rights Act, 2006. Special state-level acts, such as the Chota Nagpur Tenancy Act, 1908 in Jharkhand
Revenue land and wasteland	Private	The solar/wind policy of the respective state; state-specific policies for the use of government land
Non-agricultural private land	Public	Land Acquisition Act, 2013 Specific state laws/policies (such as the Madhya Pradesh Consent Land Purchase Policy, 2014).
Non-agricultural private land	Private	Direct negotiations
Agricultural land	Private	State-specific land revenue and land reforms act State-specific wind/solar and industrial policies

Source: Manju Menon. 2021. "Development of Environmental Laws in India." New Delhi: Cambridge: Cambridge University Press and Pratap, Abhishek, Priya Pillai, Arundhati Muthu, Kanchi Kohli, and Manju Menon. 2019. "Powering Ahead: An Assessment of the Socio-Economic and Environmental Impacts of Large-Scale Renewable Energy Projects and an Examination of the Existing Regulatory Context" . New Delhi: Heinrich Böll Stiftung India / Asar Social Impact Advisors Pvt. Ltd.

Laws regulating labour and occupational safety and health (OSH)

There are 29 central government laws regulating labour, supplemented by numerous state-level legislations. In 2019-20, the central laws were reformed and absorbed into four labour codes. As of August 2025, draft rules have been published under the four labour codes by the central government as well as 32 state governments and union territories. However, Tamil Nadu, West Bengal, Delhi and Lakshadweep are yet to publish draft rules for the labour codes (PIB 2025).

In the absence of final rules being issued, developers should, for the time being, be aware of compliances under the labour law landscape prior to the labour codes.

Table A3. Labour and occupational health and safety compliances for RE projects

Area of compliance	Relevant legislation	Type of compliance
Employment of contract labour	*Contract Labour (Regulation and Abolition) Act, 1970;* *Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979*	Developer to register as principal employer of contract labour The principal employer must ensure that the contractor pays the wages of the contract labour in a timely manner and provides them with amenities such as canteens, restrooms, etc. Interstate migrant workers should be paid on par with other workers performing similar roles, but these wages cannot be below the minimum wage rate.
Provision of wages	*Minimum Wages Act, 1948;* *Payment of Wages Act, 1936*	Employers with fewer than 1,000 employees to pay wages before the 7th of every month Employers to maintain detailed registers of wage payments, bonus calculations, etc.
Provident Fund	*Employee Provident Funds and Miscellaneous Provisions Act, 1952;* *Employees Provident Fund Scheme, 1952;* *Employees Deposit-linked Insurance Scheme, 1976*	Employer to contribute 12 per cent of an employee's basic pay and dearness allowance to employee provident fund Contributions to be made by 15th of every month
Insurance	*Employees' State Insurance Act, 1948*	Employees earning up to INR 21,000 per month (up to INR 25,000 per person with disabilities) are covered under ESI. Employers must register all applicable employees on the ESIC portal and issue them ESI numbers.
Gratuity	*Payment of Gratuity Act, 1972*	Employer to pay gratuity to employees who have completed at least five years of continuous employment within 30 days of termination of employment.
Sexual Harassment	*Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 (PoSH)*	Employers required to frame a PoSH policy prohibiting sexual harassment and disseminate the policy among employees Employers to constitute an internal committee presided over by a senior female employee and at least one external member

Area of compliance	Relevant legislation	Type of compliance
Child Labour	*Child and Adolescent Labour (Prohibition and Regulation) Act, 1986*	Employment of children under the age of 14 prohibited. Adolescents aged 14 to 18 can be employed in non-hazardous occupations and processes. The list of hazardous occupations and processes includes those processes that are defined as hazardous under Section 2 (cb) in the Factories Act, 1948, which lists power generating industries hazardous. Although the Act does not specifically mention RE projects/ developers, they may be reasonably understood to fall within the scope of power generating industries. In such a case, they would be subject to the same restriction on employing individuals under the age of 18 years.
Occupational Health and Safety	*Factories Act, 1948* *The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.*	Under the Factories Act, employers to maintain cleanliness of premises, washrooms and drinking water, and ensure safety of machinery. Employers to provide facilities such as canteen and first aid. Construction workers aged 18 to 60 engaged for over 90 days in a year to be registered with the state welfare board. Drinking water, washrooms and first-aid facilities to be provided to construction workers.

Source: Ministry of Labour and Employment

Key court verdicts

The Indian Judiciary, especially the Supreme Court, has played a central role in defining and redefining environmental and social governance. Since 1996, the Supreme Court has used its power under Article 32 of the Constitution to keep the case of *TN Godavarman Thirumulpad Versus Union of India and Ors., open for three decades, admitting* thousands of interlocutory applications (IAs). Through these IAs, the Supreme Court has taken on increasingly administrative roles and overhauled India's E&S regimes. Table A4 below highlights some of the key verdicts and orders in the E&S domain that directly or indirectly affect RE deployment. Do note that the table does not present an exhaustive list. Further, Bhardwaj & Misra 2025 detail an analysis of court verdicts relating to the E&S aspects of RE deployment.

Table A4. Key court rulings shaping environmental and social governance

Case name and number	Date	Court	Key takeaway
M.K. Ranjitsinh & Ors. versus Union of India & Ors. **Writ Petition (Civil) No. 838 of 2019**	21.03.2024	Supreme Court	Overturned the interim order passed in the case in April 2021 (provided below), which required the undergrounding of transmission lines in GIB areas. Created an expert committee consisting of wildlife and electricity experts to identify the extent to which transmission lines can and should be undergrounded.

Case name and number	Date	Court	Key takeaway
M.K. Ranjitsinh & Ors. versus Union of India & Ors. **Writ Petition (Civil) No. 838 of 2019**	19.04.2021	Supreme Court	The court required that wherever feasible, transmission lines should be undergrounded in GIB areas within a year and in the meantime, bird diverters should be installed to prevent mortality.
Kalyan Singh and Ors. **versus the State of** **Rajasthan and Ors.** **D.B. Special Appeal (Writ) No.51/2020; D.B. Special Appeal (Writ) No.52/2020; D.B. Special Appeal (Writ) No. 223/2020**	29.06.2021	Rajasthan High Court	In Nedan village, Jaisalmer, Rajasthan high court cancelled the allotment of 235 hectares of land to the Adani RE Park Rajasthan Ltd (AREPRL) for the Fatehgarh Solar Park for encroaching upon public utility lands (access roads, water tanks, cremation grounds), and directed the state to survey the remaining 755 hectares to detect any remaining encroachments by AREPRL.
In Re: TN Godavarman **Thirumulpad Versus Union of India and Ors.** **IA No(s). 41723 of 2022 in Writ Petition (Civil) No(s). 202 of 1995**	18.12.2024	Supreme Court	*Orans* (sacred groves) in Rajasthan were recognised as forests under the *Forest Conservation Act, 1980*. Subsequently, the court also required the provisions of *Forest Rights Act, 2006,* and the *Wildlife Protection Act, 1972* to be applied to Orans. Several RE projects have used *Oran* lands as several *Orans* are classified as wastelands in revenue records. Following the judgment, the diversion of *Orans* for infrastructure projects, including RE, would require additional compliances under the above-mentioned laws.
Vanashakti Versus **Union of India** **Writ Petition (C) No. 1394 of 2023**	16.05.2025	Supreme Court	Under the EIA notification, 2006, a project is required to receive an environmental clearance (EC) before it begins. A notification by MoEFCC in 2017 and an Office Memorandum in 2021 allowed projects that had not received an EC to get one after the project had already started, thereby creating a process through which EIA violations could be regularized. In Vanashakti, the Supreme Court struck down this post-facto process and reiterated that EIA and EC must occur prior to the start of a project. While EIA and EC are not required by onshore wind and solar projects, they are needed for offshore wind projects. Therefore, this verdict has direct bearing on such projects.

Annexure 2 – Environmental, social and climate risks screening for low-impact siting

This site assessment tool provides essential parameters for evaluating land suitability for RE deployment. Crucially, the tool is a screening resource only and needs to be supplemented with comprehensive on-ground visits to verify local ecology and assess land dependencies. This tool is used by assimilating pre-screening parameters used by various RE developers in India.

Table A5. Environmental and social pre-screening tool for developers.

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
Does the site fall under the Wildlife Protection Act, 1972 (sanctuaries, national parks, conservation reserves, community reserves)	Protected Areas Network, National Data Repository https://ndrdgh.gov.in/NDR/pdf/Protected%20Area%20Network.pdf.	1 - The site is not a protected area and is not within 10 km of one 2 - The site is not a protected area but falls within 10 km of one 3 - The site is a protected area	Exclude if 3, mitigate if 2	
Does the site fall under the wetland areas protected under the Wetland Conservation and Management Rules, 2017 ?	Ramsar site, Secretariat of the Convention on Wetlands https://rsis.ramsar.org/?language=en&f%5B0%5D=regionCountry_en_ss%3AIndia.	1 - The site does not have any wetlands 2 - The site does not have a notified wetland, but has one or morewetlands that fulfil any of the nine Ramsar criteria for identifying important wetlands 3 - The site has a wetland notified under Wetland Conservation and Management Rules, 2017	Exclude if 3, mitigate if 2	
Does the site fall within high tide line (HTL) as per CRZ notification (land up to 500 m)	Google earth pro	1 - The site does not fall in a coastal area 2 - The site falls beyond 500 m of the shoreline 3 - The site falls within 500 m of shoreline	Avoid if 3	

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
Does the site fall under forest areas? Is the site forest land or connected/ attached to the forest department?	SiteRight	1 - The site does not consist of any forest land 2 - The site does not consist of any forest land but is adjacent/ connected to forest lands 3 - The site partially of completely consists of forest lands	Avoid if 3, mitigate if 2	
Does the site fall under eco-sensitive zones?	Envis Portal - Wildlife Institute of India https://wiienvis.nic.in/Database/Protected_Area_854.aspx Protected areas- Bhuvan portal https://bhuvan-app1.nrsc.gov.in/moef/ Key Biodiversity Areas - BirdLife International portal https://maps.birdlife.org/portal/apps/webappviewer/index.html?id=0f6c1e64fb1f4a35bc7d9d41cbaad510	1 - The site does not fall in an eco-sensitive zone 2 - The site is within 5 km of an eco-sensitive zone 3 - The site falls completely or partially within an eco-sensitive zone	Avoid if 3, mitigate if 2	
Does the site include any wildlife corridors (apart from tiger and elephant corridors under protected areas)?	Envis Portal - Wildlife Institute of India https://wiienvis.nic.in/Database/Protected_Area_854.aspx Protected areas- Bhuvan portal https://bhuvan-app1.nrsc.gov.in/moef/	1 - The site does not fall within a wildlife corridor 2 - The site falls within 10 km of a wildlife corridor 3 - The site falls partially or completely within a wildlife corridor	Avoid if 3, mitigate if 2	

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
Does the site pose risks to the bird population or fall along any migratory bird route?	Avistep tool & Consultations with ecologists	1 - The site falls in low avian sensitivity according to Avistep 2 - The site falls in moderate avian sensitivity according to Avistep 3 - The site falls in high or very high avian sensitivity according to Avistep	Avoid if 3, mitigate if 2	
Does the site have any roosting sites, and plant species that provide habitats or nesting sites for birds?	Consultations with ecologists	1 - The site does not have any roosting sites 2 - The site has roosting sites but not of vulnerable or endangered species 3 - The site has roosting sites of vulnerable or endangered species	Avoid if 3, mitigate if 2	
Does the land fall under open natural ecosystems (ONEs)	Open natural ecosystems -ATREE https://mdm.users.earthengine.app/view/open-natural-ecosystems	1 - The site does not consist of ONEs 2 - The site consists of ONEs	If 2, mitigate the ecological and social impact of the project on ONE-dependent communities	

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
Check proximity to and overlap with: **Population centres and buffer zone areas** **Airports and 2 km buffer zones** **State and national highways and 50 m buffer zone** **Railways and 100 m buffer zone** **Agricultural lands: kharif, rabi, zaid, double/triple crop, current fallow, or plantation** **Water bodies and buffer zones** **And other parameters**	SiteRight tool			
Does the site fall within 10 km in line of sight of the radar antennae of all static air defence radars and up to 8 km from VOR and Airport Surveillance Radarfall?			Exclude if yes or check to see eligibility for NOC. Source: (Indian Air Force, 2021)	
Check overlap with important bird areas and flyway. Is the site home to any endemic fauna/floral population?	SiteRight tool	1 - The site does not have any vulnerable, endangered or endemic species 2 - The site contains vulnerable, endangered or endemic species for less than 3 months of a year 3 - The site contains vulnerable, endangered or endemic species for more than 3 months a year	Avoid if 3, mitigate if 2	

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
Does the site fall in a drought-prone area or experience water scarcity?	Think Hazard	1 - The site does not fall under a drought-prone or water-scarce area 2 - The site falls under an area that experiences moderate water scarcity 3 - The site falls in an area with high water scarcity and frequent previous droughts	Avoid if 3, mitigate if 2	
Is the site in a climate-risk area? This means probability of earthquakes, flooding, cyclones and heat risks.	Think Hazard https://thinkhazard.org/en/.	1 - The site does not have a high risk of either earthquakes, flooding, cyclones, or extreme heat, according to Think Hazard 2 - The site has a high risk of any one of the climate hazards, according to Think Hazard 3 - The site has a high risk of more than one climate hazard, according to Think Hazard	Avoid if 3, mitigate if 2	
Has has the intensity of the shadow flicker been assessed?				
Is the site of cultural or religious significance?	Conduct key informant interviews	1 - The site is of no cultural or religious significance 2 - The site is of no cultural or religious significance but is adjacent to such sites 3 - The site is of cultural or religious significance	Exclude if 3, ensure there is no infringement on the adjacent site if 2	
Are there any upcoming public projects such as highways, airports, and railways? What is the proximity?	Conduct a key informant interview		Check proximity to make a final decision.	

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
Is there any encroachment or squatting on the site?	Site visit and conduct a key informant interview	1 - No encroachment 2 - There is encroachment	If 2, create resettlement action plan (RAP), and a livelihood restoration plan (LRP) as per IFC PS 5	
Will land procurement involve the displacement of people and resettlement?	Site visit and conduct informant interview	1 - No 2 - Yes	If yes, institute a resettlement action plan (RAP) and a livelihood restoration plan (LRP) as per IFC PS 5	
Is enough land available for resettlement	Site visit and informant interview		If no, exclude site.	
Will the project result in involuntary resettlement and does it involve non-title holders or informal users?	Site visit and informant interview			
Percentage of dependents at the land site who will lose their only source of livelihood?	Site visit and informant interview	1 - Less than 10% 2 - 10-30% 3 - More than 30%	If 3, exclude land site.	
Does the site fall under the red corridor area?	South Asia Terrorism Portal (SATP)- Institute for Conflict Management https://satp.org/conflict-maps/india.	1 - No 2 - Yes	If yes, exclude site.	
Is security an issue in the project area? Is there any threat from local outfits/ terror groups?	Conduct informant interviews	1 - No 2 - Yes	If yes, exclude land site.	
What is the source of water for the site?		1 - Surface water 2 - Ground water	Create mitigation plans if the source is contested	

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
If groundwater is to be used, what is the level of extraction?	Central Ground Water Board https://ingres.iith.ac.in/gecdataonline/gis/INDIA.	1 - Safe 2 - Semi-critical 3 - Critical or overexploited	Avoid if 3, mitigate if 2	
Are there any legacy issues or concerns related to use of water?	Conduct informant interviews	1 - No 2 - Yes	Create mitigation plans if the source is contested.	
Is there any overhead transmission line crossing the site?	Site visit	1 - No 2 - Yes		
Are there any roads or pathways (including cart roads or revenue roads) running through the plot that villagers use for transportation?	Site visit and KII	1 - No 2 - No, but the plot is adjacent to roads or pathways being used 3 – Yes	Avoid if 3, ensure there is no infringement on the roads if 2	
Are any trees or shrubs available on the land?	Google Earth	1 - No 2- Yes	If yes, minimise tree loss and attempt replanting	
Is the land categorised as tribal land/falling under Scheduled Area of the state? or Scheduled Tribe Area, or does it impact the indigenous peoples' territories or activities?	SiteRight tool and key informant interviews	1 - No 2- Yes		

Parameters	Suporting tools	Risk rating description	Comment	Remarks by E&S screening team
Are there any tribal populations occupying/deriving economic benefit from the site (cropping, firewood, grazing etc.)? If Yes, approximately how many households?	Conduct informant interviews	1 - No 2- Yes		
Can there be disproportionate impacts on the poor, women and children, indigenous peoples, or other vulnerable groups?	Conduct informant interviews	1 – No 2- Yes		
Does the project pose any public safety risks?	Site visit	1 - No 2- Yes		
Is the potential for social conflict greater than 80 per cent?	SiteRight tool	1 - No 2- Yes		
Are there any potential reputational risks associated with the project location or its interaction with local communities?	Assessment to be done by E&S screening team	1 - No 2- Yes		

Source: Authors' analysis and compilation from various environment and social pre-screening tools received from developers.

Annexure 3 – Key informant interview template for social assessment

Table A6. Social assessment required before siting and after siting

When to conduct?	Who to speak with?	What to ask?
Pre-siting	At least one KII with a representative from each group: village elders panchayat officials women landless labourers land owners Pastoralists/ livestock owners	Who uses this land and how do they use it? (write the name of the group, estimated number of people and what they do, please also environmental or biodiversity aspects, example: I. Villagers (around 100) use it for fairs. ii. Around 30 people use it for grazing animals. iii. Land owner uses (around 50) use for sustenance farming iv. Land owners (around 5) employ over 50 labourers for farming v. Keystone species in the areas, such as Bees acting as crucial pollinators. Ask across social, economic/livelihood, food-related dependencies Attempt representativeness across Scheduled Caste, Other Backward Classes and Scheduled Tribe communities
		Is there anyone who is not supposed to use the land but uses it anyway; how do they use it? (e.g. other communities, companies, etc.)
		Who grants access to or use of this land?
		Are there any historical land or legacy issues in the project area (such as family disputes, government acquisition problems, or other legal conflicts)?
		Does this land have religious, cultural or archaeological significance? Are there any contested land tenure issues over ownership, use, and access between various communities, or between a community and the revenue department? Have there been any major land-related legal cases or mass mobilisation against infrastructure projects in the gram panchayat and/or neighbouring GPs in the past? If yes, what was the cause of mobilisation and how was it resolved?

When to conduct?	Who to speak with?	What to ask?
Post-siting	At least one interview with the gram panchayat (development officer) of all panchayats impacted	Total population
		Population by income share (Ex. 30 per cent population earn 25,000 and less)
		Population characteristic Age break-up Education: How many people have a diploma technical degree graduate degree
		Source of livelihood in the village, especially for women and marginalised communities
		Key political leaders in the village and local areas and influence of the leaders
		Understanding social dynamics Vulnerable groups Dominance of a certain group Manifestation of dominance in panchayat, or geographical areas, use of certain resources, etc.
		Are there any developmental activities being undertaken by NGOs or other companies? Are there any other large infrastructure projects in neighbouring GPs? If yes, have they affected life in this GP?

Source: Authors' analysis

Annexure 4 – Consideration for valuers

Table A7. Key considerations for valuers in technical valuation methods

Evaluation question	What needs to be done	
Is the method transparent, just and inclusive for the de jure and de facto rights; is the information clear to, and does it empower, the community to know the rates decided after valuation?	Conduct community consultations to enhance capacity, particularly focusing on how the land rates are determined and parameters considered in the calculation. Ensure availability and transparency of the tool, discuss the price and to clarify any misconceptions about rates among the community. Allow the community to list, decide and negotiate the non-monetary values on land.	Examine the land, the land rights and any circumstances that may affect the value of the land. The Valuers should assume the existence of people, who both possess and exercise on the land. The valuer should determine whether the land is held individually or communally. The valuer should consider and include or exclude a range of other issues, such as non-market value (e.g., sociocultural value and/or natural value).
Is the valuation method/approach based on the principle of justice, fairness and equality, and does it protect tenure rights/ marginalisation?	Establishing clear and fair rules for valuation through legal definitions, legislation, and effective law enforcement is important.	The valuer should note and analyse any tenure uncertainty and estimate its effect on the value. To account for possible delays arising from such uncertainties, a contingency fund depending on such cases can be incorporated into the overall project costs. Adjustments to the value may be made in relation to the additional costs that prudent willing buyers will be ready to incur.

Source: Authors' analysis

Annexure 5 – Examples of activities that can be undertaken by leader and pioneer level developers

Table A8. Examples of activities that can be undertaken by leader and pioneer level developers.

Stakeholder	Monetary	Other benefits	
	Direct	Direct	Indirect
Communities	Providing funds for pre-selected parameters in specific community projects like roads, health clinics, water supply. (for eg, completion of road excavation, roof of health clinic, etc.)	Local hiring during construction and operation phases of the project. Support training and skill development of community youth, women aligned with improving and promoting local value chains. Training for future contracting of maintenance activities like solar panel cleaning.	
Landowners	Land lease rentals or land acquisition compensation. One-time compensation for major investment in land development (eg; fish farming, poultry farming, etc. in the last 5 years)	Local hiring during construction and operation phases of the project. Support training and skill development of community youth, women aligned with improving and promoting local value chains. Training for future contracting of maintenance activities like solar panel cleaning. Creating boundary walls or providing irrigation on adjacent fields as part of the agreement.	

Stakeholder	Monetary	Other benefits	
	Direct	Direct	Indirect
Tenant farmers	Crop compensation on leased land at full market rate for the remaining lease duration.	Local hiring during construction and operation phases of the project. Support training and skill development of community youth, women aligned with improving and promoting local value chains. Training for future contracting of maintenance activities like solar panel cleaning.	
SC/ ST land grant holders	A solatium amounting to 100 per cent of the calculated land value if land has to be compulsorily acquired rather than leased.	Design solar installations with elevated panels to allow fodder cultivation, vegetable farming, or sheep grazing underneath for SC/ST households. Work with forest and revenue officials for securing individual forest rights (IFR) claims of the ST landholders.	Work with forest and revenue officials to secure community forest resource rights for a tribal village, ensuring they have legal access to forest areas for gathering and selling produce.

Source: Authors' analysis

Annexure 6 – Role of an environment and social officer

Table A9. Indicative roles of the environment and social (E&S) officer

Phase 1	Phase 2	Phase 3	Phase 4
Ensure that social and environmental parameters are met during low impact siting Oversee social and livelihood impact assessment study, including identification of stakeholder groups and preparation of stakeholder maps Ensure adequate contract setting and selection of contractors based on parameters mentioned Oversee capacity building of contractors onboarded Oversee contractor compliance, including conducting regular site visits and meetings	Oversee formulation of ESIA, ESMMP and ensure mitigation is aligned with priorities suggested Act as point of contact with the community and ensure that communication of the same is done in a transparent manner The following roles to be undertaken for grievance management Acknowledge grievances through an identification number and a timeline for redressal Convene the committee for redressal Formally communicate the outcome Ensure actions towards resolving of the grievances Track all grievances, status of grievances and time taken to close the grievance Ensure that they are trained in effective grievance management, undergoing capacity building for the same	Ensure adherence to social and environment mitigation plans Ensure adherence to grievance management processes created Oversee contractor compliance	Undertake regular communication with communication Ensure timely exit of developers from community developer plans in a manner that it sustains beyond their exit Ensure adherence to grievance management processes created Oversee contractor compliance Undertake planning for decommissioning

Source: Authors' analysis

Annexure 7 – Protecting birds and bats

Biodiversity management must be included in the environmental and social management and monitoring plan. All species need to be protected. Consultation with relevant experts (ecologists, biologists, ornithologists) is required to conduct pre-deployment site surveys for wind turbines. The key assessment criteria must include:

- Identifying the presence of and risks to **species of concern**.
- Evaluating potential impacts from **habitat fragmentation** and on **migratory routes**.
- Assessing the location of **roosting sites** and specific **plant species that provide bird habitats and nesting areas**.

Below are some examples of protecting birds and bats through responsible wind energy development.

- Use tools such as eBird to identify avifauna species in the site areas. Avoid areas that house critically endangered species as per the IUCN Red List of Endangered Species.
- Integrate community knowledge to map seasonal migratory patterns. Site selection must be comprehensive, incorporating seasonal biodiversity changes into the analysis.
- Avoid locations that intersect with major bird migration routes, wetlands, and known bat routes.
- Paint one of the rotor blades black to increase its visibility for birds.
- For ground-dwelling birds, colour the tower base. This method is species-specific but easy to implement where relevant. Paint the lower 10 metres of the tower black to reduce collisions for these species. Painting the lower part of the tower base black reduced collisions for certain ground-dwelling species by 48 per cent. (Hoge 2021). For marine birds, add an achromatic surface pattern so that the turbine is more visible by enhancing its internal pattern of contrast (Martin and Banks 2023).
- Install bird deterrence systems that can
    - Selectively stop turbines when large birds (e.g., vultures) are nearby. Turbine pauses cut vulture fatalities by 50 per cent, with minimal impact on energy production (0.07 per cent annual loss) (Hoge 2021).
    - Emit ultrasonic acoustic sounds that can deter bats. Results from a study in Texas indicate deterrents significantly reduced fatalities for Lasiurus cinereus and Tadarida brasiliensis bats by 78 per cent and 54 per cent, respectively (Weaver et al. 2020).

- Implement habitable and site management
    - As keystone species in most grasslands, birds of prey play a vital ecological role. To conserve them and reduce collision risks, effective management of carcasses in surrounding land areas is essential. Train field staff and local communities to identify and report carcasses for removal (US Fish and Wildlife Service, 2012).
    - Ensure proper stormwater management to avoid creating ponds that attract birds
    - Ensure space between each turbine. This allows for birds to fly between turbines.
    - Plant native vegetation to create a canopy screen to allow prey on the ground from raptors flying overhead.
    - Continuously monitor bird fatalities and behaviour at wind farms.
    - Minimise attraction risks to birds and bats by avoiding unnecessary lighting.
    - Reduce the impact of power lines by placing them underground where feasible.
    - Decommission turbines that are no longer operational.
- Consider changes to turbine operation and design
    - Implement **nocturnal wind curtailment**, setting turbines to spin only when higher wind speeds are achieved during peak bat activity periods.
    - Investigate alternatives such as **bladeless wind turbines** (e.g., Vortex Bladeless) and actively support and collaborate with researchers developing this technology.
    - Utilise **emerging detection technologies** like AI, cameras, and radar systems—for example, the SKARV system—to track species in real-time (Rosa and Tande 2024)
- If impacts on bird and bat populations are unavoidable or residual, consider **compensatory measures** to mitigate or offset them. These offsets may involve **off-site conservation**, protection of essential habitats, and **habitat restoration**.

References

Aitken, Mhairi, Claire Haggett, and David Rudolph. "Wind Farms Community Engagement Good Practice Review." ClimateXChange, 2014.

ADB. 2023. *Environmental and Social Framework*. ADB. https://www.adb.org/sites/default/files/institutional-document/915711/environmental-and-social-framework-w-paper.pdf.

ADB. "Managing Risks and Increasing the Co-benefits of a Wind Project." *Development Asia*, October 26, 2023. https://development.asia/case-study/managing-risks-and-increasing-co-benefitswind-project

AMEA Power. *Environmental and Social Impact Assessment (ESIA) for the 100 MW Photovoltaic (PV) Plant in Kairouan, Tunisia*. October 2022. https://www.afdb.org/sites/default/files/environmental-social-impact-assessment-pv-plant en.pdf.

BayWa r.e. *Kreuth Solar Park*. Accessed October 24, 2025. https://www.baywa-re.de/en/projects-in-germany/kreuth

Bennun, L., van Bochove, J., Ng, C., Fletcher, C., Wilson, D., Phair, N., & Carbone, G. (2021). Mitigating biodiversity impacts associated with solar and wind energy development: Guidelines for project developers. Gland, Switzerland: IUCN; Cambridge, UK: The Biodiversity Consultancy

BirdLife International. "Key Biodiversity Areas (KBA) Digital Map." BirdLife Data Zone. Accessed January 29, 2026. https://maps.birdlife.org/portal/apps/webappviewer/index.html?id=0f6c1e64fb1f4a35bc7d9d41cbaad510.

Bhushan, Chandra. "India's Renewables Disparity." *Financial Express*, October 21, 2022. https://www.financialexpress.com/opinion/indias-renewables-disparity/2722845/

Boere, G. C., and D. A. Stroud. "The Flyway Concept: What It Is and What It Isn't." In *Waterbirds around the World*, edited by G. C. Boere, C. A. Galbraith, and D. A. Stroud, 40–47. Edinburgh, UK: The Stationery Office, 2006.

Bhardwaj, Chhaya, and Saksham Misra. 2025. "Environmental Impact Assessment & Solar Energy Projects in India: Solutions Creating the Same Problems." *NLSIR Online* (blog), July 28, 2025. https://forum.nls.ac.in/nlsir-online-blog/environmental-impact-assessment-solar-energy-projects-in-india-solutions-creating-the-same-problems/.

Black & Veatch. (2025). Four ways to increase sustainability on your solar projects. https://www.bv.com/perspectives/four-ways-to-increase-sustainability-on-your -solar-projects

Campaign for the Protection of Rural Wales. "Peatlands Under Threat Despite Welsh Government Promises." June 13, 2025.

Central Empowered Committee. "Clarification on NPV for the Minimum Rate in Case of Wind Energy as per the Honourable Supreme Court's order dated 24.04.08." PARIVESH Portal, December 22, 2008. https://forestsclearance.nic.in/writereaddata/public_display/schemes/1533995017$Scan_ 0140512_162746.pdf

Central Pollution Control Board. "Clarification in the matter of revised categorization of the industrial sector namely Solar Power generation through solor photovoltaic cell, wind power and mini hydel power (less than 25 MW)." Central Pollution Control Board, November 29, 2017. https://dste.py.gov.in/viewpdf?url=0&nid=1683

Central Ground Water Board (CGWB). "Ground Water Resource Assessment (GEC Data Online) - 2021-2022." Ministry of Jal Shakti. Accessed January 29, 2026. https://ingres.iith.ac.in/gecdataonline/gis/INDIA.

Chowdhury, Parineet Kaur, Nicole Almeida, and Akanksha Tyagi. 2025. *How can India Enable a People-centric Clean Energy Transition? Framework for Responsible RE Deployment*. Council on Energy, Environment and Water (CEEW). https://www.ceew.in/sites/default/files/ceew-how-can-india-enable-a-people-centric-clean-energy-transitionfor-web-file.pdf.

Chin, Neil, Guillermo Martinez, and Shreya Bansal. "Community Equity Opportunity Fund: Vehicle Analysis." Climate Policy Initiative, November 20, 2025.

Climate Action Network (CAN) Europe. "Community Engagement and Benefit Sharing of Renewable Energy Projects – Presenting Policies and Practices across Europe and Guidelines for Developers." April 2025. https://caneurope.org/content/uploads/2025/04/CANE-April 2025_Community-Engagement-and-Benefit-Sharing.pdf

Copping, J. P. 2025. "Solar Farm Management Influences Breeding Bird Populations in Arable Dominated Landscapes." *Journal of Applied Ecology*. https://doi.org/10.1080/00063657.2025.2450392.

Darpan. "Nature-Based Flood Mitigation: The Eco-Friendly Way to Reduce Flood Risks." Pinnacle IIT, February 4, 2025. https://pinnacleiit.com/blogs/nature-based-flood-mitigation-the-eco friendly-way-to-reduce-flood-risks/.

Dickson, Daniel. "Restoring Peatland: From Carbon Leak to Biodiverse Carbon Sink." *Vattenfall*, June 24, 2024

Directorate General of Hydrocarbons. "Protected Area Network." Accessed January 29, 2026. https://ndrdgh.gov.in/NDR/pdf/Protected%20Area%20Network.pdf.

Enel Green Power. "A Sustainable Solar Plant in the Brasilian Sertão." *Enel Green Power Stories*, June 17, 2021. https://www.enelgreenpower.com/stories/articles/2021/06/sustainable-solar plant-sertao-brazil

Enel Green Power. "Los Naranjos and Las Corchas Solar Plants, Spain." Accessed December 31, 2025. https://www.enelgreenpower.com/our-projects/operating/los-naranjos-and-las-corchas-solar plants

Eurelectric. "BayWa r.e. 17ha (14.6 MW) Ground-Mounted Solar Park of Fontenet 2." *Eurelectric Power Plant*. Accessed October 24, 2025. https://powerplant.eurelectric.org/baywa-r-e-17ha-146-mwground-mounted-solar-park-of-fontenet-2/

Eurelectric. *Power Point 2.0: A Guidebook to Electrify in Harmony with Nature*. June 12, 2024. https://powerplant.eurelectric.org/wpcontent/uploads/2024/06/Eurelectric-Biodiversity Integration-Guidebook-12-06-24_FINAL.pdf

Farias, Henrique M., S. Cavalieri, D. S. Ruas, K. S. Tavares, and Heitor De Oliveira Braga. "Influence of the Solar Power Plant on the Diversity of Mammals: A Case Study in Northeastern Brazil." *Modern Environmental Science and Engineering* 6, no. 10 (October 2020): 1041–50. https://doi.org/10.15341/mese(2333-2581)/10.06.2020/003.

Foley, Ev. "Clean Energy Developer Boosts Circular Economy with Solar Panel Recycling Deal." *pv magazine Australia*, July 31, 2024. https://www.pv-magazine australia.com/2024/07/31/clean-energy-developer-boosts-circular-economy-with-solar panel-recycling-deal/.

Forum for the Future, TERI and WRI India. 2021. "RE to Responsible Energy: A Call to Action." https://www.forumforthefuture.org/Handlers/Download.ashx?IDMF=e6c30516-cda3-48a0-ac8a-7141f43deeb7.

Global Infrastructure Hub. 2019. "Hornsdale Power Reserve Project: Tesla's Largest Utility-Scale Battery." Sydney: Global Infrastructure Hub. https://cdn.gihub.org/umbraco/media/2765/gih_showcaseprojects_hornsdale_2019_ eb_art.pdf

Global Facility for Disaster Reduction and Recovery (GFDRR). "ThinkHazard!" World Bank Group. Accessed January 29, 2026. https://thinkhazard.org/en/.

Government of India. 2022. *India's Updated First Nationally Determined Contribution Under Paris Agreement (2021-2030)*. UNFCCC. Accessed 06 24, 2025. https://unfccc.int/sites/default/files/NDC/2022-08/Indiaper cent20Updatedper cent20Firstper cent20Nationallyper cent20Determinedper cent20Contrib.pdf.

Hoge, Alexander. "Measures for Mitigating Avian Collision Rates with Wind Turbines – Determining an Effective Technique Regarding Effort and Effect." *EGU Journal of RE Short Reviews*, 2021. https://www.hb.fhmuenster.de/opus4/frontdoor/deliver/index/docId/13682/file/08_Hoge_EGUJRenEnRev_2021.pdf.

Hornsdale Wind Farm. "Nukunu and Ngadjuri Painting." March 2, 2017. https://hornsdalewindfarm.com.au/2017/03/02/nukunu-and-ngadjuri-painting/.

IEA. 2023. *Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach*. Paris: IEA. https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to-keep-the-15-0c-goal-in-reach

IRENA Coalition for Action. 2025. *Nature-positive Energy Principles: Environmental Siting and Permitting of Solar, Wind and Grid Infrastructure*. IRENA. Abu Dhabi: International RE Agency, 2025, Pg. no. 24.

Indian Air Force. "Guidelines for NOC Updated." Resources. Accessed January 29, 2026. https://indianairforce.nic.in/Resources/pdf/utilities/guidelines-for-NOC-UPDATED.pdf.

Jaitly, Akshay. "RE." In *Regulation in India: Design, Capacity and Performance*, edited by Devesh Kapur and Madhav Khosla, 183–202. Oxford: Bloomsbury Publishing, 2019.

Kalies, Liz, Hartung, T. 2019. Principles of Low Impact Solar Siting and Design. The Nature Conservancy in North Carolina. https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedSt tes/edc /Documents/ED_TNCNCPrinciplesofSolarSitingandDesignJan2019.pdf

Kohli, Kanchi, and Manju Menon. *Development of Environmental Laws in India*. New Delhi: Cambridge University Press, 2021.

Lake Turkana Wind Power Ltd. *LTWP 2024 Sustainability Report*. Accessed October 24, 2025. https://ltwp.co.ke/main/wp-content/uploads/2024/07/LTWP-Sustainability-Report.pdf.

Land Conflict Watch. 2025. "Renewable Energy Conflicts Database." Land Conflict Watch. https://www.landconflictwatch.org/renewable-energy-projects.

Priyansha Chouhan, Mrinali, Kumar Sambhav and Fernando Barrio. 2024. *Land beneath the panels: Examining renewable energy land-use conflicts to foster a just energy transition*. Land Conflict Watch & Queen Mary University of London. Land Conflict Watch (Nut Graph LLP): New Delhi.

Lawrence, Alexandra, Samuel Hoffmann, and Carl Beierkuhnlein. "Topographic Diversity as an Indicator for Resilience of Terrestrial Protected Areas against Climate Change." *Global Ecology and Conservation* 25 (2021): e01445. https://doi.org/10.1016/j.gecco.2020.e01445.

Madhusudan, M. D., Abi Vanak, and Abhijeet Kulkarni. "Mapping India's Open Natural Ecosystems (ONE)." Google Earth Engine Apps. ATREE. Accessed January 29, 2026. https://mdm.users.earthengine.app/view/open-natural-ecosystems.

Mahindra Susten. 2025. Water conservation measures for renewable power plants. https://www.mahindrasusten.com/water-conservation-measures-for-renewable-power plant#:~:text=Inper cent20ourper cent20questper cent20forper cent20water,andper cent20innovativeper cent20moduleper cent20cleanngpercent20brushes

Martin, G. R., and A. N. Banks. 2023. "Marine Birds: Vision-Based Wind Turbine Collision Mitigation." *Global Ecology and Conservation* 42: e02386. https://doi.org/10.1016/j.gecco.2023.e02386

May, R., Torgeir Nygård, Ulla Falkdalen, Jens Åström, Øyvind Hamre, and Bård G. Stokke. 2020. "Paint It Black: Efficacy of Increased Wind Turbine Rotor Blade Visibility to Reduce Avian Fatalities." *Ecology & Evolution* 10 (16): 8927-8935. https://doi.org/10.1002/ece3.6592

Mccall, A. 2024. Assessment and mitigation of environmental impacts in large-scale infrastructure development.

Misrahi, Prerana Pakhrin, Christelle Marais, and Irene Varoli. 2024. *Clean Energy as a Catalyst for a Nature-Positive Transition*. WEF. https://www3.weforum.org/docs/WEF_Clean_Energy_2024.pdf.

MNRE. 2014. *Development of Solar Parks and Ultra Mega Solar Power Projects*. New Delhi: MNRE. https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2022/12/2022122199-1.pdf.

MoEFCC. 2004. "Guidelines for Diversion of Forest Land for Wind Power Projects." PARIVESH Portal, https://forestsclearance.nic.in/writereaddata/public_display/schemes/2146926545$guildelneper cent202.pdf.

MoEFCC. "Office Memorandum on the Applicability of Environmental Impact Assessment on Solar Photo Voltaic Power Projects." Ministry of Environment, Forests and Climate Change, Impact Assessment Division, July 7, 2017.https://environmentclearance.nic.in/writereaddata/OMs-2004 2021/182_OM_07_07_2017.pdf.

Murayama, Rikako, and Aaron Sheldrick. 2021. "This Japanese Start-up Has Designed a Wind Turbine That Can Work in Typhoons." World Economic Forum. November 25, 2021. https://www.weforum.org/stories/2021/11/japan-start-up-wind-turbine-typhoons-energy/.

Norfund. *Lake Turkana Wind Power*. Accessed October 24, 2025. https://www.norfund.no/lake-turkana/.

NRSC/ISRO. "Bhuvan-MoEF: Geoportal for the Ministry of Environment, Forest and Climate Change." Bhuvan Geoportal. Accessed January 29, 2026. https://bhuvan-app1.nrsc.gov.in/moef/.

Vattenfall. 2016. Pen Y Cymoedd Community Fund Prospectus. *Pen y Cymoedd Community Fund Prospectus*. October 2016. https://penycymoeddcic.cymru/wp-content/uploads/2016/07/Pen-y-Cymoedd-Prospectus-A4.pdf

Phillips-Davies, Alistair. "Offshore Wind Can Power a UK Industrial Renaissance – but We Are at a Crossroads." *SSE*, September 11, 2023. https://www.sse.com/news-and views/2023/09/offshore-wind-can-power-a-uk-industrial-renaissance-but-we-are-at-a crossroads/.

Prabhu, Raj. "Wind Becomes Competitive with Solar as Tariff Drops to a Record Low." Mercom India, October 5, 2017. https://www.mercomindia.com/wind-becomes-competitive-solar-tariff drops-record-low-per centE2per cent82per centB92-64-kwh.

Procore Technologies. "Optimizing Operations for Complex Construction Projects: Skanska USA Civil." Accessed October 24, 2025. https://www.procore.com/casestudies/skanska-civil.

Rao, Harsha., and Disha Agarwal. "How India's Solar and Wind Policies Enabled its Energy Transition: A Decade in Review." Council on Energy, Environment and Water, 2021. https://www.ceew.in/publications/how-indias-solar-and-wind-policies-enabled-its-energy

Ramsar Sites Information Service. "Annotated List of Ramsar Sites: India." Secretariat of the Convention on Wetlands. Accessed January 29, 2026. https://rsis.ramsar.org/?language=en&f%5B0%5D=regionCountry_en_ss%3AIndia.

Rosa, L., & Tande, J. (2024). How can control engineering save birds in wind farms? SINTEF Blog. https://blog.sintef.com/energy/how-can-control-engineering-save-birds-in-wind-farms/

Responsible Energy Initiative. "RE to Responsible Energy: A Call to Action." March 25, 2021. https://wriindia.org/sites/default/files/renewableenergytoresponsibleenergy_fullreport-lr.pdf

Rewa Ultra Mega Solar Limited. "Addendum to RAP and LRP for RUMSL's 1500 MW Solar Park Project and Associated Infrastructure across Neemuch, Agar and Shajapur, Madhya Pradesh." Rewa Utlra Mega Solar Limited, May 3, 2021. http://rumsl.mp.gov.in/wp content/uploads/news/2021/05/Addendum_to_RAP_vol-I_report-for_Agar-Shajapur Neemuch_Solar_parks.pdf.

Sareen, Siddharth., and Sunila S. Kale. "Solar 'power': Socio-political dynamics of infrastructural development in." *Energy Research and Social Science* 41 (July 2018): 270–78.

Schaub, Tonio, Raymond Hendrikus Gerardus Klaassen, Caroline De Zutter, and Alexandre Millon. 2025. "Wind4Birds: An Interactive Tool for Optimising the Dimensions of Wind Turbines and Their Distance to Nest Sites to Mitigate Bird Collision Risk."*ResearchGate*, https://www.researchgate.net/publication/395712457_Wind4Birds_An_interactive_tool_fr_optimising_the_dimensions_of_wind_turbines_and_their_distance_to_nest_sites_to_mitigate_bird_collision_risk.

Solar Energy Cooperation of India. 2020. Environmental and Social Management Framework. SECI. https://documents1.worldbank.org/curated/en/406541534751743414/pdf/ESMF-FINAL-DRAFT-August-17-2018docx.pdf

South Asia Terrorism Portal. "Conflict Maps: India." Institute for Conflict Management. Accessed January 29, 2026. https://satp.org/conflict-maps/india.

Smart Energy Answers. 2024. "Beating the Heat: How Aiko Solar Panels Maintain Performance in High Temperature." *Smart Energy Answers Blog*. July 15, 2024. https://www.smartenergyanswers.com.au/blog/how-aiko-solar-panels-maintain-performance-in-high-temperatures-beating-the-heat.

Sharma, Prabhakar, Ashita Srivastava, Deepalika Mehra, and Vibhuti Garg. 2025. "Challenges in India's Tender-Driven Renewable Energy Market." Institute for Energy Economics and Financial Analysis (IEEFA). https://ieefa.org/sites/default/files/2025-03/Challenges%20in%20India%E2%80%99s%20Tender-Driven%20Renewable%20Energy%20Market_March%202025.pdf.

Standing Committee on Energy 2021-22. *Evaluation of Wind Energy in India*. New Delhi: Lok Sabha Secretariat, 2022.

Tata Power Solar. 2025. "100 MW NTPC Anantapur, Andhra Pradesh." Accessed October 23, 2025. https://www.tatapowersolar.com/project/100-mw-ntpc-anantapur-andhra-pradesh/.

Tata Power Solar. 2025. "Tata Power Solar Commissions India's Largest Solar Project under DCR for NTPC." Press release. Accessed October 23, 2025. https://www.tatapowersolar.com/press-release/tata-power-solar-commissions-indias-largest-solar-project-under-dcr-for-ntpc/.

The Biodiversity Consultancy. "Mitigation Hierarchy." Accessed October 24, 2025. https://www.thebiodiversityconsultancy.com/services/site-level-advisory/mitigation hierarchy/.

The Nature Conservancy, SolarPower Europe, and Metabolic. *Rewarding and Incentivising Nature Inclusive Solar through EU Policy*. 2024. https://www.metabolic.nl/publications/rewarding and-incentivisingnature-inclusive solarthrough-eu-policy/.

The Solar Recycling Company. "The Complete Guide to Solar Farm Decommissioning." *The Solar Recycling Company*, January 7, 2025. https://solarrecycling.com/the-complete-guide-to solar-farm-decommissioning/

U.S. Fish and Wildlife Service. *Land-Based Wind Energy Guidelines*. March 23, 2012. https://www.fws.gov/sites/default/files/documents/land-based-wind-energy-guidelines.pdf.

Vaidyanathan, Sharmila. "The Lapwings of India." *Nature inFocus*, June 24 2022. https://www.natureinfocus.in/story/the-lapwings-of-india.

Weaver, Sara P., Cris D. Hein, Thomas R. Simpson, Jonah W. Evans, and Iván Castro-Arellano. 2020. "Ultrasonic Acoustic Deterrents Significantly Reduce Bat Fatalities at Wind Turbines." *Global Ecology and Conservation* 24: e01099. https://doi.org/10.1016/j.gecco.2020.e01099.

Wildlife Institute of India. "National Parks." ENVIS Centre on Wildlife & Protected Areas. Accessed January 29, 2026. https://wiienvis.nic.in/Database/Protected_Area_854.aspx.

World Bank. 2016. "World Bank Environmental and Social Framework." Washington, DC. https://documents1.worldbank.org/curated/en/383011492423734099/pdf/114278-WP-REVISED-PUBLIC-Environmental-and-Social-Framework.pdf.

World Bank. *Guidance Note for Borrowers: ESS1—Assessment and Management of Environmental and Social Risks and Impacts*. First edition, June 2018. https://documents1.worldbank.org/curated/en/142691530216729197/Guidance-Note-for Borrowers-ESS1-Assessment-and-Management-of-Environmental-and-Social-Risks-and Impacts.pdf.

Wunderbuild. "Case Studies: How Top Companies Use Construction Management Software." Last modified November 14, 2024. https://www.wunderbuild.com/blog/case-studies-how-top companies-use-construction-management-software/.

Indian Air Force. (2021). *Guidelines for issue of NOC for constructions around Indian Air Force aerodromes* [PDF]. Ministry of Defence, Government of India. https://indianairforce.nic.in/Resources/pdf/utilities/guidelines-for-NOC-UPDATED.pdf

Press Information Bureau, Government of India. (2025). *Implementation of Labour Codes*. Press Release ID: 2147926. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2147926&lang=2&reg=3

Glossary

Biodiversity net gain: This is an approach for development projects that leaves biodiversity in a better state than before, ensuring negative impacts are fully offset by positive actions and more.

Low-impact siting: Process of selecting project sites that minimises or avoids social and environmental impacts, such as avoiding biodiversity-rich areas or sites of cultural significance.

Mitigation hierarchy: A structured approach to managing environmental risks consisting of four steps: avoid, minimise, restore, and offset and lastly contribute for net gain.

Open natural ecosystems (ONEs): Areas like grasslands, savannahs, deserts, and scrublands that are ecologically vital and biodiversity-rich but may not always be designated as such.

Shadow flicker: The effect caused when rotating wind turbine blades cast moving shadows over nearby buildings or land.

De facto and de jure dependents: *De jure* refers to legal owners or tenants, while *de facto* refers to those who use the land by custom or necessity without legal title, such as grazers or landless laborers.

Free, prior, and informed consent (FPIC): A specific standard for engagement that ensures communities can give or withhold consent without coercion, before project activities begin, and with full knowledge of the project.

Environmental and Social Impact Assessment (ESIA): A formal study conducted to identify and evaluate the potential impacts of a project on the surrounding environment and community.

Sweat equity: A model where a community earns an ownership stake in a project through active participation or co-development rather than financial investment

Land aggregators: Land aggregators or land facilitators are individuals/organisations involved in the process of land aggregation, which refers to consolidating smaller parcels or pieces of a particular land into a larger connected plot.

RE developers: Companies that may bid, develop, build, and operate projects that generate electricity from renewable sources.

This Guidebook is part of REI's broader suite of playbooks aimed at driving the adoption of responsible practices across the ecosystem of procurers, developers, and investors.

Responsible RE procurement by Climate Group: Renewable energy buyers ranging from corporations and utilities to public sector entities are not merely passive consumers of clean energy but active market shapers, setting expectations for responsible conduct and catalysing positive change throughout the entire value chain. The responsible energy procurement toolkit being built by the Climate Group equips renewable energy buyers with practical guidance to embed people-and planet-centric principles into their procurement strategies. It is a proactive, strategic approach that positions buyers as leaders, innovators, and stewards of sustainable development and outlines how buyers can achieve decarbonization goals while ensuring environmental and social responsibility. It focuses on key thematic areas like Land and communities, Environment and project end of life, Worker wellbeing and health, Material sourcing and Business responsibility. In each theme, it explores responsible actions such as low-impact land siting, equitable land procurement model, protecting biodiversity, ensuring circularity among several others. Building in such responsible criteria into their procurement policy and seeking suitable compliance while choosing developers and projects to procure from, can not only help buyers ensure long-term value creation for businesses and local communities, but also drive sectoral transformation for ecosystem and stakeholders.

Playbook for investing in responsible RE by Forum for the Future: Forum for the Future, in collaboration with Dalberg, is developing a playbook to guide investors in the renewable energy ecosystem towards responsible investment practices. While the playbook focuses on the financing ecosystem more broadly, its primary audience is upstream investors, including limited partners (LPs) and sovereign wealth funds, who play a critical role in shaping investment priorities and standards. The playbook addresses key challenges faced by renewable energy (RE) financiers and investors in integrating responsible investing principles and provides practical, actionable guidance to move beyond traditional ESG frameworks. It aims to drive responsible practices across the entire RE value chain and lifecycle, ensuring environmental sustainability, social equity, and long-term value for all stakeholders.

Guidebook for responsible RE deployment by CEEW: The Guidebook for responsible RE deployment provides phase-wise implementable guidance on deploying projects in a socially inclusive and ecologically just manner. It aims to be a practitioner's Guidebook and is intended for implementation not only by sustainability teams but also by project teams, on-ground staff, and project leaders. Guidance is provided on implementing various activities across themes of land identification, community development, biodiversity conservation and so on. It also contains best practices to provide real-world examples of impact and action. Specifically crafted to the Indian context and realities, the Guidebook aims to ensure a people-centric accelerated renewable energy deployment.

Interested in collaborating with REI India?

Are you ready to raise your ambition and tackle socio-environmental risks within the renewable energy sector? Do you want to work with changemakers focused on driving responsible energy practices? Perhaps you're interested in becoming a friend of REI India? Or in providing the vital funds needed for us to carry out our work?

Whether it's working one-to-one or by joining forces with other changemakers in the sector, there are many ways we can collaborate.

Together, let's enable the renewable energy sector in India to adopt business models and value chains that are people-centric and ecologically positive.

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