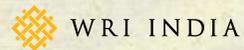
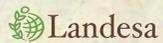


Renewable Energy to Responsible Energy: A Call to Action



Core partners



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Renewable energy to responsible energy: A call to action

An invitation to collaborate towards a just and regenerative future

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Foreword

India has set ambitious targets for renewable energy (RE) capacity and has demonstrated strong growth in the deployment of RE technologies. The sector is key to the reduction of carbon dioxide emissions and delivers a range of other benefits spanning energy security, opportunities for greater energy access, jobs and livelihood opportunities, as well as reduced or no pollution from electricity generation, among others.

Though these benefits are substantial, virtually no sector is yet universally sustainable in its impact. As the RE sector continues to grow and evolve, it will need to be increasingly mindful of the need to ensure that adverse impacts on the environment, communities and human rights do not arise from its value chain and operations. This is particularly so as the relative positive and adverse impacts across RE value chains will only amplify as deployment scales.

Now, in 2021, the sector has the opportunity to take proactive action - a step that is essential to avoid and mitigate risks to its progress. It is also critical in enabling sustainable growth for itself and for serving as a model for other growth sectors. We believe this is the moment for the RE sector in India to take steps to better understand its impacts more holistically and commit to mitigating action.

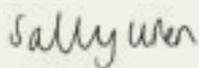
The collective challenges we face require all sectors to take urgent and ambitious action towards a just and regenerative future. Now is the time for the renewable energy sector in India to transform itself into a responsible energy sector and take the lead in initiating the action towards the transition.

Signed

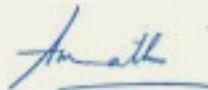
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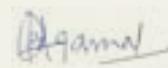
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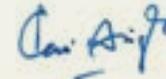
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Ravi Singh
Secretary General & CEO
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Abbreviations

ADB: Asian Development Bank
APTEL: Appellate Tribunal for Electricity (India)
BU: Business Units
CERC: Central Electricity Regulatory Commission (India)
CSR: Corporate Social Responsibility
DISCOM: Distribution Company
EIA: Environmental Impact Assessment
ESG: Environmental, social and governance
ESIA: Environmental and Social Impact Assessment
ESMS: Environmental and Social Management System
FDI: Foreign Direct Investment
GW: Gigawatt
IEA: International Energy Agency
IFC: International Finance Corporation
INR: Indian Rupee
IOCL: Indian Oil Corporation Limited
IREDA: Indian Renewable Energy Development Agency Limited
IPP: Independent power producer
MNRE: Ministry of New and Renewable Energy (India)
MoEFCC: Ministry of Environment, Forests and Climate Change (India)
MW: Megawatt

MWh: Megawatt Hour
NAPCC: National Action Plan on Climate Change (India)
NBFC: Non-Banking Finance Company
NCEEF: National Clean Energy and Environment Fund (India)
NGT: National Green Tribunal (India)
NIWE: National Institute of Wind Energy (India)
NTPC: National Thermal Power Corporation Limited (India)
OHS: Occupational Health and Safety
PSU: Public Sector Undertaking
RBI: Reserve Bank of India
R&D: Research and Development
RE: Renewable Energy
REC: Renewable Energy Certificate
RPO: Renewable Purchase Obligations
SDG: Sustainable Development Goals
SEBI: Securities and Exchange Board of India
SHP: Small Hydro Power
SIA: Social Impact Assessment
SPPD: Solar Power Park Developer
TPDDL: Tata Power Delhi Distribution Limited
TWh: Terawatt hour

Introduction

The rapid rise of renewable energy (RE) to meet growing demand and displace fossil fuel sources is a keystone element of our transition to a low carbon economy. At the same time, a renewable energy system has the potential to expand access to affordable, clean energy for all, create jobs and help economies and societies to thrive in the long term.

That energy markets are mostly moving in the right direction is highly encouraging. Clean sources like solar and wind are being installed at a rate that is twice as fast as that of fossil fuel power stations.¹⁴ The share of RE in global electricity generation increased to nearly 28% in the first quarter of 2020, from 26% in the same quarter of 2019.¹⁵ This welcomed trajectory continues to be driven by reductions in costs, an increase in RE procurement mandates, as well as a rise in scale of production in many parts of the world.

While the growth of RE is enabling the transition towards a low carbon economy, it is also placing increasing pressure on resources, albeit on a relatively lower scale than conventional systems. This includes minerals used for equipment manufacture, land used for establishing large-scale projects, water used for operation and maintenance of certain technologies, along with the challenge of sustainably managing resources at their end of life. The World Bank estimates that under a 2-degree climate scenario,

we may see over a 1000% rise in global demand for minerals used in energy storage technologies essential for RE and related technologies like electric vehicles such as aluminium, cobalt, iron, lead, lithium, manganese and nickel.¹⁶ Similarly, a 300% rise in global demand is forecast for key minerals used in solar panels - including aluminium, copper, indium, iron, lead, molybdenum, nickel, silver, and zinc.¹⁷

The effects of such pressure are already beginning to surface, both in terms of environmental health, as well as in social inequities and human rights abuses.¹⁸ It is also becoming clear that the different stages of the RE value chain are not immune from labour rights risks.¹⁹

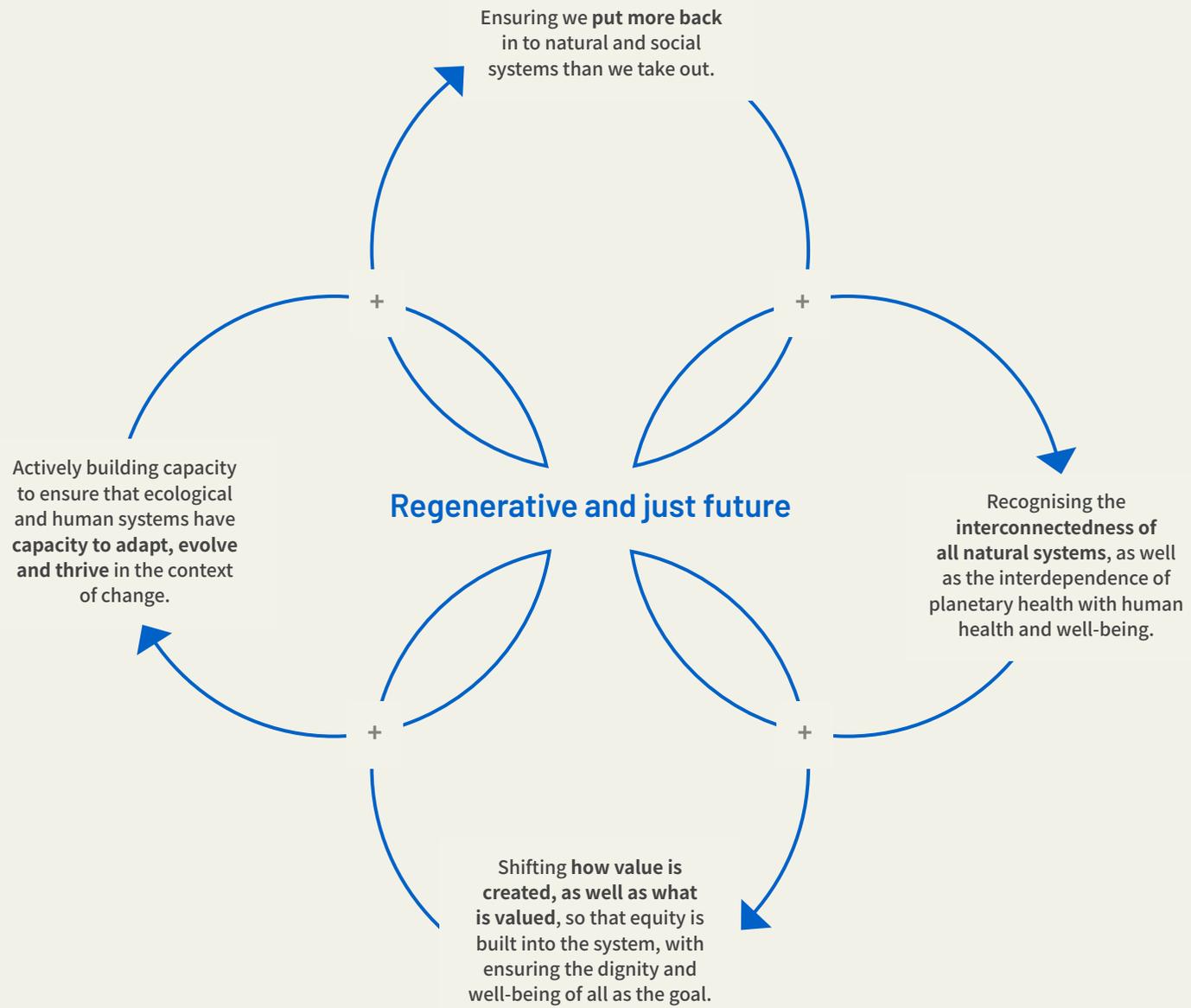
Against this backdrop, although awareness and management practices are growing, the Indian - and global - RE sector's current response is best described as nascent. As this report highlights, not enough attention is being given to environmental or social impacts related to the production of RE equipment, or to the consequential effects of their deployment, leaving. In this connection, even the most well-intentioned developers, investors and procurers open to a myriad of risks.

There is a clear case for action: RE actors have an opportunity - and a responsibility - to create an RE system in India that ensures the imperative

to reduce emissions from energy is met in a way that is regenerative and just. Avoiding adverse impacts will be critical in ensuring that the sector operates in an environmentally and socially responsible manner and thus avoids damaging investor confidence in ways that may ultimately hamper the uptake and growth of RE in India. Moving towards a benchmark of operating in ways that have just and regenerative effects is not only critical for the RE sector, but a necessary way forward for all. The RE sector has the potential to shape new approaches in this direction. In figure that follows, we lay out the principles underpinning the concept of a just and regenerative future.

While the growth of RE is enabling the transition towards a low carbon economy, it is also placing increasing pressure on resources, albeit on a relatively lower scale than conventional systems.

What is a 'regenerative and just' future?



Why is a just and regenerative RE sector important for India?

India is rapidly establishing itself as a powerhouse in the deployment of RE technologies. This is particularly so in the case of solar energy, but increasingly also with regards to wind and small hydro power. With hydrogen and increasing storage capacity firmly on the policy radar, India continues to widen and deepen its interests in RE.

The Government of India set an ambitious target in 2015 of installing 175 GW of renewable energy capacity by 2022. In 2019, Prime Minister Modi announced the intention of increasing this to 450 GW.²⁰ As one of the boldest commitments in the world, this speaks to the significant role India plays in shaping the global low carbon future. It also firmly establishes the country as a powerful influencer of behaviour and practice in the RE value chain through their position as a buyer and deployer of the technology.

As India couples these positions with an increasing focus on domestic manufacturing of RE technologies and the discovery of new lithium reserves in Karnataka,²¹ it will be able to directly control the impacts

of the industry at all critical stages of the value chain - raw material extraction, manufacturing, development, generation and disposal. This control optimally positions India for pioneering action and global leadership. Such action will directly support India's 'just transition' - ensuring that it does not focus solely on those who need to transition from jobs and processes involving fossil fuels, but that it also considers those impacted by the *process of transition* and what we transition to. Learning from the effects of previous 'energy revolutions', and moving into RE in an environmentally safe and socially just way, will enable progress against multiple Sustainable Development Goals (SDGs). Further, it will enable the meeting of the Paris Climate Agreement goals without risking unintended environmental and social consequences.

By pioneering efforts to establish the Indian RE sector as one that embeds just and regenerative practices into its value chains, India has an opportunity to set global norms that contribute towards achieving an ecologically safe and socially just future for humanity.

About this report and the Renewable Energy to Responsible Energy Initiative

In 2020, World Resources Institute India (WRI India), The Energy and Resources Institute (TERI), Landesa, World Wildlife Fund for Nature India (WWF India) and Forum for the Future collaboratively launched the *Renewable Energy to Responsible Energy Initiative*. This timely effort seeks to engage key actors in the RE system to identify, set and action norms that will shift the sector away from behaviours that risk generating adverse impacts, towards those that produce more just and regenerative outcomes.

As the RE sector mainstreams and diversified financing models support its accelerated growth, this is a critical moment in its development to instill practices that enable the sector to have transformative impacts. This report is the outcome of the first stage of the *Renewable Energy to Responsible Energy Initiative*, marking an important step towards achieving this end. It will be followed by a collaborative effort between actors across the value chain to collectively address the challenges and opportunities outlined in this report, and to move forward with tangible actions.

Our findings provide a broad understanding of the environmental and social impacts being generated by the Indian RE sector and the extent to which these impacts are currently being governed, managed and mitigated. It recognises that many of the challenges faced by the RE sector are systemic, affecting multiple sectors and requiring international alliances.

This report aims to catalyse a deeper cross-sector inquiry. Rather than produce immediate solutions to the challenge in lays out, it is designed to invite key actors in India's RE system to collectively inquire into the barriers and opportunities for change. Most importantly, it is a call to ambitious RE developers, investors, financiers, procurers, policy-makers and civil society to collaboratively set a new direction for creating a just and regenerative RE system in India. The *Renewable Energy to Responsible Energy Initiative* provides the opportunity to take this important step.

This is a call to ambitious RE actors to collaboratively set a new direction for creating a just and regenerative RE system in India. The Renewable Energy to Responsible Energy Initiative provides the opportunity to take this important step.

The technologies we focus upon

The report focuses on four categories of renewable energy technologies, based on their current installed capacity across India and related market predictions:

- **Primary technologies** - rapidly expanding and being mainstreamed with an established ecosystem: on-shore wind, large-scale solar.
- **Upcoming technologies** - developed and will likely scale in India in the next 5-10 years: Small Hydro Power (SHP) and off-shore wind.
- **New technologies** - possible future sources or carriers that are still at the conceptual and trial stages: Hydrogen.
- **Storage technologies** - required to address intermittency of some RE: Lithium-ion batteries.

We have excluded technologies that we consider to be incompatible with the just and regenerative principles, such as large hydro power (above 25 MW) and most biofuels. Innovation will mean that new RE technologies will develop over time. They too must apply the principles, norms and approaches put forward in this report.

This report has been compiled through a collaboration between WRI India, TERI, Forum for the Future, WWF-India and Landesa. The findings presented are the result of a literature review, semi-structured interviews with stakeholders from industry, the financial sector, civil society and government, and on-site visits. It has also benefitted from the insights of an expert panel of reviewers.

SECTION 1

The RE landscape in India



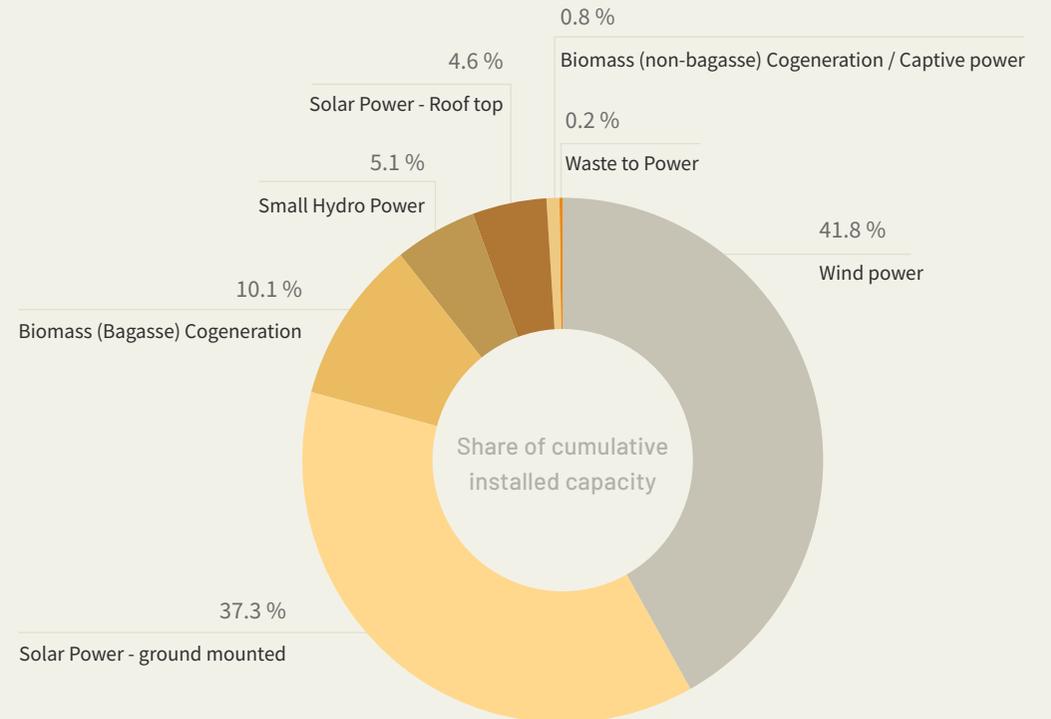
1. The Renewable Energy landscape in India

The Government of India's 450 GW target²² sets the scene for what has become the fourth most attractive market for RE in the world.²³ With over 90 GW of installed capacity at the end of 2020,²⁴ RE accounts for approximately 24% of India's total installed capacity²⁵, and is thus on a welcomed trajectory of rapid growth.

As evidence of the Government's intention to further promote this trajectory, the Ministry of New and Renewable Energy (MNRE) was allocated an annual budget increase of 10.62% or INR 57.53 billion (approximately \$806.65 million) in 2020,²⁶ and the Prime Minister announced at the World Sustainable Development Summit in February 2021 that, by 2030, 40% of all energy in India will be generated from green sources.²⁷



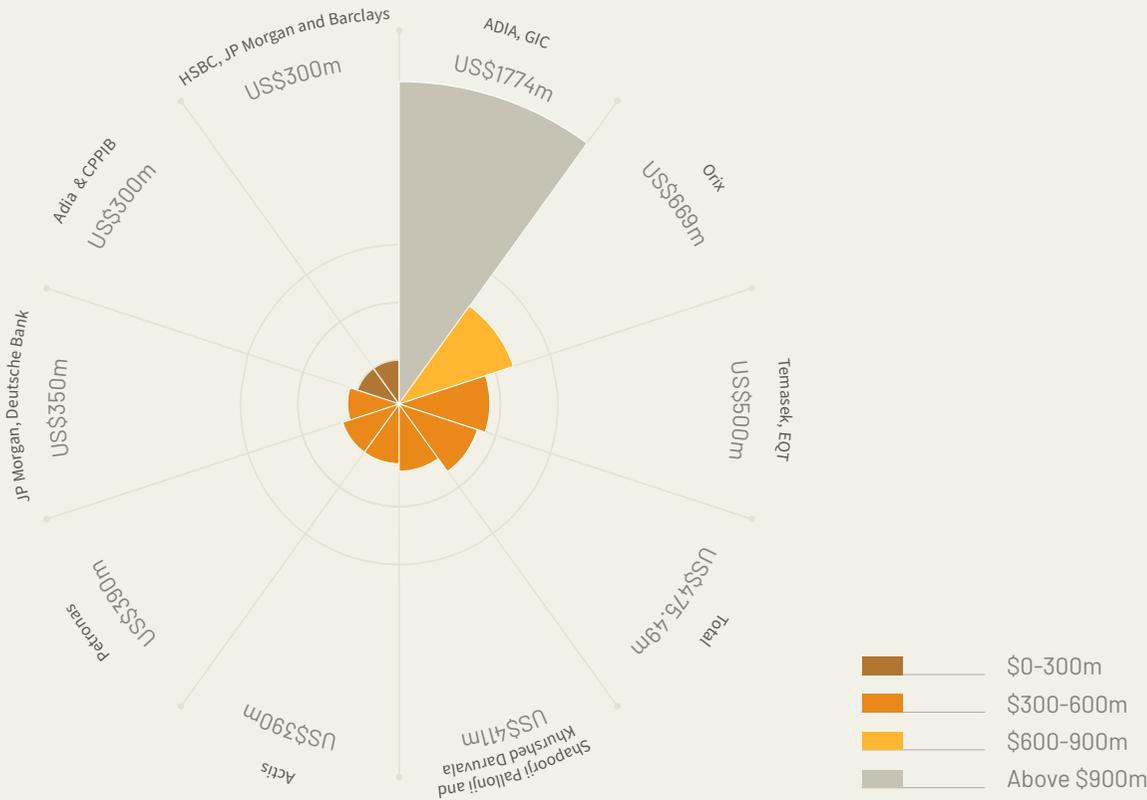
Share of cumulative installed capacity
as of 01/01/21



Source: Programme/Scheme wise physical progress in 2020-21 and cumulative up to Dec, 2020
<https://mnre.gov.in/the-ministry/physical-progress> Accessed February 2021

Key investors in renewable energy

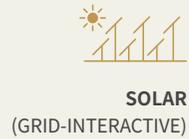
2019 / 20



Source: Based on JMK Research accessed in ET Energy World 06/06/20 Opinion: Is India's renewable energy investment on track? [https://energy.economicstimes.indiatimes.com/news/renewable/opinion-is-indias-renewable-energy-investment-on-track/76229607#:~:text=Ind\[%E2%80%A6\]20investors](https://energy.economicstimes.indiatimes.com/news/renewable/opinion-is-indias-renewable-energy-investment-on-track/76229607#:~:text=Ind[%E2%80%A6]20investors) (accessed January 2021)

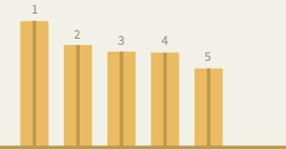
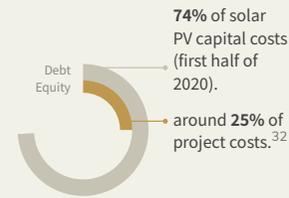
Against this backdrop, the Institute for Energy Economics and Financial Analysis (IEEFA) estimates that, in addition to the \$US42 billion in investment the Indian RE sector has received since 2014, a further US\$500 billion is required in order to reach 450 gigawatts (GW) of capacity by 2030.²⁸ Low tariffs, decreasing module costs, low interest rates along with the security provided by government-backed 25 year power purchase agreements will, according to the IEEFA, enable the requisite level of finance to be raised.²⁹

Key market data



Installed Capacity: **38.7GW**
34.5GW (ground mounted) | 4.2GW (rooftop)³⁰

PV capacity: **106GW** by 2025³¹



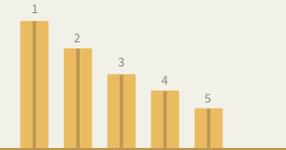
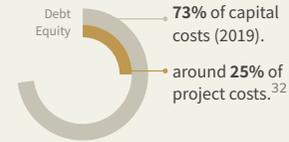
Limited domestic manufacture but policy intent to support growth. Majority imported from China.

Top Solar PV developers:³²
1. Acme Solar Holdings (2900 MW)
2. Renew Power (2352 MW)
3. Adani (2198 MW)
4. Greenko Energy Holdings (2175 MW)
5. Azure Power (1809 MW)



Installed Capacity: **38.6 GW**³⁰

Wind capacity: **56.7GW** by 2025³¹



70-80% turbine manufactured in India, by Indian and major global players.³³

Top Wind developers:³²
1. Renew Power (2957 MW)
2. Greenko Energy Holdings (2318 MW)
3. Sembcorp (1730 MW)
4. Mytrah Energy (1350 MW)
5. Tata Power (932 MW)



Installed Capacity: **4.74GW**³⁰

Expected growth in India: **5GW** by the end of 2029-30³⁴

Financing sources include Government assistance or subsidy schemes e.g. through Rural Electrification Corporation.^{35 36}

All components manufactured in India.³⁵ Large base of installers.

Greenco, Lanco, Toshiba India³⁷



Storage capacity addition: over **150 GWh** by 2022 and 500 GWh 2023-27³⁹

Annual lithium-ion battery market: 132 GWh in 2030.⁴⁰

Estimated USD 136 billion required to meet demand potential up to 2032.³⁹

Majority metals imported⁴⁰
Many players in battery recycling, formal and informal.⁴²

Largest grid-based energy storage facility: Tata Power Delhi Distribution Limited (10 MWh).⁴¹

Recycling: Tata Chemicals, Mahindra Electric (in plan)⁴²



Expected growth in India: Demand could increase between 3-10 times by 2050.⁴³

Union Budget 2021: Rs 1,500 crore to IREDA and National Hydrogen Mission in 2021-22 to generate green hydrogen.⁴⁵

Currently only Grey Hydrogen produced in India. Plan for green hydrogen plants for grid-scale solutions and ammonia production.⁴⁵

IOCL: hydrogen storage and dispensing terminal, customises hydrogen fuel cells etc.⁴⁴

NTPC: considering green hydrogen production facility.⁴⁵

Reliance: replacing transportation fuels with hydrogen and clean electricity.⁴⁵

1.1 The landscape for key technologies

Solar and wind have long been the dominant RE technologies in India. They are likely to remain so for the foreseeable future, with small hydro playing a lesser albeit significant role. Meanwhile, more technologies are emerging onto the scene or increasing in emphasis, such as hydrogen and other forms of energy storage.

Solar

The Indian solar market is the third largest in the world.⁴⁶ Between FY 2015/16 and FY 2018/19, solar electricity generation grew by over 50% year on year. Despite slowing in 2019/20, it is expected to keep growing at pace, with new ultra-mega plants gaining support. India's leadership of the International Solar Alliance (ISA) and the dedicated Central Public Sector Undertaking (PSU) Solar Energy Corporation of India (SECI) provide a geopolitical and institutional boost to the growing sector. Only a small percentage of equipment installed is Indian-made though, despite *Atmanirbhar Bharat*⁴⁷ ('Self-Reliant India') and 'Make in India' policies.⁴⁸ The majority of solar cells, modules, components and critical raw materials are currently imported from China.

Wind

India has the fourth largest installed wind capacity in the world,⁴⁹ with most of its capacity being concentrated in the states of Tamil Nadu, Gujarat, Rajasthan, Maharashtra, Karnataka and Andhra Pradesh.⁵⁰ Thus far, installations are exclusively on-shore, though the potential for off-shore is high. The first off-shore wind farm - a 1GW installation - is planned

for the coast of Gujarat, but has suffered delays in tendering.⁵¹ As suitable sites on land are exhausted in the future, the MNRE foresees a rise in the viability of off-shore farms.⁵² Unlike solar, several stages of the wind manufacturing value chain thrive in India. To date, 17 manufacturers produce over 44 turbine models, ranging up to 3 MW in size.⁵³ These not only serve the domestic market, but also Europe and the United States of America, among others.⁵⁴

Small hydro power

Small Hydro Power (SHP) (below 25 MW)⁵⁵ currently contributes approximately 1.3% of electricity generated in India.⁵⁶ As of 2019/20, there were 1,127 SHP projects installed, and a further 109 under various stages of implementation.⁵⁷ Himachal Pradesh and Karnataka lead significantly in terms of installed capacity, but analysis suggests that the states of Arunachal Pradesh, Himachal Pradesh, Jammu and Kashmir, as well as Uttarakhand constitute approximately half⁵⁸ of an estimated 21 GW potential.⁵⁹ An ecosystem of small hydro equipment manufacturers in India provide the vast majority of components required domestically.

Lithium ion and other types of battery energy storage

What follows from the proliferation of grid-interactive RE projects is an increased need for large-scale storage capacity to manage demand and supply. It additionally allows for greater flexibility and power system resilience. Storage can take many forms, including mechanical, electro-chemical, thermal, electrical, as well as by way of electrochemical hydrogen. Driven in part by the need for



mobile storage for the estimated 6 to 7 million electric vehicles forecast as part of the National Electric Mobility Mission Plan 2020,⁶⁰ increased emphasis is being put on lithium-ion electrochemical batteries. The largest grid-based energy storage facility in India was installed in Delhi by Tata Power Delhi Distribution Limited (TPDDL) and has a capacity of 10 MWh. According to NITI Aayog, India will need 6 gigawatt-scale facilities, with each having 10 GWh capacity by 2025 and 12 by 2030 to cater for domestic demand.⁶¹ Whilst gigafactories or large-capacity manufacturing facilities for lithium-ion batteries are not yet present in India, there is speculation that Tesla is showing interest in entering the market.⁶²

Hydrogen

India has had a National Hydrogen Energy Roadmap⁶³ for over 15 years, recognising its long-standing role as a feedstock for industrial processes. Recently, however, it has received increased attention due to Government interest in its potential as a fuel for vehicles (and its related attributes for reducing air pollution), and as storage for RE. A new National Hydrogen Mission specifically focused on generating hydrogen

from “green” sources is due for release before mid-April 2021.⁶⁴ The emphasis on ‘Green Hydrogen’ is key, as ‘Grey Hydrogen’ - produced using natural gas and therefore resulting in high greenhouse gas emissions - accounts for 95% of hydrogen used globally. In contrast, ‘Blue Hydrogen’ - also produced using natural gas, but with carbon capture, utilisation and storage (CCUS) - accounts for 4%.⁶⁵ In terms of current applications, there are a variety of hydrogen-based energy technologies including its use in a modified combustion engine in a mechanism similar to fossil fuel vehicles today; use in combined cycle gas turbines to produce energy; and fuel cells that convert chemical energy to electrical energy. While no commercial-scale Green Hydrogen plants yet exist in India, there is speculation that the Solar Energy Corporation of India (SECI) might invite Expressions of Interest⁶⁶ soon.

The key market data infographic on page 12 shows the scale of the rapid and massive expected growth of each of these technologies, as well as key characteristics that determine where influence lies in their value chains.



Developers and sponsors of the five largest solar and wind energy parks in India

Bhadla Industrial Solar Park | RAJASTHAN

Sponsors: Rajasthan Solar Park Development Company Ltd., ESSEL, IL&FS, Adani RE Power Ltd.
Developers: SB Energy SoftBank, Hero Future Energies, NTPC, ACME Solar, Azure Power, Sunseap Energy, Engie, Avaada Power, Fortum Solar, Vector Green, Renew Power, Phelan Energy, Electrotherm, Aditya Birla, LNB Group, Roha Dyechem

Commissioned in March 2020



2245 MW

REWA Ultra Mega Solar Park | MADHYA PRADESH

Sponsor: Rewa Ultra Mega Solar Ltd.
Developers: (each 250 MW): ACME Solar, Solengiri Power, Mahindra Renewables.

Fully operational by July 2019



750 MW

Pavagada Solar Park | KARNATAKA

Sponsors: Karnataka Solar Park Development Corporation Limited
Developers: Tata Power, ReNew Power, Fortum Solar, Avaada Energy, SoftBank Energy, Adani Green Energy, ACME Solar, Azure Power, Rattan India, KREDL

Operational by December 2019



2050 MW

Adani Kamuthi Solar Park | TAMIL NADU

Sponsor: Adani Green
 Operational in 2016



648 MW

Kurnool Ultra Mega Solar Park | ANDHRA PRADESH

Sponsor: Andhra Pradesh Solar Power Corporation Pvt Ltd
Developers: SunEdison, SBG Cleantech, Azure Power, Prayatna Developers (Adani Green)

Commissioned in July 2017



1 GW

Muppandal Wind Farm | TAMIL NADU

Developed by the state-owned Tamil Nadu Energy Development Agency. Features turbines from several manufacturers including Suzlon, NEG Micon, Vestas, and Enercon.

Commissioned in 1986



1,500MW

Jaisalmer Wind Park | RAJASTHAN

Developed by Suzlon Energy; Caters to a range of customers including private and public sector firms, independent power producers and power utility providers. Some of the clients include Hindustan Petroleum Corporation, Rajasthan State Mines and Minerals and CLP India

Commenced in 2001; current capacity achieved in April 2012



1,064 MW

Brahmanvel Wind Farm | MAHARASHTRA

Developed by Parakh Agro Industries.



528 MW

Vankusawade Wind Park | MAHARASHTRA

features turbines from Suzlon and Enercon



259 MW

Dhalgaon Wind Farm | MAHARASHTRA

Developed by Gadre Marine Exports, features turbines from Suzlon and Enercon

Commissioned in 2005



278 MW

1.2 The RE financing landscape

Utility-scale solar and wind are typically 75% debt : 25% equity financed in India.⁶⁷ In the course of the early 2000s, financing was mainly driven by foreign sources. This included concessional loans from multilateral agencies and development banks, such as the World Bank and Asian Development Bank.⁶⁸ As the market has matured, commercial financing options have increased and the share of concessional loans from multilateral development banks declined.⁶⁹

Currently, Non-Banking Finance Companies (NBFCs) as well as domestic commercial⁷⁰ and international banks provide the largest source of finance for the RE sector in India. Key players among the NBFCs include the Rural Electrification Corporation (REC), the Power Finance Corporation (PFC) and the Indian Renewable Energy Development Agency (IREDA). The growing number of Indian RE developers, the increase in local debt finance and strong national government support for the sector is leading to a greater degree of domestic influence over the RE system and the RE value chain.

In September 2020, the Reserve Bank of India announced an increase in the cap on loans for RE under its priority sector lending rules. Although lending to RE projects in India had reached US\$2.64 billion in 2018, this marks an important step given the further US\$500 billion required to meet the target of 450 GW.⁷¹

Beyond the aforementioned sources of debt financing, an analysis of RE investment trends in India over the course of 2019-20 suggests that the remainder consisted of majority equity investment or green bonds, as well as initial public offerings (IPOs). Mergers and acquisitions (M&A) also played a role.⁷² For India to achieve its ambitious RE targets however, it will need to diversify its sources of finance for the sector.⁷³

1.3 The role of corporate procurement

The growing demand from the Commercial and Industrial ('C&I') sector for renewable sources of energy is adding further impetus to the growth of the sector in India. Indian corporations signed over 5 GW of RE procurement deals by the end of 2019, making it the largest market in Asia.⁷⁴ The majority of deals come from the largest C&I actors, though these comprise only 3% of businesses in India.⁷⁵ As future forms of carbon tax emerge and as corporations make greater commitments to reduce carbon emissions, RE procurement will likely increase.

Corporate procurers of RE

Examples of large corporate procurers - either headquartered or with significant operations in India - who have made significant commitments to RE include:

- AB InBev
- Adobe - RE100 member⁷⁶
- Apple - RE100 member
- Coca-Cola - RE100 member⁷⁷
- Cognizant
- Dalmia Cement - RE100 member
- IBM
- Infosys - RE100 member
- Mahindra Holidays & Resorts - RE100 member
- Signify Innovations India (formerly Philips) - RE100 member
- Tata Motors - RE100 member

Landscape of green finance, fiscal years 2016-2018

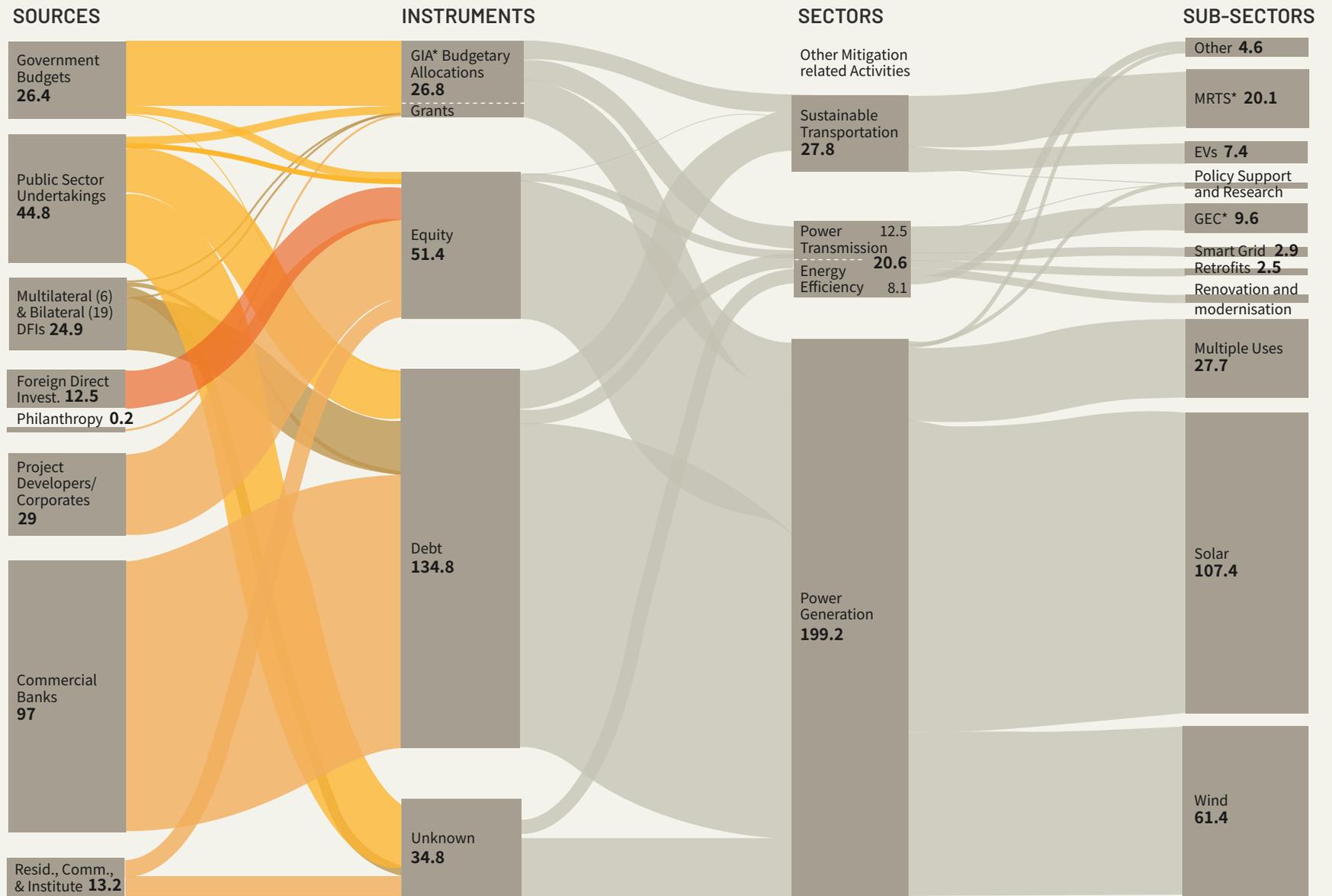
INR 248 thousand crores (approximately US\$34bn)

Total tracked green finance

This diagram was originally produced by The Climate Policy Initiative to show the path of 'green' finance flows along their lifecycle. In this case, green finance includes climate finance, as well as other environmental objectives that are necessary to support sustainability. However, it does not include finance with only explicit social aims.⁷⁸

All figures in thousand Crores

- Public domestic
- Public international
- Private domestic
- Private international



*Acronyms: GIA = Grants in Aid MRTS = Mass Rapid Transit System GEC = Green Energy Corridors

1.4 Governance of the RE sector

The Government of India has had, and continues to have, a dominant role in shaping and governing the RE sector. It has introduced a wide variety of policy instruments to incentivise the growth and maturity of the RE sector; it has facilitated land acquisition for project sites; and it has constructed a regulatory regime to enable RE to become part of the energy system. The analysis highlights that governance mechanisms specific to certain environmental and social impacts associated with the RE value chain will need to further evolve such that the sector holistically integrates accountability for these impacts into its operations.

Institutional arrangement for RE governance

Currently, public governance in the Indian RE sector primarily functions as a market-enabling force, driving both the uptake and the deployment of RE, so as to meet the ambitious targets set by the country.

Under India's federal structure, the mandate to govern the electricity sector is jointly held by union and state governments (both Parliament and the state legislatures play a role). In addition, multiple institutions and agencies are involved in the governance of the RE sector at various tiers of government, with the Ministry of New and Renewable Energy (MNRE) serving as nodal ministry at the central level. Electricity regulatory commissions are constituted at state and central levels (i.e. state electricity regulatory commissions (SERCs) and the Central Electricity Regulatory Commission (CERC) respectively). The Appellate Tribunal for Electricity (APTEL) hears appeals on decisions made by the SERCs and CERC.

The figure on the following page maps the public institutional arrangement for governing the RE sector.

Promoting RE sector growth through policy and regulation

The Electricity Act of 2003⁷⁹ is the parent legislation that governs the generation, distribution, transmission, trading and consumption of electricity at the state and national levels. The promotion of RE was one of the key reforms introduced under this seminal Act. Its provisions obligate all distribution utilities, captive-power users and open-access consumers to procure a proportion of their power requirement from renewable sources i.e. Renewable Purchase Obligations (RPOs).⁸⁰ In 2018, the Ministry of Power increased the erstwhile RPO target further, from 17% to 21%, to be achieved by 2022.⁸¹

Various National Plans and Missions provide direction to the RE sector. For instance, the National Action Plan on Climate Change (NAPCC) was released in 2008 by the Prime Minister's Council on Climate Change.⁸² The NAPCC sets out a comprehensive approach for adaptation and mitigation of climate change issues, whilst simultaneously yielding co-benefits. Meanwhile, the launch of the flagship National Solar Mission in 2010 was one of eight national missions dedicated to developing India's solar capacity.⁸³ Further, the National Green Corridor Scheme seeks to integrate RE into the national grid to improve evacuation and transmission.⁸⁴ The shared mandate between union and state governments means that the detail of policy and regulatory support mechanisms for RE projects vary from state to state.



Institutional arrangement for public governance of the RE sector

NATIONAL LEVEL

MNRE

Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The main technologies under its purview are: solar energy including photovoltaic and thermal; bio energy, including biomass, biogas, biofuels, improved cook stoves; wind energy; small/mini/micro hydro (up to 25 MW capacities); as well as upcoming technologies like hydrogen, fuel cells, geothermal and tidal. Five institutions support MNRE with technical and financial aspects:

NISE:

The National Institute of Solar Energy

NIWE:

The National Institute of Wind Energy

SSB-NIBE:

Sardar Swaran Singh National Institute of Bio Energy

IREDA:

The Indian Renewable Energy Development Agency

SECI:

The Solar Energy Corporation of India

Technical Agencies

Financing Agency

Facilitator and Scheme implementor

Ministry of Power

For development of national electricity tariff policies which include renewable energy, the mandate lies with the Ministry of Power under the Government of India.

SPPDs

Particularly for utility scale solar technologies, the Solar Power Park Developer (SPPD) governs solar parks and ultra-mega solar projects. SPPDs can comprise a singular Central Public Sector Undertaking (PSU), State PSU, State Government organisation or subsidiary, or a Joint Venture Company (JVC) between two or more of the above.

CERC

The Central Electricity Regulatory Commission (CERC) regulates at the union government level. In conjunction with SERCs, they develop tariff structures and guidelines and specify Renewable Purchase Obligations (RPOs).

STATE LEVEL

SNAs

The various State Nodal Agencies (SNAs) carry out the mandate of the MNRE at state level.

State Governments

State-level energy departments and renewable energy development agencies lead on developing renewable energy policy and promoting RE.

Ministries & Agencies

Regulators

Appellate Tribunal

SERC

The State Electricity Regulatory Commission (SERC) operates at various state levels. They develop tariff structures and guidelines and specify Renewable Purchase Obligations (RPOs).

APTEL

An Appellate Tribunal for Electricity (APTEL) has been constituted for redressing grievances and appeals against the orders of the CERC and SERCs.

Key policies and regulations

In addition to the policies and regulations specifically encouraging sector growth, several key pieces of legislation apply to RE projects as part of the broader infrastructure and manufacturing sectors. These include:

Land acquisition: LARR Act 2013

Land acquisition is a core component of RE development and - as is the case with most infrastructure projects - often involves environmental and social impacts. The key regulatory mechanism governing this sphere in India is the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 ('LARR Act').⁸⁵ The Act includes stringent requirements for consent from private land owners whose land is being acquired. It also requires Social Impact Assessments ('SIAs') to be conducted within six months of the commencement of the acquisition process and for these to be evaluated by a government-appointed multidisciplinary expert group. Further, the Act sets a threshold on the acquisition of irrigated and multi-cropped land. It also contains provisions designed to address the situation of families who do not own the land to be acquired but whose livelihoods nevertheless depend upon it.

The LARR provisions can be challenging to adhere to for RE actors for a number of reasons:

- they might be unable to meet the regulated threshold for the number of consents they are required to obtain from land-owners;

- the process of developing and implementing the SIA can take up to four years, which can lead to costly delays in the project implementation; and
- the process for updating land records can be time-consuming.

Recognising these challenges, the Central Government, with encouragement from NITI Aayog,⁸⁶ has allowed states to establish alternative mechanisms for acquiring private land for RE developments. For instance the Karnataka Solar Policy allows the District Commissioner all powers to re-classify agricultural land. In effect however, these alternatives have enabled RE actors to side-step certain provisions of the LARR Act. As states compete for investors in renewable developments, these 'fast track procedures' are becoming the norm, as observed in the case of Charanka Solar Park, Gujarat.⁸⁷ In this particular instance, land acquisition led to the enclosure of commons used by a number of pastoralist communities, thus significantly impacting upon their livelihoods.

Existing policies also enable states to establish Special Purpose Vehicles (SPVs) to purchase or lease land for RE projects. As part of this process, these state-controlled bodies may commission independent agencies to conduct SIAs as part of the acquisition process. Anecdotal evidence suggests that these assessments can be substantially less stringent than the impact assessments prescribed under the LARR Act. They can also foreground the interests of the land-owners, rather than other rights-holders such as landless agricultural labourers, or legal female heirs.

This presents a risk to the rights of Scheduled Tribes, Scheduled Castes and other vulnerable communities, whose lives and livelihoods are intrinsically connected to the land for their sustenance, economic development, as well as for meeting their cultural and spiritual needs.

Involvement of intermediaries in land acquisition transactions remains a challenge to the effective implementation of the LARR Act. There are reported accounts of intermediaries paying prices far below market value to marginal farmers to acquire their land prior to public notification of developing the solar park, and then re-selling it to the government or developers at significantly higher prices.⁸⁸ This can be difficult to prevent where there is a lack of official data on land use, for instance whether it was in agricultural or pastoral use. One key case study suggests that, in the absence of adequate public consultation and engagement with vulnerable communities regarding compensation, livelihoods, rehabilitation and resettlement, there is a risk of further deepening inequitable distribution of benefits and burdens, thus exacerbating socio-economic inequity. Whilst there is no evidence that this is universally true across all projects, it is important for consideration.

Forest diversion: The Forest Rights Act

RE projects that require diversion of forest land need to comply with the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 (FRA). The rules mandate the District Collector to secure consent from the Gram Sabha(s), and submit the report to the Conservator of Forests within a specified time.

FRA implementation, however, remains generally low across the country, often on account of communities not being aware of their individual and community rights under the Act. A 2019 report on socio-economic and environmental impacts of large-scale RE projects in India highlights the example of the Bhima Shankar Wildlife sanctuary, where communities are still struggling to gain control of the forest land that was acquired for wind projects many years ago.⁸⁹ According to the study, no consultations were held with the Gram Sabha to discuss diversion of forest land for non-forest use, breaching the provisions of the FRA.

Environmental Impact Assessment: Environment Protection Act

Environmental Impact Assessment (EIA) notification 2006 lays down the rules for obtaining environmental clearances for projects across most sectors. Critically however, unlike other sectors, the solar, on-shore wind, small hydro (up to 25 MW), biomass and waste to energy (up to 15 MW) projects are not required to conduct an EIA,⁹⁰ so long as these projects are not located in eco-sensitive zones.⁹¹ The exemption does not however, apply to manufacturing of RE equipment.

The Environment Protection Act (EPA) 1986, is an umbrella legislation designed to provide a framework for central government coordination of the activities of various central and state authorities established under previous laws, such as the Water Act and the Air Act, as well as for other forest and biodiversity conservation related legislation.⁹² All RE projects are required to comply with the EPA to ensure activities

or pollution from such projects do not adversely impact the environment. The responsible agencies for overseeing the compliance of the EPA are: the Ministry of Environment, Forest and Climate Change (MoEFCC, Government of India), the Central pollution control board (CPCB) at the national level, and the State Pollution Control Boards (SPCBs) at state level.

Groundwater: No Objection Certificates

RE projects require water for the operation and maintenance stage, particularly for solar projects where panel cleaning is an important part of the maintenance process. As per the guidelines outlined by the Central Ground Water Authority (CGWA) under the Ministry of Jal Shakti, infrastructure users in the context of RE projects are required to obtain a No Objection Certificate (NOC) prior to extracting groundwater.

Waste: e-waste, hazardous waste and battery management rules

According to most of the central bidding documents, the responsibility for handling and disposing of photovoltaic (PV) waste rests on the developers, as per the E-waste (Management and Handling) Rules, 2016.⁹³ These rules, however, make no mention of the solar panel waste. The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 also do not specify details regarding solar cells and modules.⁹⁴

Where RE projects involve batteries, they are required to comply with the Batteries (Management and Handling) Rules 2001 under the EPA, 1986. (Indications

are that these rules will be replaced by the Draft Battery Management Rules 2020.⁹⁵) Among other responsibilities, this would involve ensuring that used batteries are not disposed of in any manner other than by depositing with the seller or in demarcated areas. The bulk consumer is also required to register with the State Pollution Control Board, as well as to ensure that scrap batteries are not disposed of in any manner other than depositing it to registered recyclers.

1.5 The role of the judiciary

The judiciary plays an important role in providing a route to remedy for addressing the social and environmental impacts of RE projects. A number of landless and marginalised communities have sought fair compensation through the courts following acquisitions that forcibly displaced them from the land they traditionally occupied, and upon which they depended for their socio-economic survival. For instance, in September 2020, the Rajasthan High Court ordered a temporary stay on a 1,500 MW solar energy power project after local farmers challenged the allocation of nearly 990 hectares of agricultural land for the project.⁹⁶

The judiciary has also been active in expressing concern on the issue of mounting solar panel waste and the corresponding dearth of policy mechanisms fit to address irresponsible disposal of such waste. The National Green Tribunal (NGT) has on multiple occasions directed the Ministry of New and Renewable Energy (MNRE) and the Ministry of Environment, Forests and



Climate Change (MoEFCC) to take necessary action particularly on the matter of disposal of antimony-coated solar panels.⁹⁷

There are various examples of the judicial responses holding the RE sector to account. For instance in 2010, the Bombay High Court had directed the state to prohibit new windmills inside the Koyna Wildlife Sanctuary.⁹⁸ This ruling was in response to public interest litigation based on a Right to Information application under the Right to Information Act, 2005. The application revealed that 215 of the 1,240 windmills in the region were situated inside protected forest areas.⁹⁹ On another occasion, the principal bench of the NGT formed a six member committee in response to a plea to investigate threats posed to the Great Indian Bustard (an endangered bird) as a result of collisions with RE project-related transmission lines. In response, the NGT ordered for power transmission lines to be placed underground for all subsequent RE projects developed within marked habitats of the bird. It also recommended installing bird diverters on existing solar and wind power lines.¹⁰⁰ Notwithstanding these examples, grievance redressal through the judiciary can be expensive due to costs associated with litigation. It can also be time-consuming due to the pendency of proceedings in India, making it challenging for many affected communities to access judicial mechanisms to protect their rights.

1.6 Role of civil society in upholding accountability

Civil society has a long record of scrutinising and holding infrastructure projects involving RE accountable. For instance, plans made in 2020 to develop a mega RE park in Kutch have prompted several environmental activists and experts to raise concerns about related impacts upon the area's unique desert ecosystems.¹⁰¹ Civil society groups have further highlighted the need to review various evacuation and transmission infrastructure for both solar and wind projects because of the threats these raise to avian ecology.

There has also been concerted support for Adivasis (indigenous peoples) whose lives and livelihoods will be impacted by the Kasargod solar project in Kerala.¹⁰² This has prompted various civil society groups to highlight the need for related development projects to be reviewed. Civil society's role as watchdogs in the regulatory aspects of RE projects helps surface on-the-ground social and environmental impacts, prevent corruption, as well as encourage appropriate action.¹⁰³

It remains, however, that the exemption of RE generation projects (when outside zones deemed eco-sensitive) from EIAs significantly limits civil society from being able to engage formal mechanisms to monitor and assess environmental impact. In response, organisations have crafted alternative means to build civic governance of the sector. One such example is the role played by the Environmental Justice Atlas that "documents and catalogues social conflicts around environmental issues."¹⁰⁴

The exemption of RE generation projects (when outside zones deemed eco-sensitive) from EIAs significantly limits the ability of civil society to engage formal mechanisms to monitor and assess environmental impact

The SiteRight Tool:

An example of civil society enabling sustainable decision-making for the RE sector

A publicly available decision-support tool, SiteRight,¹⁰⁵ helps policymakers, developers and financial institutions reduce unintended socio-ecological impacts, as well as associated risks. To this end, the SiteRight tool is designed to help identify areas where solar and wind development is less likely to encounter or spark socio-ecological conflicts, thereby helping to reduce project delays and cost overruns. Currently developed for the states of Madhya Pradesh and Maharashtra, the tool's applicability is intended to soon extend to all states with large solar and wind energy potential.

The environmental and social impacts of RE in India



2. The environmental and social impacts of RE in India

The positive and negative impacts across RE value chains are expected to amplify with the scaling of deployment. To date, the focus has been on accounting for the benefits of RE - namely, the significant contribution that it makes to reducing carbon dioxide emissions, as well as to reducing India's energy import bills.

In India, the RE sector also delivers a range of benefits beyond emissions reductions, including:

- robust and flexible infrastructure with the potential to last 25-40 years;
- dramatically reduced (or eradication of) air, sound, soil and water pollution during electricity generation;
- the promise of sustainable energy self-reliance and security;
- greater opportunities for energy access in remote locations, and the consequential benefit to agricultural productivity, rural livelihoods and human development;
- 'green' jobs and livelihood opportunities;
- significant contribution to driving the national economy and GDP, as the sector and related manufacturing, grows.¹⁰⁶

The well-recognised positive impacts of RE have meant that the deployment of the technology is often viewed as inherently good by a wide range of stakeholders. For instance, RE companies are often included in sustainable investment portfolios, simply on the basis that they produce clean, green energy.

Yet, in many ways the RE sector's value chains share similarities with other infrastructure sectors and as such, are exposed to the same range of environmental and social risks. By not taking adequate steps to manage these risks, the social license to operate at both project and sector level would be threatened, thus risking the slowing of the transition to RE.

There is however another way to look at it: the RE sector is uniquely poised to pioneer the shift to just and regenerative business models. To achieve this potential, the RE sector will need to couple the production of clean energy with environmentally safe and socially just practices throughout the value chain and life-cycle of the technologies.

In this section, we highlight key environmental and social adverse impacts that are or may emanate from the production and deployment of key RE technologies relevant to the Indian ecosystem. Rather than full life-cycle assessments, the intention is to provide an overview of these impacts in order to establish a picture of what these impacts are and where they are at risk of manifesting in the value chains.



2.1 Adverse environmental and social impacts in the RE value chain

The kinds of adverse environmental and social impacts the RE sector needs to take into account include:

- Increased ecological and social vulnerabilities resulting from land-use changes;
- labour and human rights abuses, particularly in locations where raw material extraction / mining, production and end-of life-stages of RE technologies take place, especially in the informal sector;
- impacts on local and regional biodiversity during the construction and operation phases of the value chain in particular;
- water-related competition and conflict arising from intensive water use associated with solar panel operation and maintenance;
- energy justice concerns in instances where communities near project sites are not prioritised for improved access to electricity and other benefits.

Several critical impacts are emerging in the RE system in India and their international value chains. Often, these adverse impacts disproportionately affect vulnerable and disenfranchised members of society, exacerbating social inequities and hampering efforts to achieve the SDGs. The opportunities and risks pertaining to women in particular are explored on page 26.

Some of these impacts result from activities that take place outside of India, such as raw material extraction

or solar panel manufacturing. Nonetheless, they occur within the value chains that ultimately deliver RE to the Indian market. Whilst the RE sector in India is not the sole or the most significant contributor to these impacts, a more direct correlation might emerge for India and globally as the sector continues to grow rapidly. Other sectors have demonstrated the importance of, and good practice in, influencing positive environmental, social and governance (ESG) practices across international value chains, including fashion and textiles, forest-based products and electronics. As deployment within India scales, the need to recognise the agency that Indian actors will have in mitigating these impacts across the international value chain becomes critically important.

All the impacts discussed in this section are the result of an interplay of complex issues, several of which are not unique to the RE sector, and hence should not be read as reasons to impede the growth of the sector.

As deployment within India scales, the need to recognise the agency that Indian actors will have in mitigating these impacts across the international value chain becomes critically important.



The scaling of RE will not contribute to a just transition if its design perpetuates the structural exclusion of women.

The gender equity opportunity

The just transition to a low carbon future must offer opportunities to advance gender equity and reshape the energy sector so that it better aligns with the needs, interests and rights of women and other vulnerable groups.

India's Solar Mamas (see page 47) constitutes just one example of how the DRE sector has sought to enhance gender equity at household and community levels. Can their experience offer lessons for the utility-scale sector on gender?

Generally, improving access to reliable energy reduces the length of time required for household tasks, thus providing more opportunities to engage in education, employment and political engagement or community governance. Moreover, clean cookstoves reduce

the level of indoor air pollution and use fuel more efficiently, resulting in less time being required to collect firewood. Crucially, reliable energy for street lighting reduces gender-based violence. India's Self Help Groups (SHGs) are internationally renowned as hubs for women entrepreneurship within the RE sector and beyond.¹⁰⁷

At present, there is a knowledge gap on the gender-related impacts of large-scale renewable energy. A roundtable hosted in 2020 by the Global Initiative for Economic, Social, and Cultural Rights and Friedrich Ebert Stiftung highlighted that a change in the source of energy does not automatically lead to a change in ownership or voice, and that the scaling of RE will not contribute to a just transition if its design perpetuates the structural exclusion of women.¹⁰⁸

The Roundtable findings, coupled with interviews in support of this study,

suggest that particular steps should be taken to identify and address the following challenges within the utility-scale RE sector:

- Risk of discriminatory gender and social norms that limit women's ownership and access to land, leading to greater risk of inequitable compensation or engagement;
- Risk of inequitable participation in decision-making, particularly in early stages of project planning, which is likely to impede equal access to benefits from renewable energy services and/or address gender-based priorities;
- Risk that operational-level grievance mechanisms are not informed by the distinct challenges faced by women in terms of accessibility and/or adequacy;
- Risk of increase in gender-based violence due to economic activities

around the project site;

- Risk of gender inequity in corporate recruitment, management and at board level, as the energy industry is traditionally male-dominated.

Against this backdrop, the Roundtable warned utility-scale RE projects against replicating the extractivist and profit-driven practices of the fossil fuel industry, emphasising that: "If 'business as usual' is allowed to prevail and the green transition is not accompanied by a transformation in the behaviour of energy companies, we can expect the exploitation and dispossession of women to become further entrenched."¹⁰⁹

The challenges outlined by the Roundtable are deep-rooted and systemic, common across many sectors and therefore require the RE sector to collaborate across industries to drive long term change.

Human rights implications of RE driven land-use change of common land

The FRA 2006 makes express reference to the colonial period's failure to recognise ancestral lands, and the need 'to address the longstanding insecurity of tenurial and access rights of [...] those who were forced to relocate their dwelling due to state development interventions'.

In 2011, the Supreme Court case of *Jagpal Singh & Ors. v State of Punjab & Ors.*, further recognised challenges related to the restitution of common lands as a systemic problem, impacting 15-25% of the country's entire land mass. As previously discussed, the LARR Act has a narrow focus on private land, which can be seen to favour privileged

land owners. Since historically land ownership in India has been governed along caste lines with so-called upper castes owning most agricultural land,¹¹⁰ the LARR Act provision risks exacerbating inequity.

The UN Guiding Principles on Internal Displacement stipulate that, "States are under a particular obligation to protect against the displacement of indigenous peoples, minorities, peasants, pastoralists and other groups with a special dependency on and attachment to their lands". In the absence of due process, forced displacement further aggravates the already precarious situation of affected communities. Affected rights include - but are not limited to - the right to life, the right to adequate food, the right to information and to participation, as well as the right to an effective remedy.

2.2 Using the finitude, fragility and fairness framework

We have categorised and analysed the environmental and social impacts and risks across the value chains for the different RE technologies being deployed in India using the Finitude, Fragility and Fairness ('3F') Framework.¹¹¹ We chose not to use a traditional ESG lens as it risks treating 'Environment', 'Society' and 'Governance' risks as independent and mutually exclusive. In reality, impacts that might appear insignificant when examined in isolation can become significant as they intersect and compound one another. Accordingly, the 3-F Framework helps articulate the complex interplay between communities, ecosystems and social justice. For each technology we provide a summary map of key risks and impacts across the 3-Fs along the value chain. In these we focus on the material issues being raised by sector and civil society experts, and recognise that additional risks may arise as understanding evolves.



The 3-F Framework

Finitude 

Physical and biological resources are finite, and there are limits to how much we can use. This is true even for renewable resources (such as freshwater) if the rate of extraction is greater than rate of recharge.

RE technologies need different kinds of resources such as metals, minerals (including rare earth minerals) and fresh-water either as raw materials or to keep them operating. These may be extracted across local, national and international boundaries.

Fragility 

The vulnerability of an ecosystem to different kinds and scales of shock, at a given point in time. A combination of multiple shocks can lead to tipping points beyond which the system breaks down, causing social and environmental damage. Often, social and environmental shocks can compound or feed off each other to create unexpected or disproportionate impacts.

Activities within the RE value chain can risk exacerbating existing shocks to ecosystems or create new ones. For example, rapid land-use change driven by RE projects can impact ecosystem services. Social shocks like loss of traditional livelihoods for pastoralism can drive further land-use and socio-economic change.

Fairness 

Recognition and protection of human rights, as well as the concepts of social and ecological justice. Both intra-generational fairness (fairness between different people and other species within the same generation) and intergenerational fairness (ensuring our actions are fair to future generations, while attending to our well-being).

RE technologies can lead to unjust outcomes, and also exacerbate existing injustices. For example, land acquisition for RE projects can benefit landowners to the detriment of other users of land (such as pastoralists, agriculture labour). The process can also have disproportionate economic impact on women.

2.3 Socio-environmental impacts and risks of utility-scale solar

Large-scale land acquisition and land-use change

Estimates of the total land footprint needed to meet the 2022 target range from 55,000 to 125,000 km² - the equivalent of between the size of Switzerland and Greece. This is expected to be sourced from the approximately 880,000 km² of land that is classified as 'wasteland', representing 27% of India's total land mass.¹¹²

RE projects that are allocated 'wasteland' may face multiple social and environmental risks due to its problematic definition (see What is 'wasteland' in reality?). Depending on the category of wasteland used, risks include the exacerbation of socio-economic inequities, increasing ecological stress on the land and climate, and competition with other uses such as food production. The lack of publicly available data on the category of wasteland used for solar parks limits the means of ensuring that siting decisions for solar park projects do not have adverse impacts.

What is 'wasteland' in reality?

'Wasteland' was introduced as an official designation for common land, which was considered non-taxable or non-revenue during the colonial period. The Department of Land Resources defines wasteland as "Degraded land which can be brought under vegetative cover, with reasonable effort, and which is currently under utilised and land which is deteriorating for lack of appropriate water and soil management or on account of natural causes."¹¹³ Many areas of land essential to India's population and ecosystem are therefore classified as wasteland.¹¹⁴ This includes waterlogged areas and marshes essential to groundwater recharge; grasslands and pasturelands upon which the lives and livelihoods of millions of livestock and pastoralists depend; as well as deserts, rocky outcrops, and plateaus that are rich in geological features and are also home to a unique set of fauna and flora.¹¹⁵ A lack of nuance in using this categorisation can risk undervaluing the socio-economic and ecosystem services provided by these lands.

Water intensity of panel operation and maintenance

The cleaning of solar panels during the operation and maintenance stage can be highly water intensive. Estimates range between 7,000–20,000 litres being required per MW per wash.¹¹⁶ Due to approximately 56% of all solar installations being located in arid and semi-arid areas of India (e.g. Gujarat and Rajasthan), this brings significant risk to the local ecosystem and communities.¹¹⁷ Though new technologies are aiming to automate the cleaning process and optimise water use, their uptake and effectiveness remains to be seen.

During the operations and maintenance phase, 60% of the water used for cleaning is sourced from the ground through borewells, while the remaining 40% comes from surface water sources such as rivers, canals and lakes. Ground water is preferred by most developers and Operations and Maintenance (O&M) contractors as it is practically free and operationally expedient. Specific regulatory permissions are required for ground water extraction but these are not always adhered to.¹¹⁸

Broad impacts of mining

As solar energy scales across the world, demand for the minerals required in its production and deployment is also expected to rise rapidly. The World Bank forecasts that, under a 2°C climate scenario, global demand for key minerals used in PV panels, including aluminium, copper, indium, iron, lead, molybdenum, nickel, silver, and zinc, would increase by 300%.¹¹⁹

These minerals are predominantly mined outside of India, but the ever increasing expectations held by governments, civil society, investors and corporates for transparency and accountability, increasing voluntary agreements¹²⁰ and in some cases legislation¹²¹, mean that responsibility must be taken for the impacts in the value chains serving Indian demand. Such mining operations are high risk for human rights and environmental abuses. According to the Business and Human Rights Resource Centre (BHRRRC), the mining of copper, nickel, and zinc used in solar panels is in some cases associated with decreased access to water for local communities, increased instances of mining-related illnesses, and environmental pollution.¹²²

Labour rights

Labour rights risks lie particularly at factories dedicated to the manufacturing of RE equipment, as well as at mines supplying key minerals and in the treatment of waste at end-of-life. The solar industry has more than 2 million jobs on record, more than half of which are located in China, where the majority of solar panel production takes place. There have been reported instances of excessive working hours and occupational health and safety (OHS) violations in solar panel production specifically.¹²³ China's position as the top global producer of solar panels should prompt focused supply-chain due diligence to inform procurement choices. Through due diligence in sustainable

procurement and supply chain management, the Indian solar sector can play a role in ensuring that labour rights abuses do not take place within their supply chains.¹²⁴

Impact of hazardous waste on health and environment

Some solar panels contain cadmium - a toxic carcinogen that accumulates in bone. They may also contain lead - a cumulative toxicant that can cause permanent damage to the neurological and cardiovascular systems.¹²⁵ The risk to people and environment predominantly lies in the manufacture and end-of-life stages of the value chain. In manufacturing, the risk lies in worker exposure to these and other hazardous chemicals in the production and, potentially, assembly of PV panels. At the end-of-life stage, if not handled properly, toxic elements from disposed PV panels can adversely affect ecological systems as well as the health of those involved in disassembling the panels or dumping them.

Due to the lifespan of PV modules (25 to 30 years) and the failure to design for re-use or recycling from the outset, India will begin to see large volumes of PV modules reaching the disposal stage soon. Further, because improvements in generation efficiency are being made quickly, large volumes of modules are likely to be replaced before the end of their lifespan, thus compounding the problem. Industry and policy-makers are beginning to recognise this impending challenge and have established task forces to tackle the problem.¹²⁶





Case Study:

Land leasing in Pavagada Solar Park

Background

Commissioned in 2018, the solar park in Pavagada, Karnataka, is distributed over six villages. More than 12,000 acres of land were acquired on long-term lease agreement from local farmers. Located in a semi-arid region, Pavagada receives ample solar radiation and also reports frequent low crop yields,¹²⁷ rendering it a good choice for the development of a solar park. A land leasing mechanism was used for acquiring land for the project, and the negotiation and execution of the lease agreements with the landowners was conducted through a Special Purpose Vehicle constituted specifically for the project - the Karnataka Solar Power Development Corporation Ltd (KSPDCL). Subsequently, the lands were sub-leased to a selection of private solar power generating companies. The estimated water use by the plant is 1,110 kilolitres per day (KLPD), which is met from digging borewells in accordance with applicable rules. Our research team interacted with a number of village leaders (male), along with three households (mixed) who have leased out their lands for the project to understand their experience.¹²⁸

Impact of land use change on land prices and agriculture

The major crops grown in this region are groundnut, jowar, paddy and a variety of fruits. Farmers estimated that approximately 70% of the land was previously used for groundnut cultivation in accordance with rainfed methods. The remaining 30% was under irrigated agriculture. One farmer interviewed stated that *“The demand for agricultural land has increased, with a good jump in the land prices. Before the solar park, there were no buyers and the land price ranged from INR 75,000 to 150,000 per acre. The current price has shot up to around INR 200,000 - 600,000 per acre.”* Other interviewees agreed and reported that there are now more land buyers than sellers in the village. Whilst this may be attractive for land owners, it runs the risk of pricing villagers out of buying their own land locally.

Impact of land-use change on ecosystem services

The project has received media attention since its launch, predominantly because of the potential impacts that land-use change at this scale could have on the local ecosystem and the services it provides. Experts have called for further scientific research into the effects on soil fertility and groundwater recharge for instance.¹²⁹ There are a number of paradoxes involved that require attention such as the observation that soil temperatures under the panels were lower than pre-construction and therefore could be interfering with soil health and microbial processes, but also more positively that the lower solar radiation under the panels could reduce plant stress and boost growth.¹³⁰ Research interviews further indicated that some of the farmers were concerned that the solar park will affect the quality of the land, raising the prospect that it will not be fit for agriculture upon reaching the end of lease period. These concerns are legitimate as cement beds have been laid approximately 8 feet deep into the soil to support the solar panels and the agreement currently does not mention anything about end-of-life removal. Whilst the agreements include provision to ensure the land is cultivable after the 25 year life of the plant, it is unclear what would happen in a situation where the land is rendered uncultivable due to climate change.

Leasing process and compensation

During the discussions, the farmers raised no complaint on the compensation that they were offered in exchange for their land. They shared that the compensation and lease terms offered were fairly attractive from the outset. They further added that, while they did not feel they were in a position to negotiate, they are happy that the project has not harmed them. They recalled how they had been investing in agriculture, but incurring significant losses for various reasons. They regard the stability provided by the contract and the ability to reclaim their land at the end of the project as a more positive situation. It was also highlighted at the time of discussion that a copy of the lease agreement had not yet been received by all lessors, though it was expected soon.

Impact on livelihoods, community and inequity

The interviewees shared that the negotiation with landowners included a commitment that each family entering into the contract would be offered a job according to the educational qualification of the applying family member.¹³¹ The farmers stated that they had been given the jobs, but questioned the quality of the employment. The main jobs offered are related to security, solar panel cleaning, weeding and transporting - mostly gendered positions that exclude women from these opportunities. As a result, women have sought informal work such as running tea stalls to service the labourers and truck drivers. In doing so, they become subject to precarious labour practices. Interviewees further stressed the desire to see technical jobs offered to educated villagers, as well as roles being offered to those who have not leased out their land, but who are living in villages that are affected nevertheless.

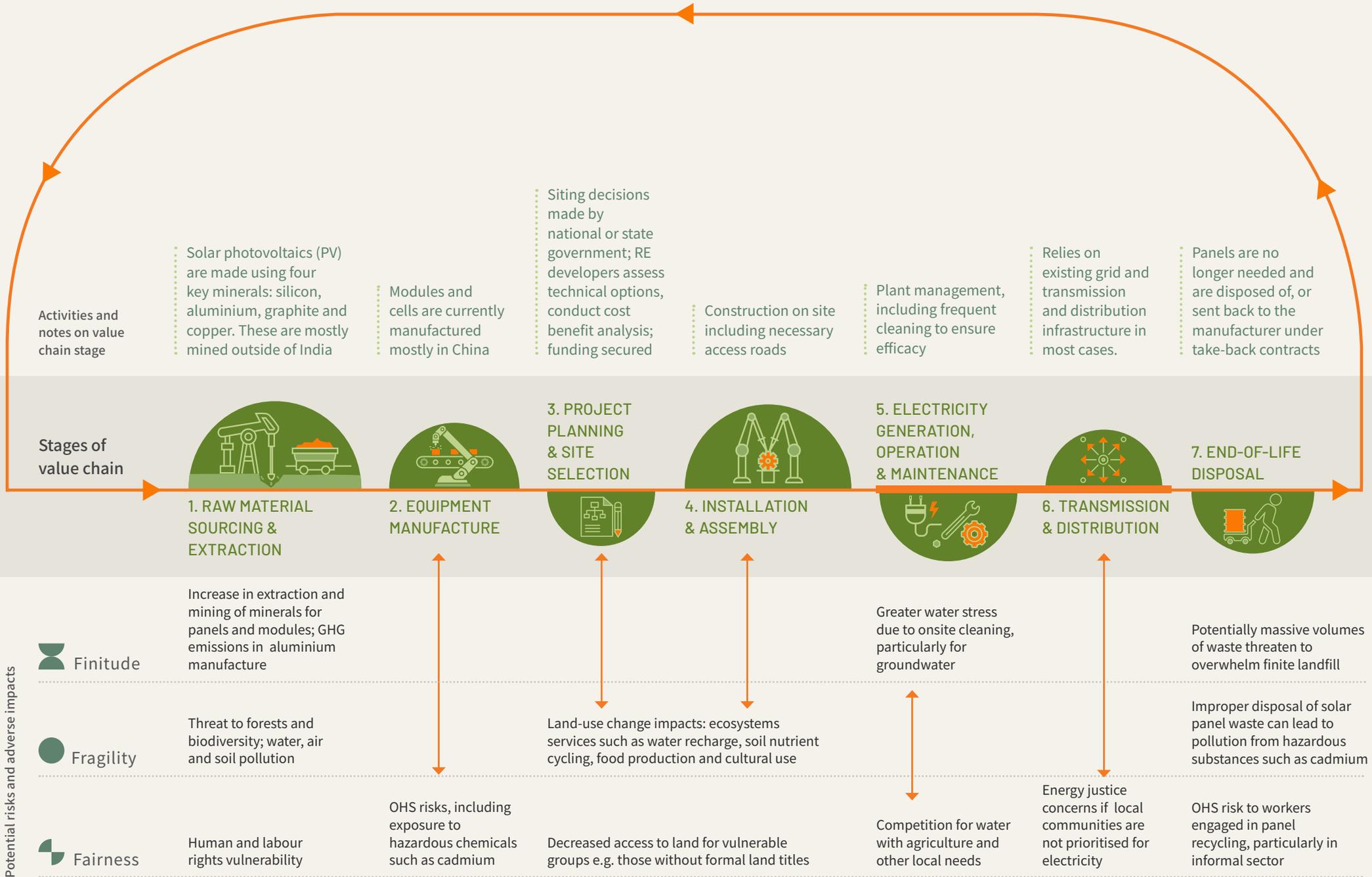
The land leasing mechanism works in favour of farmers with land, but excludes landless farmers and agricultural labourers from equitable benefits of the process.

The enclosure of common land has especially impacted pastoralists - many of whom were forced to sell their livestock - and women labourers. This has exacerbated existing disparities and created new ones among farmers in the village, particularly as those excluded and most impacted tend to be from vulnerable castes and communities. The farmers also shared that the solar companies only selected the good flat lands, disregarding those with mountainous slopes.¹³² This caused frustration to those who were willing to lease out the latter but had no takers.

Whilst farmers might attain a degree of security for a short period, there is a high degree of economic risk involved in long-term dependence on a model that does not provide for diversified livelihood options. The question of whether the park could have been designed such that the land could be cultivable whilst also generating electricity, and thus maintaining farming livelihoods where practicable, remains unanswered.¹³³

Whilst farmers might attain a degree of security for a short period, there is a high degree of economic risk involved in long-term dependence on a model that does not provide for diversified livelihood options.

Key risks and adverse impacts in the solar value chain



* Stages 5 and 6 happen simultaneously

2.4 Socio-environmental impacts and risks of utility scale on-shore wind

Impact of large-scale land acquisition and land-use change

The amount of land required for the construction of wind farms generally depends on the wind speed, hub height and the technology in use. Installing a 3 MW wind turbine requires a plot of approximately 1,600 m². However, the aggregate land affected can be significantly higher due to supporting infrastructure.¹³⁴ In the case of the Andhra Lake Wind Farm for instance according to Pratap, Pillai and Muthu (2019) “construction is limited to 87.577 hectares of forest land in Khed, the impact of allied activities like construction of the access road will cover around 3541.84 hectares of biodiversity rich forests.”¹³⁵ Infrastructure such as roads compromises the continuity of a terrestrial ecosystem, negatively affecting biodiversity and the services it provides. Studies have highlighted that access roads can trigger large scale erosion and landslides;¹³⁶ affect the hydrology of an area by changing or blocking water courses; the increased traffic makes the area more vulnerable to human exploitation; and that the restrictions imposed on wild animals can force them to migrate to nearby villages resulting in conflict with people.¹³⁷

The target of 60 GW of wind power in India will require a dramatic increase in the number of wind farms. Demand for sites with appropriate wind conditions will likely mean that wind farms begin to compete and potentially conflict with existing land use.¹³⁸ This indicates an even stronger need for due process in land

acquisition to be strengthened and upheld, particularly given the host of similar issues observed in the context of solar parks.

Impact on common property resources

Project developers acquire land from farmers, through dealers or via state forest departments for lease. The results of rapid surveys published in a report by the MNRE reveal that both agricultural and forest lands are being selected, some of which could be viewed as commons.¹³⁹ For instance, for the few select sites surveyed in Tamil Nadu, it was observed that wind farms were developed on agricultural lands.¹⁴⁰ Meanwhile, the few select wind farm sites surveyed in Maharashtra were taken on lease from the Maharashtra state forest department. Although the land ownership in these instances was not with the community, the project site was nonetheless built in close vicinity to the village commons and covered with vegetation. The project development was therefore found to have reduced the quality and quantity of the common property resource available to the community.¹⁴¹

Forest ecosystems and ecosystem services

Several important studies have drawn attention to a variety of impacts in the forest context. These range from disturbing food chains and biodiversity balance, to the impact on communities reliant on the forest for subsistence. Whether wind farms should be located in forested areas is debatable. Reports from Maharashtra suggest that protected forest areas have been used for the installation of wind farms, sometimes without suitable precautions.



Demand for sites with appropriate wind conditions will likely mean that wind farms begin to compete and potentially conflict with existing land use.

The Koyna Wildlife Sanctuary in the Western Ghats serves as a case in point. Spread over 423 km² of forest rich in biodiversity, the sanctuary provides a habitat for a number of endangered species, including leopards. Reports indicate that between 1990 and 2010, land from the sanctuary was allocated for the construction of a 215 MW turbine wind farm. This resulted in more than 500 trees being felled in Navja village, after 40 land agreements were signed. It also led to a 6 km road being constructed inside the sanctuary.¹⁴² The construction and operation hampered the movement of several species, including the endangered white stork and red-headed vulture.¹⁴³

A similar outcome was observed in the 2018 study of the Chalkewadi plateau, where wind farms were observed to have reduced the number - as well as the activity - of predatory birds. In turn, this increased the density of their prey, such as vertebrates like the ground lizard and has fundamentally disturbed the ecosystem.¹⁴⁴

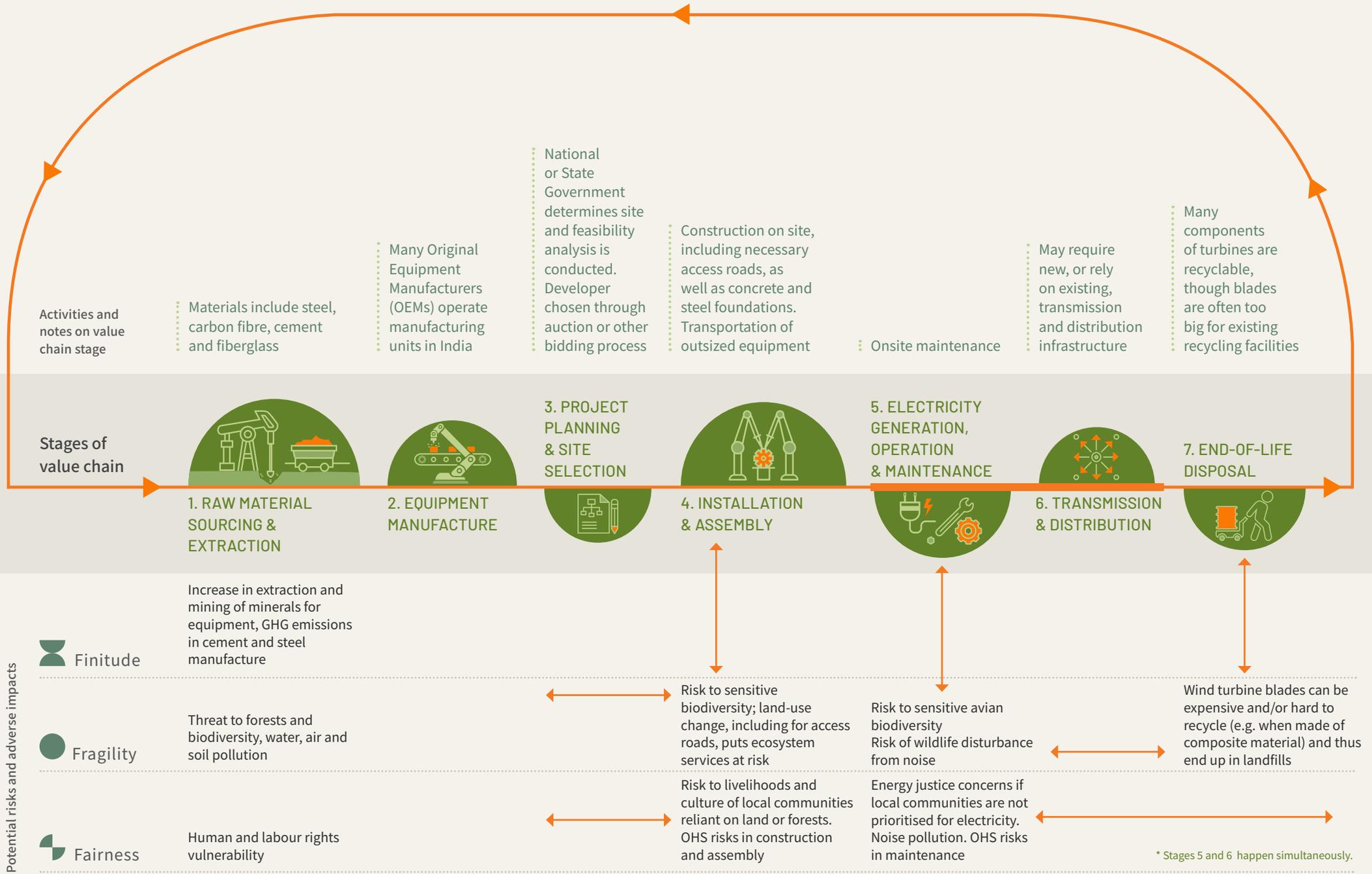
The Bhimashankar Wildlife Sanctuary - also located in the Western Ghats, Maharashtra - tells a similar story. As the home to approximately 300 species including leopards, pangolins and Indian giant squirrels, the sanctuary is regarded as a global biodiversity hotspot. In 2010, a 113 MW wind power project was approved for construction only 3.5 km away from the sanctuary boundary. The project site spread over 14 villages of the Khed and Maval talukas, covering 194 hectares of reserve forest land. The project activities led to

substantial impacts on the surrounding flora and fauna.¹⁴⁵ According to the Western Ghats Ecology Expert Panel, the proximity to the sanctuary is a concern due to the project's 'zone of influence' being much larger than the length of the roads, or than the area occupied by each windmill mast and associated structures.¹⁴⁶

Though the project was granted permission to fell 26,615 trees, over 300,000 trees were ultimately cut for the construction of 20 km of access roads. Despite the scale of the operation, consent was not sought from the local communities prior to establishing the project. Moreover, there have been reports of villagers being illegally restrained from accessing the hills. According to the same report, much of the land cleared for the construction of wind farm projects was forested land upon which the surrounding communities depend for their subsistence.

Crucially, indigenous communities in such areas tend to be impacted disproportionately as a result of often not holding formal land titles. This may further be the case in instances where they do have rights (e.g. under the Forest Rights Act), but that the enforcement of these rights is weak, thus reinforcing and exacerbating existing inequities. In the case of the Andhra Lake Wind Farms, the abutting forest is worshipped by the Satkarwadi villages as the home of the deity Shingeshwar. This case is one example of where such cultural ecosystem services can be placed at risk.¹⁴⁷

Key risks and adverse impacts in the on-shore wind value chain





Case Study: **Allowing mixed land use in Gadag, Karnataka**

Background

The first wind turbine in Karnataka was constructed in Gadag District in 1996 and installed by Natural Energy Processing Co (NEPC) India Ltd. Gadag is situated at 659.8 metres above sea level, where wind speed remains in the range of 6.4 to 7 metres per second. The ideal conditions for generating power have resulted in over 800 turbines being installed to date by various companies.

Land acquisition and compensation

Interviews conducted by the research team highlighted a number of positive impacts associated with the site.¹⁴⁸ In fact, almost all of the interviewees signalled that the park and related land purchase arrangements have mostly benefited rather than negatively affected the village inhabitants. Generally, 0.1 acres is required for the installation of one turbine, but the company procured one acre per turbine to account for roads and a consideration for the fan blade radius. Respondents unanimously agreed that the land prices paid by the companies were higher than the market value. However, there were limited instances where farmers felt they had been misled by 'representatives' from these companies and thus received a lower price.

Impact on livelihoods, community and inequity

The developers did not promise jobs for land sellers, but they are providing opportunities nevertheless by giving preference to local people, which has resulted in many being employed in various capacities. Further, almost 90% of the farming families continue to cultivate part of the land - even after selling - as the company allows cultivation anywhere beneath the turbines. It is possible that the area has not experienced a significant outward migration for this reason.

In addition, one of the most significant positive outcomes has been the provision of uninterrupted electricity supply for domestic use. That said, while the community reported a generally positive experience, a village elder expressed concerns about the inability of a few people to cope with such dramatic change. For instance, some who fell into debt after gambling the proceeds earned from selling their land now find themselves unable to buy any land locally, as the prices had increased by a factor of five or six.

Impact on ecosystem

The respondents had not observed any adverse ecological impacts in the area, including on birds.



2.5 Socio-environmental impacts and risks of utility-scale off-shore wind

As off-shore wind projects are yet to significantly take off in India, we have highlighted the potential impacts that might emanate from these, based on observations of similar project impacts in other parts of the world. These risks are flagged in the hope that the RE sector in India can address them from the very outset.

Marine ecosystems

The construction and operation activities associated with off-shore wind farms pose a variety of significant risks to marine biodiversity. The construction of wind turbine foundations and erection of towers has been reported to make the seawater turbid changing the fish distribution nearby.¹⁴⁹ Construction noise forces some fish and aquatic mammals to temporarily relocate.

The pile driving noise additionally risks causing hearing impairment, masking communication, or disorienting animals and fish as they migrate out of the zone to avoid the noise.¹⁵⁰ Vessel movements connected with surveying and installation can also pose a risk to marine animals.¹⁵¹

Whilst the footprint of an off-shore wind turbine is not significant, poor construction practices do pose a risk to the seabed environment. The shoreline construction or extension of docks likewise risks impacting seabed and shore habitats, as well as tidal movements and erosion, if poorly located.

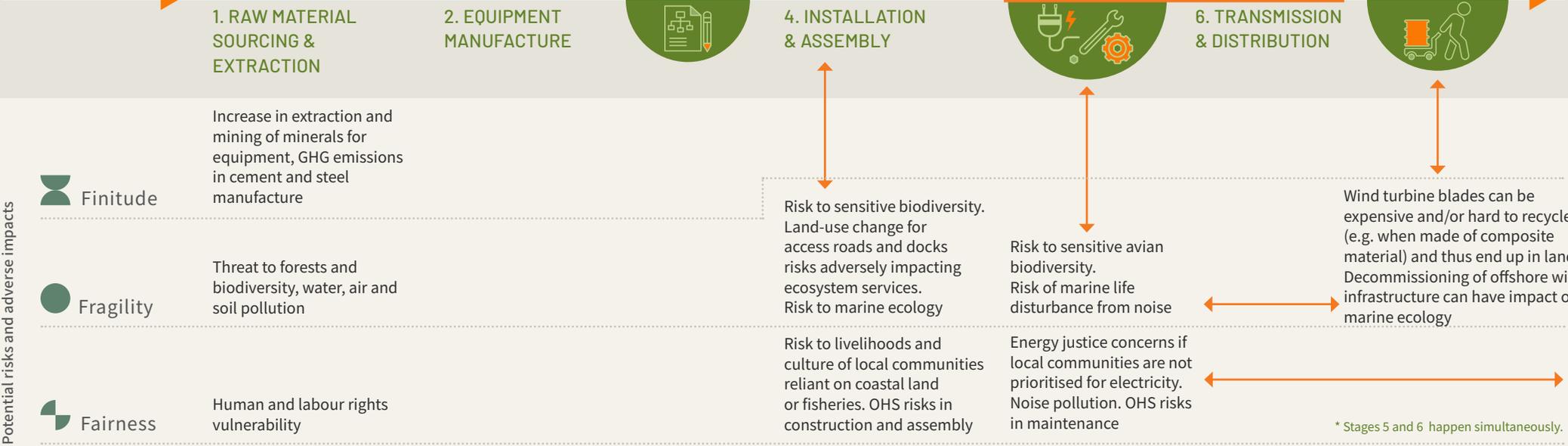
Fishing livelihoods

Initial research suggests that there are both potential negative and positive impacts related to offshore wind vis-à-vis fish stocks, with corresponding impacts on local food security and livelihoods related to fishing.¹⁵²

In addition to the adverse consequences of the disturbance to the marine ecosystem, it can be that wind turbines work as artificial reefs and can potentially increase food sources.¹⁵³

These findings are significant within the Indian context given that the two states with most offshore wind potential (Gujarat and Tamil Nadu) also rank first and second respectively nation-wide for marine fish landings.¹⁵⁴ To the best of the knowledge of the research team, no detailed analyses of the marine ecology and impact on fishery communities have been undertaken at a zone level while mapping the wind potential in India. Neither the Gujarat nor Tamil Nadu off-shore feasibility reports indicate that these livelihood-related impacts have been considered.¹⁵⁵ The due diligence conducted with respect to off-shore wind tends to focus purely on technical aspects, rather than social impacts such as livelihood creation and disruption.

Key risks and adverse impacts in the off-shore wind value chain



2.6 Socio-environmental impacts and risks of Small Hydro Power (SHP)

Occupational health and safety

The construction phase of SHP offers employment opportunities. Yet, grassroot organisations have highlighted that they also come at a high risk with tunnel collapses, rock falls, landslides, and tractor accidents reportedly causing deaths and serious injuries in the Himalayan region for example.¹⁵⁶

Impact on water flow, irrigation and livelihoods

Run-of-the-river projects are usually considered benign on account of storing limited water and using natural gradients to ensure sufficient flow to power the turbines, but they are not without risks. For instance, longer penstock tunnels - the intake structure that controls water flow - can adversely impact the flow of the river, potentially leading to fragmentation and reduced water levels.¹⁵⁷ Moreover, because SHP is often implemented as a series of projects, there can be a cascading and compounding effect on the hydrological system, as well as other ecological systems dependent on the river water.

When not carefully considered, micro and small hydro power plants can impact traditional irrigation systems and livelihoods. In Himachal Pradesh, the *Kuhl* - a low-cost, indigenously-devised, community-managed gravity irrigation system that has been in place for over 300 years - has been disrupted by mini-hydro power plants.¹⁵⁸ The shift in the *kuhls'* flow of water affects irrigation and has impinged on communities' access to drinking water.

Given that a typical community *Kuhl* also powers mills to grind wheat, maize, grams, livestock feed and other grains and spices, any disruption in flow affects the livelihoods that are dependent on these mills.¹⁵⁹

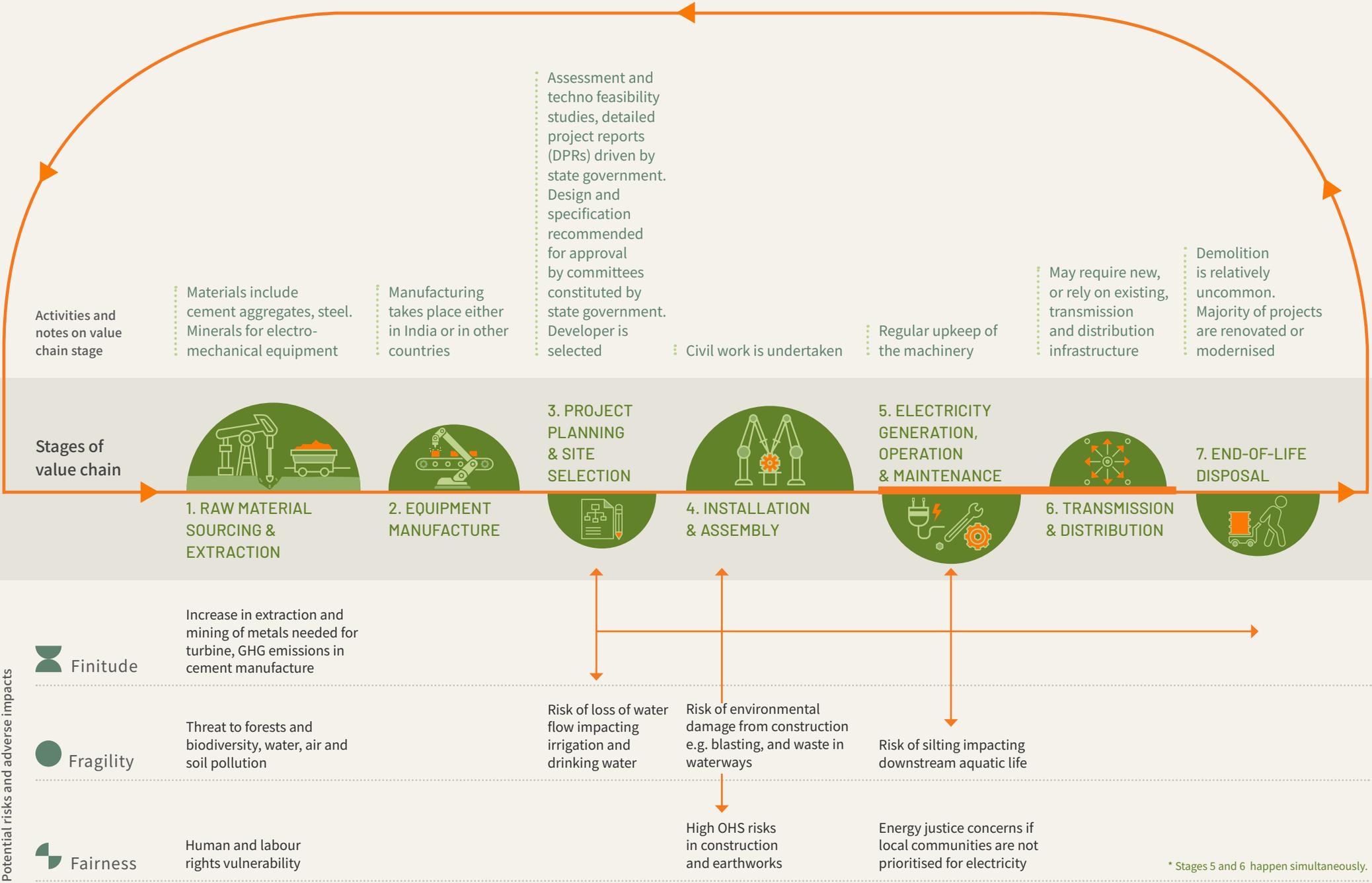
Silting and biodiversity

Silting constitutes a risk in SHP projects. For example, the 8.6 MW Gumti Hydro Plant is estimated to have submerged 46.34 km² of fertile land - home to approximately 40,000 tribal people.¹⁶⁰ This type of change in the flow has been reported to cause downstream silting that negatively impacts aquatic life, including the mahseer species of cyprinid fish in the Western Ghats and trout in the Himalayas.¹⁶¹

Perhaps relatedly, researchers have attributed declining fish stocks to SHP in some locations. For instance, some findings suggest that SHP could be a driver behind a decline in 289 species of river fish in Himachal Pradesh. Of these, 118 are endemic, including rare species of mahseers like the tor khudree and the tor mussullah. When fish ladders are not provided in construction, SHPs are at further risk of impacting fish stocks as a result of blocking migration paths.¹⁶²



Key risks and adverse impacts in the small hydro power value chain



2.7 Socio-environmental impacts and risks of lithium-ion battery storage

Human rights in mining lithium

According to the BHRRRC, the extraction and mining of minerals for use in storage technologies runs a high risk of contributing to child labour and violations of indigenous peoples' rights.¹⁶³ The mining of cobalt and lithium in particular present a high risk of child labour, modern slavery, as well as undermining land and water rights. Whilst various sources of 'green' lithium are being explored, these options are not yet the norm. As such, there is a danger that as demand significantly increases over the next decade, so too will the negative impacts. For context, it has been suggested that lithium demand will double to around 380 LCE kt (lithium carbonate equivalent 1,000 metric tons) before 2024, driven by the expansion in the production of electric vehicles.¹⁶⁴

The world's largest producers of lithium are currently Australia, Chile and China. In recent years however, there has been a significant increase in production in Argentina and a surge in investor interest.¹⁶⁵

Correspondingly, an observable rise in the number of legal challenges by indigenous and rural communities indicates concerns about adverse impacts upon water access and land use changes in ecologically sensitive areas.¹⁶⁶ The lithium-rich Puna highland desert of Salta and Jujuy in Argentina constitutes one such example. Classified in Verisk Maplecroft's water stress index as an "extreme risk", conflict between mine operators

and local populations over water rights have led to 33 indigenous communities from the area filing legal challenges against lithium operations in Laguna de Guayatayoc and Salinas Grandes¹⁶⁷.

Human rights in mining and extraction of cobalt

Over 70% of the world's cobalt is currently produced in the Democratic Republic of Congo (DRC), with the copper belt in the southern Katanga region accounting for almost half of the world's reserves at 3.4 million metric tons. Although much of this is produced at large-scale industrial mines, the DRC government reports that around 20% of cobalt exports from the country originate in artisanal mines, a majority of which are unregulated and operate illegally. Furthermore, approximately 40,000 children are estimated to be employed in artisanal mines in southern DRC, including in cobalt extraction.¹⁶⁸

Verisk Maplecroft's cobalt risk assessment reveals that human rights abuses are widespread in the sector and can occur within both industrial and artisanal mines.¹⁶⁹

End-of-life disposal related impacts

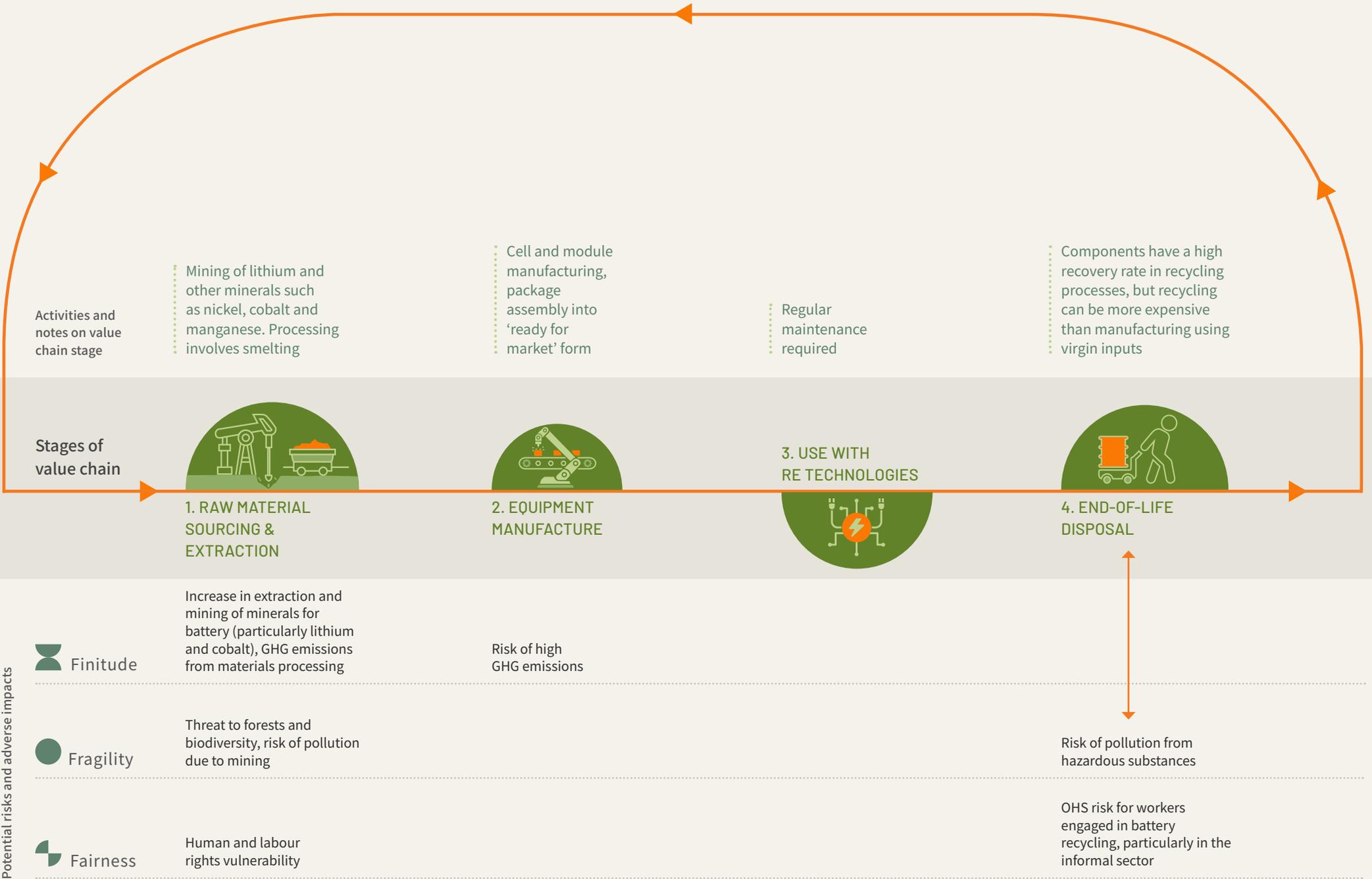
Battery re-use and recycling has been an informal industry in India for some time. The new lithium-ion batteries are more challenging to handle though, and the recycling value chain is still at an incipient stage, with a mix of informal and formal actors. Proper environmental, health and safety management is not prevalent in the dismantling, smelting and disposal of the components of lead acid batteries, with wide

ranging effects related to processing. These include contamination of surface and groundwater, along with the corresponding risk posed to potable water, which is of particular concern for vulnerable communities. Similarly, related health risks are particularly heightened for informal workers and local communities. It is unclear whether this will be significantly different for lithium-ion battery processing.

According to India's Batteries (Management and Handling) Rules, 2001 (as per Environment (Protection) Act, 1986) it is mandatory for every manufacturer, importer, re-conditioner, assembler, dealer, recycler, auctioneer, consumer and bulk consumer involved in the manufacturing, processing, sale, purchase and use of batteries or components thereof, to recycle used batteries and dispose of hazardous waste generated. To date, however, there has been a lack of awareness, as well as weak implementation of these rules.¹⁷⁰



Key risks and adverse impacts in the lithium-ion value chain





2.8 Socio-environmental impacts and risks of hydrogen

Greenhouse gas emissions

The impact of hydrogen will largely depend on the feedstock energy source used to produce it. For Grey and, to an extent, Blue hydrogen, there remains significant concerns that the benefit of low emissions in use is outweighed by the relatively high emissions in production. The extraction of hydrogen from the organic matter or hydrocarbons in which it naturally occurs is chemically and energy intensive. The natural gas used in this extraction process is usually methane - a greenhouse gas approximately 30 times more potent than carbon dioxide. This highlights the high emissions associated with Grey hydrogen in particular. Green hydrogen, on the other hand, has significantly lower emissions at this stage because RE is used to fuel the process.

Safety in handling and use

The safety risks associated with handling, moving and using hydrogen are well recognised. With an increased flammability level compared to most fossil fuels, the probability of a fire or explosion is higher.¹⁷¹ Industry has developed practices that minimise and manage these risks, and with the scaling of the distribution, it will be important to carefully replicate good practices through quality training and management.

Compounding impacts

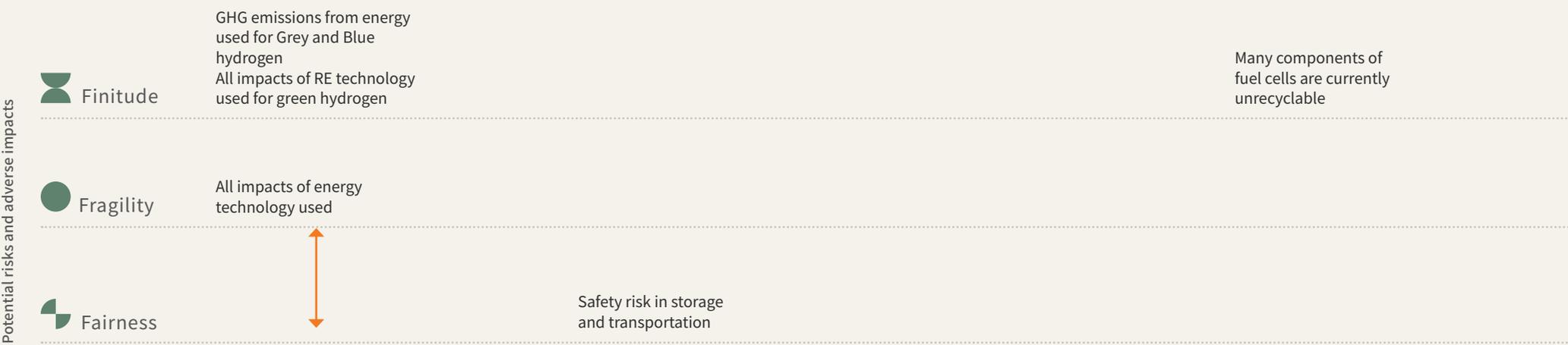
For Green hydrogen, the impacts associated with the early stages of the value chain can be read directly from earlier sections of this report according to what renewable technology is being used to produce it.

Production of hydrogen using renewable electricity and electrolysis requires both significant areas of land for renewable electricity generation and large amounts of water. Community concerns about water and land use can range from environmental protection, to uncertainty about livelihoods, as is the case with other technologies discussed in this section. This is especially the case in instances where hydrogen production is seen to be competing with existing industries and local livelihoods for water and land resources.

End-of-life

Very few, if any, national strategies exist to guide how to manage the end-of-life equipment from hydrogen fuel cells.¹⁷² India is no exception. This is likely due to its nascent stage of sector development, but is a concern given that some components of the various forms of fuel cell are toxic and not yet recyclable.¹⁷³ The degree of concern is further accentuated by virtue of the pace at which the sector is being encouraged to scale.

Key risks and adverse impacts in the hydrogen value chain



[1] <https://theprint.in/world/laptops-to-phones-cobalt-demand-is-booming-congolese-miners-need-more-protection/557944/>

Summary of key risks and adverse impacts posed by the RE sector on Finitude, Fragility and Fairness



Finitude

Fragility

Fairness

Increase in extraction and mining of non-renewable minerals for components (solar, wind, lithium-ion batteries, SHP)
 High GHG emissions in aluminium manufacture (solar), steel and cement (wind and SHP), materials processing (lithium-ion batteries) and direct energy use (Grey and Blue hydrogen)
 All impacts of RE technology used (green hydrogen)

Threat to forests and biodiversity, water, air and soil pollution (solar, wind, SHP, lithium ion batteries, hydrogen)

Significant human rights risks such as abuse of labour rights, rights of indigenous people, right to health, children's rights, environmental rights (related to land and water) and risk of modern slavery - particularly in mining and processing (solar, wind, lithium ion batteries, hydrogen, SHP)

GHG emissions (lithium ion batteries)

Risk of labour rights abuse, e.g. OHS risks related to exposure to hazardous chemicals (solar) and in storage and transportation (hydrogen)

Decisions made at this stage determine many later risks and impacts

Land-use change impacts: ecosystems services such as water recharge, soil nutrient cycling (solar and wind)
 Risk to sensitive marine and terrestrial biodiversity from site and infrastructure construction (wind)
 Risk of loss of water flow impacting irrigation and drinking water (SHP)

Labour rights in construction and earthworks risks especially with regard to OHS (SHP).
 Risk to livelihoods and culture of local communities reliant on land, forests or fisheries, particularly for vulnerable groups e.g. non-landowners (solar, wind)

Greater water stress due to onsite cleaning (particularly groundwater) (solar)

Risk to sensitive avian biodiversity (wind)
 Risk of wildlife disturbance from noise (wind)
 Risk of silting impacting downstream aquatic life (SHP)

Right to food and water related risks due to competition for water and land with agriculture and other local needs (solar) and impact on fish (SHP)

Risk to biodiversity from transmission lines (all grid-connected technologies)

Energy justice concerns if local communities not prioritised for electricity (solar, wind, SHP)
 Noise pollution (wind)

Massive volumes of unrecyclable or hard to recycle waste (panels and blades in particular) risk overwhelming landfill (solar, wind)
 Many components of fuel cells currently unrecyclable (hydrogen)

Decommissioning infrastructure poses risk to local ecology, particularly in marine environments (wind)
 Risk of pollution from hazardous substances (solar, lithium-ion batteries)

Right to health related risks due to panel and battery waste. Labour rights, particularly OHS risk to workers engaged in recycling particularly in informal sector (solar, lithium-ion batteries)

Stages of value chain



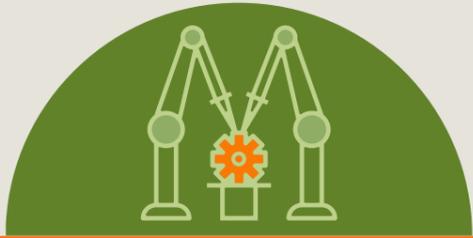
1. RAW MATERIAL EXTRACTION, SOURCING & PROCESSING



2. EQUIPMENT MANUFACTURE



3. PROJECT PLANNING & SITE SELECTION



4. INSTALLATION & ASSEMBLY



5. ELECTRICITY GENERATION, OPERATION & MAINTENANCE



6. TRANSMISSION & DISTRIBUTION



7. END-OF-LIFE DISPOSAL

Learning from the experience of the Decentralised Renewable Energy sector

As a longstanding recipient of impact investment, the Decentralised Renewable Energy (DRE) sector in India has long been seen to demonstrate positive impacts across environmental and social spheres, including in relation to upholding human rights. Whilst more empirical research is needed to understand the full extent of these benefits, it is worth exploring what large scale RE could learn from the DRE experience.

Could it ensure public health, particularly for the underserved?

Many states have already adopted DRE to augment their healthcare infrastructure. This may be for powering critical equipment, such as those necessary for vaccine and essential medicine storage, surgical lights and radiant warmers. A notable example of this has been demonstrated by the Chhattisgarh Renewable Energy Development Agency (CREDA), which spearheaded efforts to install

off-grid solar systems across 866 primary healthcare centres.¹⁷⁴

DRE has further improved access to healthcare via mobile facilities, such as the solar-powered boats serving as primary healthcare centres to facilitate access to affordable and reliable health services for thousands of people residing in Majuli island of Brahmaputra river in Assam.

Could it power more sustainable livelihoods and empower across gender, class and caste?

Despite often paying higher tariffs, rural livelihoods have benefited from DRE. For instance, solar powered rice mills, poppadum machines, roti makers and smith machines have each played an important role in empowering small rural entrepreneurs, reducing dependence on fossil fuels and enhancing their incomes. There have been a few notable case studies which demonstrate the significant potential of solar energy for generating positive development outcomes in communities. SELCO's efforts to train women solar technicians in the early 2000s began as

a means to accomplish its business goals i.e. to provide customer home-based repair of solar lanterns and cook stoves.¹⁷⁵ However, it soon became apparent that, as women became engaged in delivering energy solutions, they took on more active roles in their communities, perhaps contributing to a gradual shift in the social and cultural norms that previously acted as barriers to their agency.

In Tilonia, a town 110 km south-west of Jaipur in Rajasthan, Barefoot College teaches rural women how to fabricate solar panels, lights and PV circuits. These women - many of whom are illiterate and come from marginalised communities - have become known as 'Solar Mamas' and are playing a leading role in bringing energy access to their communities. In the words of 25-year old Santosh Devi, a young Dalit woman, "I am now a solar engineer who can install and repair lights and panels for the villagers. People of all castes come seeking my help. I had never imagined that this would be possible in my village".¹⁷⁶

Acknowledging that some impacts are not unique to the RE sector

It is important to acknowledge that not all of the adverse impacts outlined in this report are unique to the RE sector. Some are common across the energy system, including with fossil fuel sources. Others span multiple sectors.

Examples of impacts common across multiple energy technologies include the risk transmission lines pose to biodiversity and the role this can play in exacerbating human-wildlife conflict. A further example is the multitude of risks associated with an unjust transition for employees and communities reliant on fossil fuel energy jobs and related livelihoods. We have not included these in this section as they have been cited widely in a range of peer-reviewed publications.

The social and environmental impacts of large scale land-use change are common to many infrastructure sectors, not just energy. The human and labour rights challenges in mining and extraction are shared by the electronics, jewellery and surgical implants sectors amongst many others. The challenge presented by battery waste as their use increases is shared by the electric vehicle sector for instance. Similarly, a reliance on carbon intensive materials including steel, aluminium and concrete spans many sectors. These are just a few of the challenges that the RE sector shares with others.

The intent of this report is to highlight where the RE sector has an opportunity to take individual and collective action, and take the lead in collaborating with others across sectors and countries towards a just and regenerative future.



**How are market actors
in the RE sector responding
to environmental and
social impacts?**



3. How are market actors in the RE sector responding to environmental and social impacts?

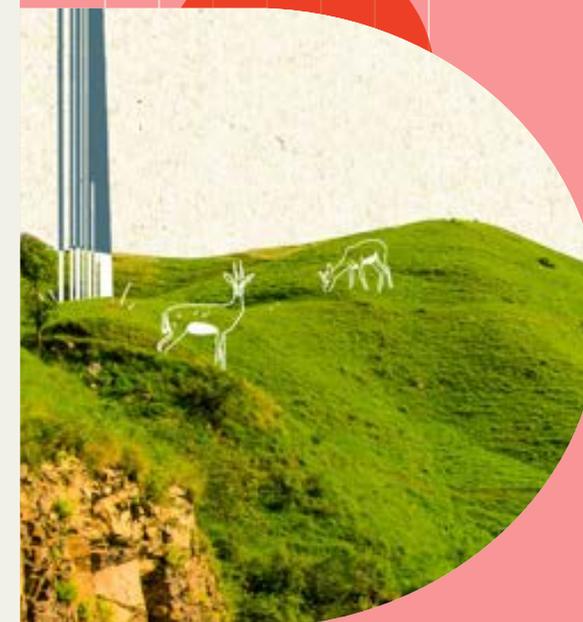
As India ambitiously undertakes the necessary transition towards a low carbon economy, it is critical that its future energy system is designed to foreground planetary health, human dignity and well-being. An important step in that direction is establishing robust accountability frameworks for renewable energy projects such that actors are aware and incentivised to integrate environmental and social imperatives into their business models and value chains.

There is also an opportunity to create an enabling environment for market actors in the renewable energy system to go beyond foundation-level compliance with Environment, Social, Governance (ESG) standards by building RE value chains that are regenerative and rights-respecting for both current and future generations. As the previous section highlights however, there is still some way to go in achieving either of these desired goals.

3.1 RE developer responses to ESG responsibilities

RE developers in India demonstrate a range of responses to their environmental and social responsibilities. At one end of the spectrum, some developers predominantly undertake CSR programmes, community investments and philanthropic activities, under the aegis of the CSR provisions of the Companies Act (for more information see corporate governance mechanisms on page 55), to satisfy their environmental and societal obligations.

Other developers go further for various reasons, including that of investors or financiers placing expectations upon them to demonstrate ESG compliance. Alternatively, it may be that their parent companies have long histories of measuring and reporting on their environmental and social impacts and have made commitments to internationally recognised environmental and human rights standards, such as those prescribed by the Science Based Targets Initiative (SBTi) or the International Labour Organisation's conventions on core labour standards,¹⁷⁷ at least for some parts of their value chain. These developers may conduct environmental and/or social impact assessments (E/SIAs) and impose ESG requirements on their contractors or suppliers through codes of conduct and contractual stipulations.



During stakeholder consultations, corporate executives from RE companies did acknowledge the need for increased environmental oversight and ESG governance. At the same time however, they did not necessarily want increased regulation on environmental and social clearances. In many instances, this was for fear of increased regulation posing a barrier to scaling production, particularly given the delays and other perceived hurdles that the impact assessment processes may cause.

Currently, land acquisition, waste disposal, water security and pollution, material consumption, afforestation, biodiversity protection, and labour rights are the environmental and social impacts that RE developers are most responsive to. In addition, a number of them invest in community initiatives around health, education and livelihoods, water and village infrastructure. Whilst land acquisition impacts are highly material to developers, there is a view that their responsibilities towards related impacts are limited by virtue of the government playing such a central role in the acquisition process. End-of-life impacts, especially in relation to solar panels, are beginning to be

recognised as material risks by some developers, though how to address the challenge is not yet clear to them.

In summary, the RE sector is acknowledging that they have an environmental and social footprint that needs managing and, to varying degrees, they are establishing the structures for enabling ESG compliance, often with reference to the IFC performance standards (see box on page 54). From the publicly available information however, there is less insight into the implementation of their ESG policies and practices, nor is there a comprehensive sense of the impacts on the ground. To some degree, data on the breadth and depth of the environmental and social impacts is still emerging, and as such, efforts will need to be made by the developers to continually monitor, respond to and align their policies to emerging risks. There is also a step further that they - and their investors - can go in realising the potential they have to transcend from a baseline of ESG compliance, to exploring business behaviours and operations that will produce regenerative and socially equitable impacts and set a different norm for the energy sector.



Top five RE developers in India (by cumulative installed capacity, June 2020) and their ESG responses.¹⁸¹

The information in this table derives directly from the most recent annual sustainability or integrated reports made publicly available by the featured RE developers. It does not present an independent evaluation of their strengths or weaknesses.

ReNew Power¹⁸²

- “As a renewable energy company, our core business has positive cascading effects on various aspects of sustainable development, permeating right down to the last mile and empowering communities in rural areas where we have our operations. Our overarching goal is to act as a responsible corporate and arrest the worryingly rapid pace of climate change through well planned initiatives focused on building resilient communities.”¹⁸³
- The company claims to have generated “almost 85,000 jobs, directly and indirectly over 10 years of its operation.”¹⁸⁴
- Implements Environmental and Social Management System (ESMS) at corporate and project level, factoring in country regulatory requirements and transnational standards, predominantly IFC performance standards and environmental, health and safety guidelines, and ADB’s Safeguard Policy and OPIC’s guidelines.
- ESMS requirements include conducting ESIA’s for all projects, accounting for and managing land acquisition-related risks, and having stakeholder engagement and contractor management policies that ensure vendors and suppliers comply with sustainability requirements.
- The company claims that generation facilities comply with pollution, emission and noise norms in force.
- The company foregrounds its CSR initiatives including the ‘ReNew India Initiative’ which focuses on electrification of rural schools through off-grid based solutions, community-based water management, self-employment and social economy enterprises for rural women, and supporting education programmes.

Greenko Energy Holdings¹⁸⁵

- “Our main shareholders, GIC and ADIA, both view Environmental, Social, and Governance (ESG) factors, as central to their core tenets and believe that companies with an innovative and creative mindset and good sustainability practices are more likely to perform well on multiple parameters in the long term. The company has augmented its ESG risk management by assessing and addressing climate risks, this year.”¹⁸⁶
- The company claims that all eligible wind and solar projects undergo a voluntary ESIA, or are evaluated through their ESMS, based on IFC’s Performance Standards.
- ESMS requires that its impact assessments “must conclude negligible environmental or social disruption”¹⁸⁷ before projects proceed.
- Greenko has a stakeholder consultation process to engage local communities as part of process.
- Greenko Integrated Management Systems (GIMS) and corporate Environment, Health and Safety (EHS) functions ensure group’s activities respect, promote and advance internationally recognized environmental principles and commitments.
- Greenko’s ESMS provides the structure for on-going monitoring of the environmental and social impacts of its operations.
- Audits are undertaken to ISO 14001:2015 standard and are integrated into procurement with more than 50% of suppliers certified for ISO 14001.
- The company recognises end-of-life impacts as a “big challenge”¹⁸⁸ for its solar and wind businesses and is investing in circular solutions.
- Greenko pays particular attention to biodiversity impacts and has formed conservation partnerships with WWF, federal and state-level government.

Acme Solar Holdings¹⁸⁹

- Publicly available materials on website only cover CSR activities activated in compliance with the Companies Act.
- Activities include rural transformation through sustainable livelihoods; addressing hunger and malnutrition and sanitation; access to healthcare and education; addressing environmental sustainability and conservation of natural resources; and disaster response.¹⁹⁰
- Publicly available information from the Asian Development Bank indicates that the company has an ESMS to screen, assess, and address environmental and social impacts and risks.¹⁹¹ In 2014, the ESMS was substantively compliant with ADB’s Safeguard Policy requirements, though some gaps in implementation were noted for corrective actions.

Adani Green¹⁹²

- Group commitments to “increase its ESG footprint by realigning its businesses with emphasis on climate protection and increasing community outreach through its CSR programme based on the principles of sustainability, diversity and shared values.”
- Adani Green notes that ESG is critical to all business decisions.
- Its ESG practices are framed according to IFC Performance Standards and UN Sustainable Development Goals (SDGs).
- The CSR programme is run by Adani Foundation.
- Adani Green has a structured ESG policy that frames its practices for managing its supply chain impacts; that sets out a responsible procurement policy; that obligates its key suppliers to implement an ESMS system; and that provides guidelines for its contractors on OHS and the treatment of workers.
- Its ESMS is based on IFC Performance Standards, ISO14001:2015.
- The company states that in 2019-20 it “did not execute any operation/ project which falls in ecologically sensitive areas, which are owned, leased, managed in, or adjacent to protected areas, and areas of high biodiversity value outside protected areas”.
- It has made commitments to “climate awareness, readiness and alignment”, with managing carbon emissions a stated priority. It monitors and measures direct and indirect emissions, though on Scope 3, it currently only covers emissions from transportation operations of contractors.
- The company states that it opts for barren non-cultivable land and “proactively optimises its designs to reduce land use” ensuring “minimal or no displacement/ disruption of communities at the project stage”. Third parties carry out environmental and social impact assessments to study the environmental, biodiversity and community impacts and the company claims to mitigate “any significant identified impact”. It claims to pay attention to cultural and heritage sites and “areas of significant to indigenous communities. Its Land Acquisition Policy¹⁹³ requires a ‘lease and sale approach’ for its projects, and does not require resettlement
- or rehabilitation of any community as it only purchases non-fertile or barren lands.
- The Group Human Rights Policy references core principles of International Labour Organization (ILO), including freedom of association and collective bargaining, health and safety of workforce, eradication of child or forced labour and harassment or intimidation in the workplace.
- The company states that all acquisitions, mergers and investment decisions “take human rights related clauses into consideration.” and supplier onboarding includes human rights provisions.
- Its stakeholder and community engagement approach follows IFC’s Performance Standard, with the ESMS providing a grievance redressal mechanism comprising grievance registers at sites.

Azure Power¹⁹⁴

- Azure Power states that its ESH approach is influenced by majority shareholders: Caisse de Dépôt et Placement du Québec (CDPQ), IFC and Global Infrastructure Fund (GIF).
- States Social, Health, Environmental and Safety (SHES) Policy enables it to “develop environmentally safe and benign practices”.
- Its ESMS follows IFC Performance Standard and ISO 14001.
- An app-based interface to collect information for SHES system, including Risk & Incident Investigation Reports (RIR), stakeholder grievances and engagement reports.
- It uses an Ecological Management Plan and Biodiversity Assessment where deemed necessary.
- It monitors Scope 1 emissions from owned vehicles, Scope 2 emissions from electricity used at its plants and guesthouse, and Scope 3 emissions from personal vehicles used in employees’ commutes. It participates in carbon offset programmes and sells carbon credits from its own energy production.
- Water usage is approached through an “intertwined lens of efficiency, conservation and our position as a responsible citizen.” It uses new robotic technology for dry cleaning of its solar panels; it claims not to withdraw groundwater and that it only uses authorised vendors. It intends to build water harvesting facilities to offset its water usage as part of its aim to become water neutral by 2023.
- The company did not detail its land acquisition policy in its integrated report but states that “to the extent possible.. [it uses] land that has no alternative use.
- Human Rights Policy prohibits use of forced labour, and hiring of individuals under 18 years for hazardous work.
- The company claims that “promote[s] a culture of open and transparent two-way communication between the employees and the management and adheres to Indian Law..”, but does not have a formal collective bargaining process publicly available.
- It states that it “communicates and partners with the local community to ensure smooth and collaborative project implementation and prevent any associated risks” and “strive[s] to maintain a harmonious relationship with the local community including indigenous people, by considering their viewpoints and honoring their values and customs.”
- It claims that it did not receive any reports of abuse of rights of indigenous people during FY2019-20.
- It states that it puts in place a project-specific stakeholder engagement plan for each project, and it makes available a grievance redressal mechanism for project staff and communities at project locations through which they can register concerns which the project/ plant manager can respond to.
- Its suppliers code of conduct comprises company policies on anti-bribery and corruption, banning of child and forced labour, non-discrimination (equal opportunity) and freedom of association, and OHS; and clauses on the “provision of acceptable living conditions...banning of corporal punishment or similar disciplinary practices..limits on maximum working hours.. and payment of minimum living wages.” Suppliers are encouraged to reduce emissions “through rewards and penalties.”
- Its CSR programme focuses on preventive healthcare, sanitation and safe drinking water; promoting education, employment and enhancing vocational skills; and land and livelihood for rural areas.

3.2 Leveraging corporate governance and market-based mechanisms to embed good environmental and social practices in the RE sector in India

Although there is a clear and urgent imperative to address existing challenges in state-based governance of the RE sector's social and environmental impacts, other sectors (such as textiles and fashion) have demonstrated that a combination of corporate governance and market-based mechanisms can be highly consequential in ensuring the sector recognises and responds to its responsibilities. Within RE, even in the absence of state requirements on RE developers to conduct environmental impact assessments, investors are shaping norms and behaviours of developers when making them a condition of financing. Whilst these mechanisms should be seen as complementary rather than as a substitute for state-based governance, they can be a powerful means of enabling greater accountability.

India has a number of corporate governance mechanisms that could be applied in ways that encourage the RE sector to address its environmental and social impacts. These include provisions under the Companies Act and disclosure obligations mandated by the Securities Exchange Board of India (SEBI), as well as soft law requirements such as the National Guidelines on Responsible Business Conduct (NGRBC). (See Corporate governance mechanisms box on page 55). Currently however, there is a weak narrative on the specific applicability of these mechanisms to the RE sector and a general lack of evidence of fulfillment.

One of the stronger drivers for environmental and social accountability within the RE sector in India appears to be the World Bank and IFC Performance Standards and similar compliance provisions from other international financial institutions, such as the Asian Development Bank and the Asia Infrastructure and Investment Bank. These accountability mechanisms typically call for developers to have Environmental and Social Management Systems (ESMS) to address four areas: issues in connection with siting and land acquisition; baseline assessments for environmental, ecological/ biodiversity and social impacts; stakeholder engagement; and the inclusion of grievance redressal mechanisms.

IFC Performance Standards and the World Bank's Environmental and Social Framework

Two accountability mechanisms have been particularly influential in shaping the ESG policies and ESMS of RE developers in India:

IFC Performance Standards:

Includes eight performance standards¹⁹⁵ for project finance: Assessment and Management of Environmental and Social Risks and Impacts; Labour and Working Conditions; Resource Efficiency and Pollution Prevention; Community Health, Safety and Security; Land Acquisition and Involuntary Resettlement; Biodiversity Conservation and Sustainable Management of Living Natural Resources; Indigenous Peoples; and Cultural Heritage.

World Bank Framework and policies:

The Environmental and Social Framework (ESF)¹⁹⁶ enables finance

recipients to manage project environmental and social risks. The ESF consists of, inter alia, the Bank's Environmental and Social Policy for Investment Project Financing (IPF), Environmental and Social Standards (ESS) and Bank Directive on Addressing Risks and Impacts on Disadvantaged or Vulnerable Individuals or Groups. In addition, the World Bank has 11 operational policies¹⁹⁷ related to environmental and social matters, including on the protection of natural habitats and forests, rights of indigenous Peoples, involuntary resettlement and physical cultural resources. In its partnership with MNRE and IREDA to finance utility scale solar parks, the World Bank requires all projects to follow a separate Environmental and Social Management Framework (ESMF)¹⁹⁸ based on World Bank and IFC standards, and national and state regulations.

Corporate governance mechanisms applicable to the RE sector

RE companies are subject to the same corporate governance regime as other companies. The key mechanisms include:

- **Companies Act 2013:** Section 166 imposes a fiduciary duty upon directors to consider the interests of stakeholders and the protection of the environment when promoting the objects of the company. Section 135 mandates companies with a net worth of INR 5 billion or more, or an annual turnover of INR 10 billion or more, or net profit of INR 50 million or more, to spend 2% of their average net profits of three years on CSR.¹⁷⁸ Eligible CSR activities are outlined in Schedule VII of the Companies Act which currently includes those pertaining to eradicating hunger, poverty and malnutrition, promotion of education, gender equality and empowering women, promoting healthcare, including preventive healthcare and sanitation, promotion and

development of traditional art and handicrafts, ensuring environmental sustainability and ecological balance, rural development projects and promoting employment, enhancing vocational skills, especially among children, women, the elderly and the differently abled, as well as livelihood enhancement projects. RE developers typically comply with this CSR regulatory requirement through projects designed to benefit communities in their areas of operation though, critically, there is no requirement that these projects directly address environmental or social impacts emanating from the production or deployment operations of their business.

- **The Securities Exchange Board of India (SEBI):** SEBI Listing Obligations and Disclosure Requirements (LODR Regulations) mandate the submission of Annual Business Responsibility Reports (ABRRs) by the top 500 listed companies on the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE).¹⁷⁹ These should align with

the requirements of the National Guidelines on Responsible Business Conduct (NGRBC). SEBI also mandates the disclosure of voting policies by asset management companies featured in their websites and annual reports, as a means of building a stewardship role for investors. In addition, the Companies Act and SEBI's LODR Regulations state that certain companies must establish a vigil mechanism for directors and employees to report grievances and to provide safeguards against the victimisation of such persons. Further, a whistleblower policy is also required, allowing stakeholders to report illegal or unethical practices.

- **National Guidelines on Responsible Business Conduct (NGRBC):**¹⁸⁰ Established in 2018 by the Ministry of Corporate Affairs, the Guidelines are designed to assist businesses to “perform above and beyond the requirements of regulatory compliance”. Businesses are expected to have policies, structures and procedures in place, as well as to adopt a set of principles that cover

the responsibility to conduct and govern themselves with integrity in a manner that is ethical, transparent and accountable; to provide goods and services in a manner that is sustainable and safe; to respect and promote the well-being of all employees, including those in their value chains; to respect the interests of - and be responsive to - all their stakeholders; to respect and promote human rights; to respect and make efforts to protect and restore the environment; to be transparent and responsible when engaged in influencing public and regulatory policy; to promote inclusive growth and equitable development; and to engage with and provide value to their consumers in a responsible manner. A Business Responsibility Reporting Framework provides a voluntary internal tool to report on actions taken and progress made. Critically, the NGRBC extends to the overseas operations of Indian MNCs and those among the top 500 listed companies in India have to report on mandatory disclosures requirements for their complete operations.

These compliance standards - alongside a recognition that energy projects are high risk investments because of their dependence on land acquisition and the inherent potential for ecological and social impacts associated with it - are also influencing the application of similar ESG frameworks by other financial actors investing in RE in India. On the whole, however, the application of these frameworks is best described as nascent. In part, this reflects the generally incipient nature of responsible investing practices in India. A further reason however is that RE is viewed and categorised as 'green' or 'clean' energy. This product-led denomination has meant that simply investing in the sector is often accepted as satisfying ESG criteria, and as such, there is little impetus to further scrutinise how equipment is produced or deployed by the developer or other actors in the value chain.

At present, it is the large foreign private equity investors that are more likely to demand environmental and social impact assessments and other forms of due diligence, especially at the pre-investment stage and early stages of deployment, such as in relation to siting decisions. While investors typically deploy a range of control and monitoring mechanisms through their investments, such as by exercising voting rights and being part of company boards, the extent to which they continue to monitor ESG impacts through project lifecycles and particularly in later stages of deployment where there may be more critical environmental and social impacts, is not always clear. A further gap is that less attention is being paid to the ESG impacts of value chain activities outside of India, such as the sourcing of minerals or production of the panels or turbines.

That said, ESG investing does present a clear opportunity to catalyse more concerted action on the part of RE developers. The increase in the number of ESG funds in India and growing numbers of signatories to the UN-supported Principles for Responsible Investment (PRI) bode well in this regard. The challenge ahead lies mainly in deepening investors' understanding of the potential the RE sector has to holistically contribute towards a just and regenerative future through its value chain. The challenge and opportunities further depend on the extent to which investors shift their engagement with the sector beyond foundational compliance with ESG standards, to incentivise RE developers towards exploring more transformative business models and practices.

ESG compliance requirements from the banking sector

Whereas there are clear signals of an emerging practice amongst investors in applying ESG to the RE sector in India, there is less evidence of similar activity in relation to banks. Generally, banks lending to the RE sector are not recognising the full extent of ESG risks across the value chain. As an example, IREDA¹⁹⁹ notes in its Annual Report that it views "RE projects as the most environmentally benign and socially acceptable projects"²⁰⁰ and even though it does apply its Environmental and Social Management System (ESMS) to these projects, it sees them as having relatively "minimal impacts".²⁰¹ Again, as is the case with investors, this low-level consciousness and engagement is likely to be commensurate with the maturity of ESG practice within the Indian banking industry. Institutions such as the Reserve Bank of India (RBI) have recognised

the importance of principles around sustainability and responsible business conduct for lending and financing institutions and have identified the need for banks to reference and apply the Equator Principles.²⁰² At this stage, however, the risks emanating specifically from the RE sector are not fully on the radar. The one notable exception is with regards to the attention banks pay to ESG issues in the context of land acquisitions for RE projects.

3.3 The role of industry associations

There is a wealth of industry associations representing various elements of the RE sector's collective voice in India. Emerging evidence suggests that some of these associations are playing an important role in proactively identifying current and future challenges for their parts of the sector and establishing task forces to shape a response. For instance, the National Solar Energy Federation of India is in the process of examining the issue of solar panel waste on behalf of its members. There are lessons to be learnt from associations in other countries in order to ensure the scope of attention is broadened. In the U.S. for example, associations are paying attention to social issues in the value chain, culminating in the Solar Energy Industries Association's (SEIA) pledge to eliminate forced labour in the solar value chain being signed by 175 companies, including some of the largest solar manufacturers in the world.²⁰³

3.4 Sustainable procurement of renewable energy

Whereas sustainable / responsible procurement is now an established practice with companies accounting for the social and environmental impacts of their suppliers, its implementation with regard to suppliers of RE is still minimal. When interviewed, the procurers of RE expressed a view that this is partly attributed to the industry being regarded as inherently 'environmentally-friendly'. Thus, despite having established ESG policies and practices that they apply to other suppliers, procurers were less attuned to how they apply to this sector and product.²⁰⁴ Moreover, the existing regulatory regime does not compel or encourage procuring companies to account for adverse environmental or social impacts relating to RE procurement choices. Instead, the primary focus of creating the most competitive clean energy auction market appears to have further discouraged procurers from requesting voluntary environmental and social impact assessments from project developers.

Another possible reason for the weak application of ESG policies by RE procurers in India could be that they experience volatility in their operating context. Abrupt policy reversals, frequently changing statutory

charges and violations of the 'must-run' status, grid access issues, infrastructure upgradation and PPA renegotiations all result in less time and resources being available for attention to ESG in procurement beyond legally mandated requirements.

That said, amidst this complex picture, there are examples of specific sustainable procurement policies being applied to RE. As an example, Apple's Supplier Clean Energy Program expressly calls upon its suppliers to "uphold stringent accountability standards to ensure that all clean energy can be verified". It further states that, "to ensure that our program achieves the greatest positive impact, we require stringent social and environmental reviews of all supplier clean energy projects".²⁰⁵

Those procurers that are paying attention to the impact of their RE suppliers recognise waste disposal (solar panels in particular) and responsible sourcing as areas of concern, though on the former the prevailing view is that the responsibility lies with the manufacturers. Only one of the companies interviewed perceived the sourcing of raw materials for the production of panels and turbines as an issue within their sphere of influence or responsibility.





**Case-study:
Investor Actis introduces ESG
practices to Ostro and Sprng Energy**

Actis is an emerging markets infrastructure investor that has described 'high environmental, social and governance standards' as a 'hallmark' of its investments. Its approach stems from a belief that "strong sustainability credentials in a business are integral to its value".²⁰⁶ ESG factors thus form an integral part of the Actis Energy Impact Model as it assesses value drivers in its energy investments across the categories of Finance, People, Social / Community,

Infrastructure, Environment, and Governance.²⁰⁷ In the course of providing seed capital to Sprng Energy and Ostro (now owned by ReNew Power), it catalysed the development of labour rights policies that both developers rolled out across their value chains.

In 2014 and 2017 respectively, the firm established the Ostro and Sprng Energy platforms, which involved the following activities and showcases the inherent potential of investors as drivers of best practice in the RE sector:²⁰⁸

- Sprng conducted an impact study incorporating noise and shadow

flicker work on wind turbines and biodiversity analysis.

- Sprng has in place best-in-class health and safety standards across all sites and requires contractors to adhere to these.
- Sprng's labour terms include offering fair wages and good working conditions that are reportedly among the best for the industry in India.
- Actis' Responsible Investment team and Ostro created a Labour Accommodation Standards Policy to set standards for worker accommodation and labour conditions, as well as guidance regarding access to safe drinking

water and sanitary facilities.

This was enforced across all projects and embedded into contracts with construction companies with the expectation of roll-out to contractors and subcontractors. A Security and Human Rights Protocol was also developed, referencing UN guidelines.

- Sprng established a healthcare programme for the local community near one of its projects with plans to replicate this initiative across sites.
- Ostro constructed water tanks and provided solar powered water dispensing ATMs to communities in Rajasthan.

Case-study: ESG at the Green Growth Equity Fund

EverSource Capital is the fund manager of the Green Growth Equity Fund (GGEF), established with anchor investment from India's National Investment and Infrastructure Fund (NIIF) and the UK's Foreign, Commonwealth & Development Office (FCDO). The Fund invests in India across renewable energy generation and distribution (utility-scale, C&I distribution), resource efficiency (waste and water), e-mobility and energy services (energy efficiency, energy storage, Operations and Management services, as well as asset management) and other emerging green sectors.²⁰⁹

EverSource's ESG Policy and ESG Management System (ESGMS) integrate ESG risk management into the Fund's investment processes. Both reference local and national environmental and social legislation, as well as various ESG-related international frameworks adopted by the FCDO, NIIF, the Green Climate Fund, FMO, World Bank/ IFC, and the UN Guiding Principles on Business and Human Rights.²¹⁰ Additionally, the Fund has aligned its impact strategy to the United Nations Sustainable Development Goals (SDGs). The indicators identified in line with these SDGs have been set out as a framework to measure the impact created through the Fund's investee companies.

Procedures followed in the Fund's investment process to ensure that ESG commitments are met include: screening ESG issues in potential investees; conducting ESG due diligence to understand ESG risks and levels of compliance; developing an ESG action plan and timeline based on the outcome of diligence and incorporating these into the shareholder's agreement; and regular monitoring and review of companies and reporting to the Board.²¹¹ Meanwhile, key aspects of the ESG due diligence include physical site visits; data of employees, (sub)contractors and workers on the target investment's premises; an overview of corporate level management systems for ESG aspects; as well as checking environmental and social compliances of sample projects/

subsidiaries/verticals.²¹² Additional core elements of its ESG Policy clarify that:²¹³

- Where international standards are more stringent than Indian laws, GGEF will apply national requirements to investees, but expect the implementation of targeted actions to meet international standards over an appropriate timeline.
- If issues related to land acquisition, involuntary resettlement and/or Indigenous peoples are identified after project approval, due diligence or contract signing, then the investee will need to implement project specific requirements to address any such issues.

Towards a just and regenerative RE sector



4. Towards a just and regenerative RE sector

4.1 What does this tell us?

The research conducted for this report suggests an RE sector that, while producing low-carbon energy, cannot be assumed to be inherently sustainable.

A complex mix of factors (some of which are mapped on the Key Forces diagram on the following page) have meant that, the RE sector is still evolving with regard to managing the environmental and social impacts along its value chain.

It is clear that a more robust approach is necessary in order to address critical impacts emerging in the RE system in India - including the impacts of land-use change, water use, biodiversity impact, energy injustice, and labour and human rights abuses. These impacts are complex, and most are not restricted to the RE sector alone. Instead of being a limiting factor however, this indicates an opportunity to take the lead and collaborate to drive far reaching impact.

During the course of this research, several sector leaders, large RE procurers and investors have shared their recognition that now is the time to move from the current reactive stance, to a proactive approach that systematically manages impacts and applies the just and regenerative principles throughout the life-cycle and value chain.

Recognising and identifying environmental and social implications, and correspondingly implementing ESG approaches, is a necessary first step on the journey towards a just and regenerative approach, not only for RE but for every sector. From this first step there is a real opportunity to move beyond doing 'less bad' to pioneering business models that enable social justice and economic resilience, as well as the regeneration of ecosystems and social fabric. It demonstrates the possibility that efforts to achieve a 'just transition' towards a low carbon future can, and should, go far beyond traditional definitions to also look at the impacts of what is transitioned to, and how. This moment of exponential scaling is an opportunity to enable broad reaching transformation that sets India up for long term prosperity.

These impacts are complex, and most are not restricted to the RE sector alone. Instead of being a limiting factor, this indicates an opportunity to take the lead and collaborate to drive far-reaching impact



Key forces affecting the adoption of just and regenerative RE in India

LANDSCAPE:
The big picture 'operating context' of long term megatrends and shared social values

Significant surge in uptake of ESG in investment and finance community globally

Companies recognising those with good ESG practice are proving more resilient to economic downturn

India's low per capita electricity consumption is seen as a sign of its low growth, creating a perverse incentive to consume more power

Increasing recognition across multiple stakeholders of lighthouse issues e.g. solar panel waste

Increasing domestic manufacturing and finance means greater local control and influence

Shrinking civil society space with minimal avenues for redress

REGIME:
The mainstream, day to day business as usual

Price / tariff pressures lead to a focus on short-term cost cutting and a lack of resources

Lack of incentives through public governance to take responsibility for value chain impacts

Assumption from investors, procurers and policy makers that the RE value chain is inherently sustainable

Tendency to emphasise CSR activities over preventing or mitigating environmental and social impacts emanating from core business operations and the value chain

Pressure from investors upon developers to implement ESG compliance

Tick box attitude to E/SIAs, rather than seeing them as means of identifying opportunities to create more value

Cycle of blame between stakeholders, as each control different impact determinants (e.g. siting decisions)

Lack of nuanced narrative in media and research on value chain impacts of RE

Narrow definition of *Just Transition* means efforts focus on supporting people moving from fossil fuel sectors, and don't consider people affected by what we transition to, and how

NICHE:
The margins of the mainstream - social & technical innovations

Partnerships with civil society as providers of enabling solutions and tools e.g. Site Right

Recognition of need for new paradigm in ESG frameworks: assessment of impacts over time and meaningful stakeholder engagement

Pioneer procurers are basing their RE choice on environmental and social impact

Industry associations convening on lighthouse issues, e.g. solar panel waste

Pioneer developers being recognised for demonstrating responsibility for supply chain and siting impacts



ACTIVATING FORCE:
moving the sector towards a just and regenerative approach



RESISTING FORCE:
hindering the sector becoming more just and regenerative

4.2 What can we do now?

The next immediate step

If you are involved in RE in some capacity, there are immediate steps you can take to help drive this transformation. Learning from the successes and shortcomings of past approaches in other industries can accelerate the move to regenerative practice. The *What can we do now?* figure on the following page sets out priority recommendations emanating from our research for immediate action by different types of stakeholders.

The actions are mapped against three levels of ambition:

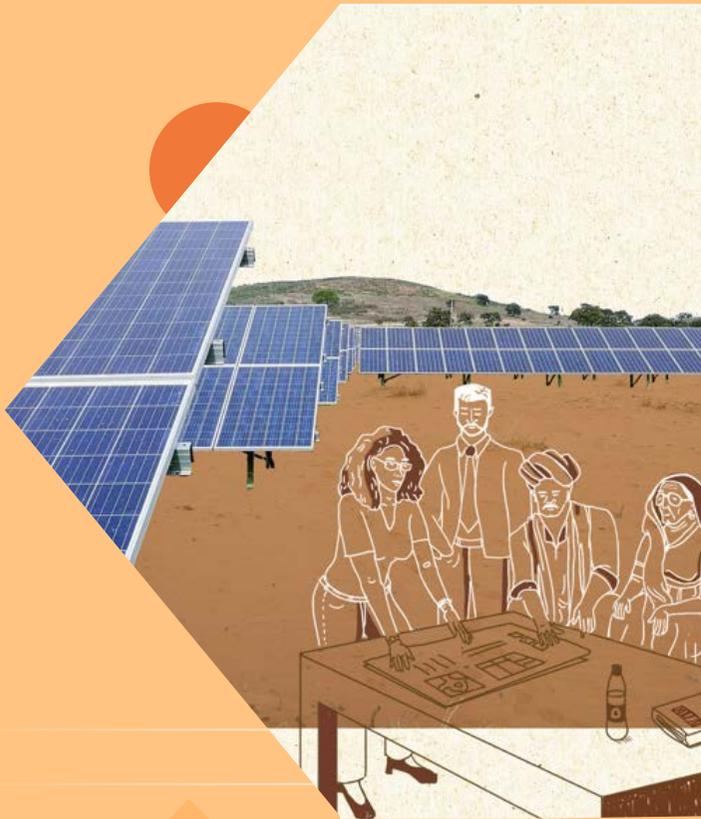
1. **Performer:** “We understand our key impacts and are managing them”;
2. **Leader:** “Sustainability is a source of long-term value”; and
3. **Pioneer:** “We can only survive if our context is just and regenerative.”

Given the nature of the sector, we invite actors to consider ‘Performer’ to be a minimum requirement and to recognise that these recommended actions will likely

become more stringent over time. This is particularly so as the sector matures and as international societal and investor pressure continues on its current trajectory. With that in mind, it is important to note that the actions are by no means an exhaustive list. Further suggestions are most welcome.

In general, it is vital that two actions are taken urgently:

- **Challenge the notion that because the energy production itself is sustainable, the RE value chain is inherently sustainable:** The sector and supporting ecosystem of actors raise their awareness of the importance of looking beyond and beneath the positive credentials associated with the production of low carbon energy. In doing so, they recognise the need to better understand and to address the ESG impacts and risks throughout the RE value chains; and
- **Build a deeper collective understanding of sector impacts:** RE companies, investors and financiers, civil society actors and other decision makers collaborate to map and take action to mitigate emerging adverse impacts, before they become more of a risk to the pace of industry growth.





RE DEVELOPERS

Set the regenerative and just narrative:

Make it clear through industry and organisational communications that operating on a regenerative and just basis is an essential part of delivering on India's ambitions for RE and low carbon energy transition.

Co-build the vision:

Drive the collective agreement of what the sector aims to contribute to a regenerative and just future in a manner that enables a step change across the industry.

Drive cutting edge collaboration across stakeholder groups:

Establish partnerships with suppliers and R&D labs on critical innovation needs such as circularity. Host safe space discussions on tricky issues aiming for collaborative action. Establish long term partnerships with local community bodies, as well as leading national groups on indigenous and marginalised community rights and opportunities, and those involved in protecting and regenerating ecosystems.

Set your transformational strategic purpose:

Focus your business strategy and operating model on how you can have the most transformational impact as you develop and generate RE. Map your impacts and opportunities throughout your value chain with the help of value chain members and community organisations. Partner to understand and build responses that meet regenerative and just goals.

Drive positive value chain impacts:

Share effective policies with suppliers and encourage them to do the same. Set regenerative and just expectations through sustainable procurement practices. Use recognised certifications and standards in specifications and contracts as minimum baselines and incentivise exceeding them.

Industry collaboration:

Play an active role in industry efforts addressing particular challenges such as the National Solar Energy Federation of India on solar panel waste.

Align and embed your operating policy framework:

Ensure all operating policies align with the regenerative and just ambition within the organisation itself, ensure attention is paid to all aspects of ESG and the intersections between them. Use best practice international standards as minimum baselines, including for instance on establishing effective grievance mechanisms.

Map and communicate your impacts well over time:

Establish good practice impact monitoring over the entire lifecycle of projects and throughout the value chain, preferably using independent bodies, and report transparently to globally recognised standards.

Collaborative working with funders and investors:

Engage investors and financiers on ESG matters as early as possible, sharing risks and costing good practice into your requirements.



INVESTORS AND FINANCIERS

Set the regenerative and just narrative:

Be public about prioritising investments that are regenerative and just, going beyond compliance and doing less bad. Share how it creates value for you in a way that will encourage others to shift.

Collaborate and set intent on systemic challenges:

Drive sector-wide understanding of material issues, and vision for change. Enable the sector to identify and act on key barriers such as eradicating corruption and inequality in impact assessment; understand how to assess cumulative impacts and impacts over time horizons, and factor this into investment decisions; partner with local and national organisations expert on or with the perspective of marginalised communities, social justice and environment to explore in more depth and nuance the opportunities that could be offered through RE deployment and value chains.

Pioneer practice on using impact to determine cost of finance:

Establish partnerships with pioneer institutions to learn and embed practice on determining the cost of finance according to ESG impact.

Set your transformational strategic purpose:

Establish your own transformational strategy towards regenerative and just impact. Map your impacts and opportunities throughout your portfolio, set transformation goals in line with science and regenerative and just intent.

Accelerate awareness and learning:

Raise awareness internally and externally that how RE companies operate is part of determining whether they are a sustainable investment and support investment decision makers to understand the sector material issues. For those who have been practising sustainable investing for some years, share your learning on the multi-faceted, multi-layered approach you have developed over time through industry events, publications and discussion with peers.

Be consistent across all funds:

Ensure that ESG considerations are meaningfully integrated in all decisions alongside finance, not just on ESG funds.

Hold the space for dialogue on tensions:

Be public about the tensions you experience between achieving regenerative and just intent and the demands of shareholders and others in the market system, thus opening up the space for dialogue on solutions and responses.

Make key commitments:

Sign up to and act on the UN PRI and / or the UN Principles for Responsible Banking and make good use of their various learning platforms. If you cannot sign up, explain why publicly.

Collaborative working with investees / lendees:

Proactively engage potential and current investees on tricky issues, creating a shared solution / response building space and encouraging openness. Engage at multiple levels of the organisation beyond the board and managers.

Contribute to building capacity in the monitoring and auditing sector:

Commission in a way that makes your intent clear and enables assessors to train others effectively - moving beyond tick box approaches.



PIONEER



LEADER



PERFORMER



RE PROCURERS

Advocate for regenerative and just RE:

Where choices on energy source are restricted or information is limited, engage in discussions with relevant local and national energy bodies to advocate for regenerative and just RE, better information provision and greater availability of more sustainable options.



CIVIL SOCIETY, RESEARCHERS, ACADEMIA AND MEDIA

Collaborate for impact:

Engage with RE companies, investors and banks to ensure your impacts are understood, integrated into consideration and become part of long term collaboration towards regenerative and just RE.

Hold an enabling space to understand and address tensions and set ambitions:

Encourage and hold space for open dialogue on difficult issues, providing a constructive yet ambitious space. Tap into deep motivations and intent within the industry in a way that ensures accountability and that makes monitoring impactful in itself.



POLICY MAKERS AND REGULATORS

Establish partnerships to design enabling market mechanisms:

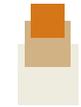
Evaluate the impact of low prices encouraged by auctions upon good ESG practice and design incentive mechanisms to reduce the trade-off in collaboration with industry and the wider power sector.

Establish India as the home of cutting edge R&D for regenerative and just RE:

Enable the building of an R&D ecosystem for RE that innovates to make project lifecycle impacts regenerative and just in partnership with industry and academia, taking the proactive move to establish India at the cutting edge of the industry as it evolves.

Regularly ratchet standards expected from industry to reflect science:

Establish expectations of and set a trajectory for continuous improvement through increasing standards, effective enforcement and communication of the just and regenerative benefits achieved.



PIONEER

Treat RE as you would any other product or service in best practice sustainable procurement:

Understand and evaluate choices based on impacts throughout the value chain and understand the whole life costs in environmental and social as well as financial terms.

Accelerate learning through your value chain:

Share learning on how to procure regenerative and just RE with suppliers as part of RE uptake efforts.

Set the regenerative and just intent narrative:

Communicate in a way that encourages the accelerated shift towards regenerative and just RE: highlight the opportunities for greater positive impact, channelling the voices of communities to those that may not hear.

Proactively join the conversation:

Attend and join dialogues on the scaling of RE in India to integrate the social and environmental dimensions.

Provide advice and solutions:

In a way conducive to your business model, proactively offer expert advice and solutions on key issues such as establishing meaningful and just dialogue with communities and effective grievance mechanisms.

Set expectations in line with international best practice:

Adopt a National Action Plan on Business and Human Rights and ensure all sectors are included. Enable businesses to proactively prepare for mandatory human rights and environmental due diligence requirements signalled by the EU and consider implementation in India.

Foster a regenerative and just manufacturing base:

As it scales, encourage indigenous RE manufacturing to maximise positive impact and wide contribution to SDGs from their business operations, in addition to CSR, using best practice regenerative and just approaches.



LEADER

Scrutinise as you scale your RE procurement:

Raise awareness in your procurement team of the risks and opportunities when buying RE, and how to maximise positive impact.

Raise awareness:

Support members of your organisation and other organisations to understand the opportunities for regenerative and just impact in the RE sector.

Understand the impacts on communities and their environments:

Connect with your stakeholders to identify any risks and possible opportunities for support. Be familiar with and uplift the voice of the communities you work to empower as you may do on other matters.

Provide an enabling environment:

Provide access to information and clarity so that, for instance, land use risks (such as areas of high conservation value) can be mapped and used in siting decisions, and grievance mechanisms are well understood by all stakeholders involved.

Set enabling standards:

Mandate and encourage good quality environmental and social impact assessments as part of gaining clearances. Build capability in teams to recognise good quality assessments and enable a cultural shift towards these being seen as essential.



PERFORMER

Creating lasting systemic change - join us

The steps recommended in the previous section are easier written than done. Many of the actions are known by the ecosystem players, and there is an intention to do more. However, there are structural and systemic reasons why they are not already happening.

In some cases, it is simply that one organisation alone cannot make the necessary change, and there is a perceived first-mover disadvantage in such a competitive industry. In others, meaningful change requires questioning deeply held assumptions and structures upon which management practices, policy and norms are built.

These assumptions and structures - cultivated and ingrained over time - affect the whole RE ecosystem and many other industries alike. Questioning these is critical to India's just and rapid transition to a low carbon future. Could RE be the hero industry to step into addressing these and paving the way for systemic change? We believe so.

The questions in the box to the right have been raised during our discussions with the industry and their stakeholders. None can be answered by one organisation or even community on their own. They require a type of collaboration rarely seen in our context. Urgent, action-oriented and systemic, it must bring together stakeholders who do not traditionally sit at the same table. Only then can the industry accelerate towards its most positive role in creating a regenerative and just future.

Questions that require further inquiry and innovation

On leading practice, how might we:

- Become the pioneer regenerative industry, leading the way for others to follow?
- Learn from successes and failures of other industries on ESG and regenerative practice?
- Motivate and incentivise world class ESG practice in RE companies, investors and other financial institutions in India?
- Build sufficient levels of awareness of the impacts of RE and of how to enact the just and regenerative principles in relevant stakeholders?

On impacts, how might we:

- Better understand and account for the cumulative social and environmental impacts of an RE development over time?
- Radically reduce the use of non-renewable resources in the RE value chain?
- Drive the regeneration of ecosystems?
- Foster social justice and equity?
- Enable shared understanding of siting trade-offs / impacts?

On accountability, how might we:

- Transform attitudes and behaviours on accountability across the value chain and the enabling system (e.g. among policy-makers)?
- Drive a fundamental shift in the design, effectiveness and contextualisation of impact evaluation?

On enabling the sector, how might we:

- Support civil society to amplify their unique role in enabling responsible RE?
- Establish a world-class RE R&D ecosystem in India that brings the just and regenerative principles to life?
- Structure the market in such a way that just and regenerative RE becomes the default approach?
- Build capability across the ecosystem so that all stakeholders can contribute to transformational change?
- Shape a policy landscape so that just and regenerative RE becomes the mainstream?



These assumptions and structures - cultivated and ingrained over time - affect the whole RE ecosystem and many other industries alike

Over the course of the conversations and research for this case for action report, we have met many visionary leaders looking for the opportunity to address these questions - in RE companies, investors, banks and large buyers of energy, as well as civil society actors and policy makers. For many, the idea that this industry should be a force for greater good is a matter of common sense.

Forum for the Future, WRI India, TERI, WWF-India and Landesa would like to invite individuals from these communities to join us in a programme to better understand these issues and opportunities as well as to set a collective vision for a just and regenerative RE industry. Together, we can then take practical steps towards implementing this vision in India and thus serving as a model for the global RE ecosystem.

Through a series of collaborative workshops and working sessions, as well as by engaging with experts, drawing on lessons from other sectors and learning from those impacted through the RE value chain, we will:

- **Establish a shared systemic understanding of the potential just and regenerative role of RE**, taking account of the implications of inaction and identifying the barriers to integrating good ESG practices into business models and governance.

Join us in an action inquiry programme to better understand and act on these issues and opportunities

The shared systemic understanding will further extend to opportunities for shifting structures, mindsets and behaviours with a view to enabling the sector to meet its full potential as a just and regenerative force in achieving a sustainable future.

- **Identify practical ways to transform business models and practices (including governance around investment) and the system participants operate within** so that they are set to deliver long-term value for both society and shareholders.
- **Run pilot interventions that demonstrate a shift in business models, practices and the wider system** through a) how the RE industry responds to its environmental and social impacts; and b) through how the wider system - including investors, policy makers, financiers and those procuring RE - are encouraging and incentivising just and regenerative approaches to ESG.



Do you recognise these challenges in your own work? Do you share this ambition? Do you want to collaborate to drive greater positive impact?

If so, please contact Saksham Nijhawan for more information on the next phase of the Responsible Energy Initiative, on

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About UK's Foreign, Commonwealth & Development Office (FCDO)

The UK Government pursues the national interests of the UK and projects the UK as a force for good in the world. UK Government defends the UK's values, works to reduce poverty and tackle global challenges with international partners.

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S&P Global Foundation

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S&P Global Foundation supports inclusive sustainable economies and thriving global communities. S&P Global Foundation is more than philanthropy—it's making a difference by finding and developing essential connections between the knowledge and skills of S&P Global and the needs of society. We make sure the work we do maximizes opportunities to engage S&P Global's employees and has a genuine impact on the global community. We focus our efforts where we can make a real difference: Bridging the Global Skills Gap, Creating an Inclusive Economy, and Promoting a Sustainable Environment. We also support global disaster relief efforts with a focus on resiliency.

Disclaimer: The views and opinions expressed in this report are those of the research partners and do not necessarily reflect the official policy or position of the S&P Global Foundation or S&P Global.

About the partners



About Forum for the Future

Forum for the Future is a leading international sustainability non-profit with offices in London, New York, Singapore and Mumbai. We specialise in addressing critical global challenges by catalysing change in key systems. For 25 years, we have been working in partnership with business, governments and civil society to accelerate the shift toward a sustainable future. Our expertise in systems change allows us to work with our partners to diagnose problems, understand root causes, and identify how and where to act to create change. Together we are reinventing the way the world works.

Find out more at www.forumforthefuture.org



About WRI India

World Resources Institute (WRI) is an independent, non-profit global research organisation that turns big ideas into action at the nexus of environment, economic opportunity and human well-being. Our work focuses on building sustainable and livable cities and working towards a low carbon economy. Through research, analysis, and recommendations, World Resources Institute puts ideas into action to build transformative solutions to protect the earth, promote livelihoods, and enhance human well-being.

WRI India has the capacity to convene key stakeholders, and forge strategic partnerships with governments, business, foundations, civil society organisations, institutes and NGOs, to scale-up solutions that can bring game-changing results for the sustainable management of natural resources in India.

Find out more at www.wri-india.org



About Landesa

Landesa is an international non-governmental organisation that fights rural poverty and provides opportunity and security for women and men through the power of land rights. Insecure land rights are a leading factor in extreme poverty, food insecurity, gender inequality, conflict, environmental destruction, and sluggish economic growth. With offices in China, India, Liberia, Myanmar, and Tanzania, Landesa's policy advocacy and implementation efforts have helped strengthen land rights for more than 500 million people in more than 50 countries worldwide.

Find out more at www.landesa.org



About WWF-India

WWF-India is one of the country's leading conservation organisations dedicated to delivering sustainable solutions to address challenges at the interface of development and environment conservation. We focus on creating science-based programmes to address India's complex environmental issues and promote science-driven policy design for sustainable development to impact positive change. Working with diverse stakeholders, including governments, corporates and businesses, NGOs, schools, education institutions and civil society, WWF-India is committed to creating and demonstrating practical solutions to conserve India's biodiversity, maintain its ecosystems and contain its ecological footprint.

Find out more at www.wwfindia.org



About The Energy and Resources Institute (TERI)

TERI is an independent, multi-dimensional organisation, with capabilities in research, policy, consultancy and implementation. We are innovators and agents of change in the energy, environment, climate change and sustainability space, having pioneered conversations and action in these areas for over four decades. We believe that resource efficiency and waste management are the keys to smart, sustainable and inclusive development. Our work across sectors is focused on (a) promoting efficient use of resources, (b) Increasing access and uptake of sustainable inputs and practices and (c) reducing the impact on environment and climate.

Our research, and research-based solutions have had a transformative impact on industry as well as communities. We have fostered international collaboration on sustainability action by creating a number of platforms and forums. We do this by translating our research into technology products, technical services, as well as policy advisory and outreach. Headquartered in New Delhi, we have regional centres and campuses in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji, and Nainital. Our 1200-plus team of scientists, sociologists, economists and engineers delivers insightful, high quality action-oriented research and transformative solutions supported by state-of-the-art infrastructure.

Find out more at www.teriin.org

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181 The information provided in this table is illustrative and not exhaustive. While companies will typically have detailed technical standards, policies and manuals across various ESG aspects such as environmental standards, worker safety etc., for the purpose of this table we have primarily referred to high-level policies and practices highlighted on company websites and sustainability reports.

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