# Use of Land for Clean Energy Projects in India

India's ambitious climate and clean energy targets, which include reaching 500 GW of non-fossil fuel capacity by 2030 and achieving net-zero emissions by 2070, are redefining the investment landscape for renewable energy ("**RE**") and electric vehicles ("**EVs**"). As international and domestic players intensify their focus on these sectors, one of the most critical, and often underestimated, determinants of project viability is land.

Certain challenges exist in India's RE sector with respect to land, both in terms of availability and access/use. In particular, large-scale deployments, including green hydrogen development, may face obstacles in terms of land scarcity, land acquisition, and access to 'uncommitted' water resources (i.e., water beyond what is already committed to sectors such as agricultural/ industrial/ domestic use and others) – especially since the cost of land and the availability of water may directly influence the levelized cost of power and hydrogen, respectively. Right of way for transportation of large equipment or components thereof is also a formidable issue. Land conflicts and population density may pose additional obstacles.

In general, RE development, particularly in the solar and wind sectors, demands significant land and real estate resources, with site selection being one of the most critical early-stage considerations. Securing land in India for RE projects involves navigating a complex matrix of legal, regulatory, and socioeconomic factors. Land ownership patterns vary widely across states, and issues such as fragmented titles, incomplete revenue records, complex tenancy rights, litigation, and opposition from local communities can lead to delays or legal challenges.

While dedicated RE parks or designated zones with pre-acquired land and transmission infrastructure may help in streamlining project development, developers must still account for project-specific environmental clearances, construction

permissions, open access, and proximity to substations or transmission corridors – factors that can significantly impact project viability and timelines.

With respect to the EV sector, according to a recent report by Savills India, India's EV sector is likely to impact the real estate and industrial market, where 5,760 to 6,852 acres of land may be required by 2030 to support EV manufacturing, lithium-ion battery plants, and public charging infrastructure, amounting up to USD 9 billion in investments. This surge in EV demand may further catalyze the need for: (i) industrial and warehousing spaces for EV and battery manufacturing; (ii) assembly units for streamlined production; and (iii) storage and distribution centers for EV components and batteries. The expansion of supply chains is also likely to elevate the demand for strategically located warehouses and logistics parks, thereby reshaping the industrial landscape.

## SCALE AND SCOPE OF LAND REQUIREMENTS

RE and EV infrastructure projects are land-intensive by nature. A utility-scale solar photovoltaic plant typically requires about 5 acres of land per MW of installed capacity, depending on the technology used and its location. Wind projects require significantly more land in terms of spread due to turbine spacing, although the actual land footprint is lower and may allow for dual use, such as agriculture.

Certain land types, like agricultural land, are not ideal for large-scale RE projects due to concerns about crop yield and environmental impact. Hybrid projects (wind-solar or solar-hydro) and green hydrogen plants with electrolyzers demand integrated land clusters that are well-connected to transmission infrastructure. With the emergence of green hydrogen, pumped hydro, and hybrid RE parks, the demand for strategically located land parcels is accelerating.

EV infrastructure also has its own land needs. Industrial-zoned land may be required for EV charging corridors on national highways (especially if existing structures are being modified or large transformers being installed), battery manufacturing facilities under the Production Linked Incentive ("**PLI**") Scheme, logistics hubs for vehicle assembly and parts distribution, associated warehousing infrastructure, as well as battery swapping stations. Additionally, such industrial land should be available with robust connectivity, power supply, and clear title, preferably close to consumer demand centers or ports/logistics corridors.

## LAND ACQUISITION MECHANISMS: PRIVATE, GOVERNMENT, AND HYBRID MODELS

India offers multiple pathways for acquiring land for RE and EV projects:

***Private Acquisition*:** Direct purchase or lease of land from private landowners remains a common route, particularly in states with flexible land ceiling laws and supportive local administrations. However, private transactions can be challenging due to fragmented land parcels, complex land revenue processes across states and underlying statutory approval required for the process. However, certain states have relatively mature private market frameworks.

***Government Allocation*:** Many state governments have designated RE parks (*e.g.*, for solar energy projects) or industrial clusters where land is pre-acquired to be used by interested parties for the designated purpose. Certain state industrial development corporations offer land in such industrial or RE zones with pre-clearances. While these plug-and-play models are likely to reduce due diligence timelines and infrastructure costs, they may involve premium payments, reduced operational flexibility and/or development-related conditions. Some states facilitate sub-leasing models as well.

***Hybrid/PPP Models*:** Under public-private partnerships (PPP), a private RE player may co-develop land and infrastructure with government agencies especially for projects which impact public interest. This is increasingly seen in special economic zones (SEZs) and 'smart city' initiatives.

## LEGAL DUE DILIGENCE: TITLE, ZONING, AND ENCUMBRANCES

Before acquiring land for developing RE projects, a thorough legal due diligence is necessary. Key issues to examine include the following:

- Title Verification: Since India does not have a centralized title registry, title is established through a mix of historical documentation and revenue records. Historical revenue records, mutation entries, and registered sale deeds need review for diligence purposes. Land records are typically maintained at a district/local level. Title insurance is being increasingly adopted by institutional investors.

  The Digital India Land Records Modernization Program (DILRMP) seeks to develop a modern information management system for the purpose of improving real-time

data on land and the use of land resources, as well as to reduce land-related disputes and fraudulent transactions.

- Land Use and Zoning Compliance: In India, most land outside urban areas is classified for agricultural use. The thumb rule is that agricultural land must be converted to non-agricultural use, but under new RE policies adopted by many states, solar projects are permitted on agricultural land without conversion. Industrial use (for battery/EV factories or logistics hubs) may require additional approvals.

- Encumbrance Checks: Mortgages, litigation, easements, tenancy claims, or community rights can complicate or delay land purchases/acquisitions. Accordingly, third-party claims and/or litigation, disputes, rights of way, and mortgage status need to be investigated.

- Environment and Forest Clearances: For projects on forest or ecologically sensitive land, or in respect of specific project categories, certain additional statutory clearances may be required, such as under the Forest (Conservation) Act, 1980 and the Environment (Protection) Act, 1986, along with environmental impact assessments (EIAs). Projects in or near protected areas, as defined under the Wildlife (Protection) Act, 1972, may require wildlife clearances from the National Board for Wildlife (NBWL) after receipt of forest clearance.

- Stamp Duty and Registration: These vary by state and can significantly impact transaction costs. Some states may offer exemptions, waivers, or rebates for RE and EV projects, including for RE parks and battery units.

## REGULATORY CONSIDERATIONS: STATE-LEVEL VARIATIONS AND CENTRAL INCENTIVES

Land is a state subject under the Indian Constitution. As such, land laws, ceiling limits, conversion processes, and consent requirements vary considerably across states. For instance:

- Certain states have streamlined solar land acquisition policies, offer industrial land in solar parks, and/or allow sub-leasing.

- Certain states have well-articulated EV policies, offering plug-and-play industrial land and tax incentive schemes, subsidies, single-window clearances, and concessional land.

- Certain states have launched land banking and EV cluster initiatives.

- Certain state-level RE policies enable revenue land allocation at concessional rates, including for hybrid projects. In some instances, concessional industrial land may be offered.

In addition, central government schemes such as the PLI scheme for batteries and solar modules, and the National Green Hydrogen Mission (NGHM), create indirect incentives for land acquisition by enabling upstream/downstream infrastructure investments. The inter-state transmission system (ISTS) waiver for RE projects may further impact land location decisions. Developers must balance central incentives with state-specific regulations, including with respect to dual-level structuring and compliance.

## COMMUNITY RELATIONS AND SOCIAL IMPACT

RE project developers may need to address social and environmental sensitivities over and above statutory compliance. For larger projects, land is acquired from the public at large as per the prevailing land acquisition laws. In that regard, developers should ensure that the mandated process is strictly followed, and compensation is fair and traceable. On account of the influence of international financial institutions and growing emphasis on ESG factors in investments, some investors may require third-party environmental and social impact assessments.

## FINANCING AND LAND-LINKED RISKS

Where applicable, leasehold structures should allow for transferability. In instances of state industrial land use, 'NOC' conditions, i.e., the requirement for seeking a confirmation as to there being no objection from the lessor, for mortgaging may need to be checked. Title insurance may provide additional protection against defects in property ownership, including in respect of land acquired for RE projects, by safeguarding buyers and lenders from financial losses due to disputes or errors in title.

## EMERGING TRENDS: LAND OPTIMIZATION AND DIGITAL TOOLS

The India Industrial Land Bank ("**IILB**") is a Geographic Information System ("**GIS**")-based portal for the purpose of serving as a one-stop repository for industrial areas (including clusters, parks, nodes, zones, etc.) and infrastructure-related information across the country to help investors identify their preferred location for investment – including in respect of connectivity; natural resources and raw material availability (*e.g.*, agricultural and horticultural crops, minerals); sectoral parks (such as chemicals, automobiles) and types of parks (*e.g.*, plug-and-play, private, and public); land available for allotment by state and sector; view on key utilities and infrastructure (such

as a park, plot, urban infrastructure, terrain, connectivity via road, rail, air and port network, and sectoral clusters); plot-level data on vacant plots; lines of activity; and contact details.

Currently, the IILB has approximately 4,300 industrial parks mapped across an area of 0.7 million hectares of land. This database has been integrated with industry-based GIS systems of most states in India, reflecting updated details on a real-time basis. In terms of feasibility scanning, the use of GIS tools and land aggregators to identify suitable sites before bidding or investment could prove useful. Further, certain states are piloting blockchain-based registration and land/property record management systems.

## CONCLUSION

The access to, and use of, land in India's RE and EV sectors is foundational to RE project success and long-term value creation. For energy companies, 'clean tech' and sovereign wealth funds, and infrastructure investors, the challenge lies in balancing legal certainty with commercial agility and buy-in from the local community.

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