

New energy (biofuels, solar, and wind) and implications for land as a resource

Executive summary

The growth of India's economy, rising population, and desire for better living standards have led to a steady growth in the quality and quantity demand of energy services. The renewable energy segment of the energy sector in particular is also becoming extremely important in context of the energy security concern and commitment to a 'Low Carbon Growth Strategy', for India. Renewable Energy (RE) provides solutions to the sustainability problems associated with conventional fuels that are used for power generation as RE resources are non-exhaustible and relatively clean. The share of renewable energy in India's energy mix is increasing, though slowly, and is poised to continue to rise in the near future. The country is blessed with renewable energy resources, such as solar, wind, biomass, and hydro, among others.

The development of renewable energy in India, to a large extent, has been due to enabling policy and regulatory regime in place by the Central and State governments. The 11th Five Year Plan realized the importance of new and renewable energy to enhance the domestic energy supply options as well as to diversify the energy sources. The 12th Five Year plan's strategy aims to develop the RE sector through capacity addition of 39 GW during the plan period in wind power, small hydro power, solar power, and bio-power sectors. Thus, the RE space in the country is going to witness a large number of RE projects in coming years. There is also an important role being played by the private sector which compliments and supports the role of the central government and state-level actors. Private sector is seeing its role at most of the points along the value chain, especially in generation, transmission, and power trading. However, low interest remains in the distribution network.

An increase in development of renewable energy plants is expected due to their rising significance and government interest. Land requirement is an important factor of production. This exploratory study is done to assess the implications of the growth of renewable energy on land with a view to create knowledge and data to support policy-making.

Estimates of the land-use intensity for renewable and conventional sources of energy vary considerably, depending on a number of assumptions. Till date, there is no standard methodology to produce these estimates. In addition, it is difficult to compare land-use intensities for renewable energy technologies with those of fossil fuel technologies. For example, for fossil fuels, calculations of land-use intensity may include the power plant footprint, plus mining or production area, plus areas occupied by transportation and logistics infrastructure.

In case of solar power, smaller solar panels can also be put up on the rooftops of the existing buildings where no new land is required. In addition, these kinds of installations clearly provide end consumers with the benefit of avoidance of T&D costs. Certainly, for smaller solar PV installations, the ability to tie directly into the distribution grid is also an advantage. In addition, many renewable energy plant sites are compatible with pre-existing land uses. This has been particularly observed in the case of wind energy. Large wind turbines typically use less than half an acre of land including access roads, which enables the farmers to continue plant crops and graze livestock right up to

the base of the turbines. The wind farms can also provide a potential source of income for land owners in the form of lease payments or royalties.

Some key observations from the state policies on land and renewable energy are:

- Madhya Pradesh has published separate policies for wind, solar, and biofuels. These policies help in the allotment of Government land (subject to re-possession if not utilized), provide concessions on land rates and accelerate the approval/clearance process. It does not encourage forced acquisition of private land, but allows consensual establishing of wind projects on Scheduled Tribe land.
- Rajasthan has published separate policies for wind, solar, and biofuels. These policies help in the allotment of Government land (subject to re-possession if not utilized), provide concessions on land rates and accelerate the approval/clearance process. For bio-energy, only waste/degraded Government land is allotted, but lease agreements with private land owners are allowed.
- Karnataka's unified RE policy accelerates the approvals/clearances, but does not offer concessions on land rates. Allotment of Government land is on lease only, but acquisition of private land is encouraged with some equity in the project is reserved for original cultivators.
- West Bengal, in the case of wind and solar, allots Government land on lease, but does not accelerate the approval processes. It does not grant any concessions on land rates and prohibits any land acquisition. In the case of bioenergy, allotment of degraded/waste Government land is permitted and the approval/clearance process is expedited. Re-possession of mis- or un-utilized land is also favoured in West Bengal. The position on land acquisition is ambiguous.
- Punjab offers Government land allotment (including Panchayat owned land), concessional rates and an expedited process to wind and solar energy proponents. For bioenergy, it offers Government waste-land allotment at concessional rates and an expedited approval process, but prohibits diversion of forests. The position on land acquisition is ambiguous.

Indian states can also benefit from international experience:

- Ontario and Victoria: While the Ontario policy focusses on Government land, the Victoria policy is based on the role of Government in all landscape/land-use planning. Both policies re-iterate that renewable energy development will have to work in the context of existing legislations and adhere to pre-existing planning frameworks, without creating many concessions for renewable energy. Of particular note is the highlighting of aboriginal interests and laws protecting them. Their effectiveness draws from their ability to identify all the diverse pertinent legal requirements that the Government expects to see addressed in the developer's application in a single document, thus stream-lining and evening the approvals process.
- South Africa: The statistics driven approach of South African provides the clarity on the Government's objectives and sets a benchmark for evaluating the success of the policy that Indian policies currently lack. However, it does evaluate the problem of land inflation. It shares its Indian counterparts' tendency to underestimate or ignore the potentially deleterious effects of incentives combined with power asymmetries on existing land use patterns.

The current share of renewable energy in energy mixes is still small in comparison to conventional energy and many countries are aiming to transform their energy matrix with partial or total shift to RE. While undertaking the transformation to

renewable sources, the role of social and environmental externalities needs to be addressed and mitigated to avoid any controversies associated with the conventional fuels. The main externalities emerging from renewable sources could be: (a) displacement; (b) impact of the project on local environment; (c) clearance of forests; (d) impact on surrounding flora and fauna; (e) impact of diversion of land for projects as in the case of biofuels; (f) conflicts between energy security and food security; (g) strict application and adherence of policies to avoid discontent between developers and people; (h) waste generation and disposal; (i) aesthetics.

Key recommendations in addressing these externalities and other issues that arise in context of land use for renewable energy are:

- To avoid major conflicts between people and projects, Social Impact Assessment (SIA) studies would be beneficial to identify affected families as well as to build a roadmap for the development.
- Setting up of wind energy plants in remote desolate areas may witness with time migration of people to these areas due to the infrastructure that is created near the plants. In that case it may become important to take adequate measures that would allow the development of these areas for habitat. The project developers should also be cautious in the utilization of resources, such as water and land, and their conservation and recycling.
- Waste generation and disposal mechanism need to be in place along with decommissioning plans for renewable energy projects, to avoid similar mishaps that have occurred historically in the utilization of conventional fuels. Appropriate measures should be taken to dispose off solar panels and coolant liquids safely. Authorities, such as Pollution Control Boards should be actively involved in monitoring compliance in renewable energy projects also.
- Concerns such as impact on forests and biodiversity also need to be addressed immediately to avoid conflicts. An emerging phenomenon is of “not in my backyard” (NIMBY) concerns. There are numerous incentives from the government for developers to set up renewable energy projects, however, public attitudes towards the siting decisions could be equally detrimental in the setting up of renewable energy facilities. Current trends show that renewable energy has not seen any vehement opposition, especially in India, as compared to other infrastructure developments, but this may change with growing and competing land use choices. At the same time, these concerns can be addressed through improving awareness of the opportunities and risks that renewable energy presents relative to other energy sources, thereby improving participation of citizens in energy decision making processes.
- Like other development projects, it is important to identify zones and locations that can be made available to renewable energy project developers, so that it does not pose any danger to the ecological sensitivity of the region, or force changes in land use patterns and there is minimization of social impacts. The local communities should be made partners in progress and there could be clear guidelines that ensure that community’s welfare is not compromised due to the existing/upcoming RE projects.

Public perception of renewable energy in India is significantly favourable to the sources and their positive impacts on India’s energy profile would reduce our dependence on oil and coal. Hence, the deployment of renewable energy technologies needs to be cautiously undertaken to avoid contentions that conventional fuels have faced and the inadequate management of negative externalities.