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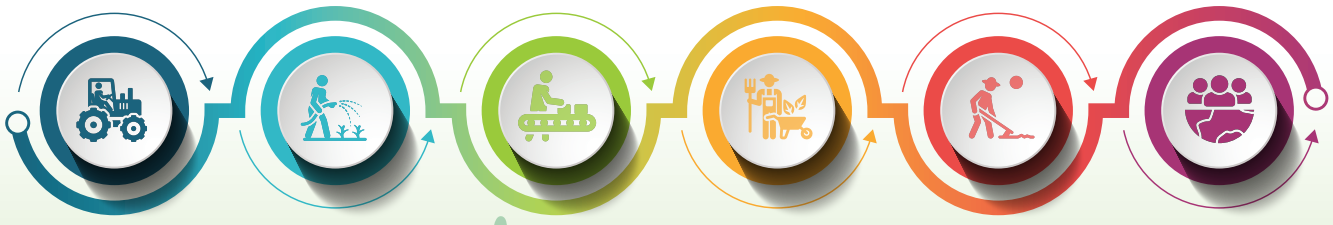
A People-First Approach to Fair and Equitable Land Use Transitions



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This paper dwells on certain key sectors where land use change can be expected or is required, namely- renewable energy expansion, agriculture and nature-based solutions. Through international and national case examples of inclusive and fair practices in these key sectors, the paper explores possible approaches for facilitating the transition in these sectors while minimizing the social, economic and environmental impacts on people and ecosystems.

1. Understanding Land and Land Use

From the tea plantations in Assam to the agricultural fields across the Gangetic plains, to the salt pans in western India and the lush rainforests of southern India, land is a central part of human existence. Land and related resources- soil, water and biodiversity are essential to sustain livelihoods and economies. The Special Report on Climate Change and Land by the Intergovernmental Panel on Climate Change (IPCC)[1] notes that "People currently use one quarter to one third of land's potential net primary production for food, feed, fibre, timber and energy". Therefore, there is a need to understand the various demands for land (food, energy, industry, etc.), current & projected requirements, its undergoing transition and the related impacts on people.

In order to do the above, it is important to note the technical terms and definitions used while discussing land. Land Use and Land Cover (LULC) are terms that are often used interchangeably to further understand the land classifications, however there is a distinct difference between the two. Land Cover describes the physical features and biological characteristics of a piece of land such as forests, grasslands, scrubs, wastelands, water bodies, etc. Land Use on the other hand, refers to the purpose the land serves or when a 'socio-economic function is added to it'[2] - agriculture, settlements, mining, etc.[3] Monitoring changes in LULC are important for informed management of land and other related natural resources.

To reflect global changes, terminology used to describe land has also evolved.
For example, the term 'landscapes' is being used in the context of development cooperation, landscapes are defined as "socio-ecological system that consists of natural and/or human-modified ecosystems, and which is influenced by distinct ecological, historical, political, economic and cultural processes and activities. The spatial arrangements and governance of a landscape contribute to its unique character."[#]

LULC is also important because the value of land goes beyond quantitative measure. It is not just a physical asset but a resource that has intrinsic social and ecological value as well. Its true value can be examined when we assess the ecosystem services that land provides which include access to natural resources, carbon sequestration, climate regulation, soil and water conservation mechanism, cultural services etc.[4]

In this paper, we use the term land use change and transitions to refer to modifications and changes occurring in natural environments and landscapes to meet social and economic needs.

This paper aims to explore the competing land uses in India including future land requirement for climate action. Further the paper suggests a '5 C' approach to minimise potential implications of land-based transitions on people and communities. Lastly, the paper provides potential suggestions on how the donor communities and the private sector can contribute to enhancing dialogue and take action to people centric approach to land use transitions.

1 IPCC, 2019: Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.- O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. https://doi.org/10.1017/9781009157988.001
2 MOSPI, GoI- EnviStats2020Z
3 Sources: Intergovernmental Panel on Climate Change; Annual Land Use Land Cover Atlas of India (2024)- National Remote Sensing Centre, India.
4 https://www.sciencedirect.com/science/article/abs/pii/S2211464520300464
Landscape Approaches: Background Paper, GIZ & (Denier, L., et al. (2015): The Little Sustainable Landscapes Book. Global Canopy Programme (GCP), Oxford. p. 26.)

2. The Scramble for Space: Navigating Competing Land Uses in India

Land is a shared yet finite resource and has competing demands. They range from infrastructure to housing; industries to livelihood enhancement; food production to meet our growing population; and to meet the country's overall development aspirations and goals.

2.1 Land Use Trends in India

India with 2.4% of total land area of the world (3.287 million sq. km) is supporting a whopping 18% of the world's population. Over time fulfilling the needs of this growing population has led to land becoming scarcer than ever, with a gradual decline in the per capita availability of land for primary purposes. The per capita availability of land in India declined from 0.89 hectare in 1951 to 0.27 hectare in 2011.[5] As of 2019, the per capita availability of agriculture land in India was 0.12 ha whereas the world per capita agriculture land was 0.29 ha.[6] This underscores the challenges for ensuring food security amongst other developmental challenges.

Figure 1 provides an overview of the area under land use and land cover classes in India over a period of 30 years.[7]

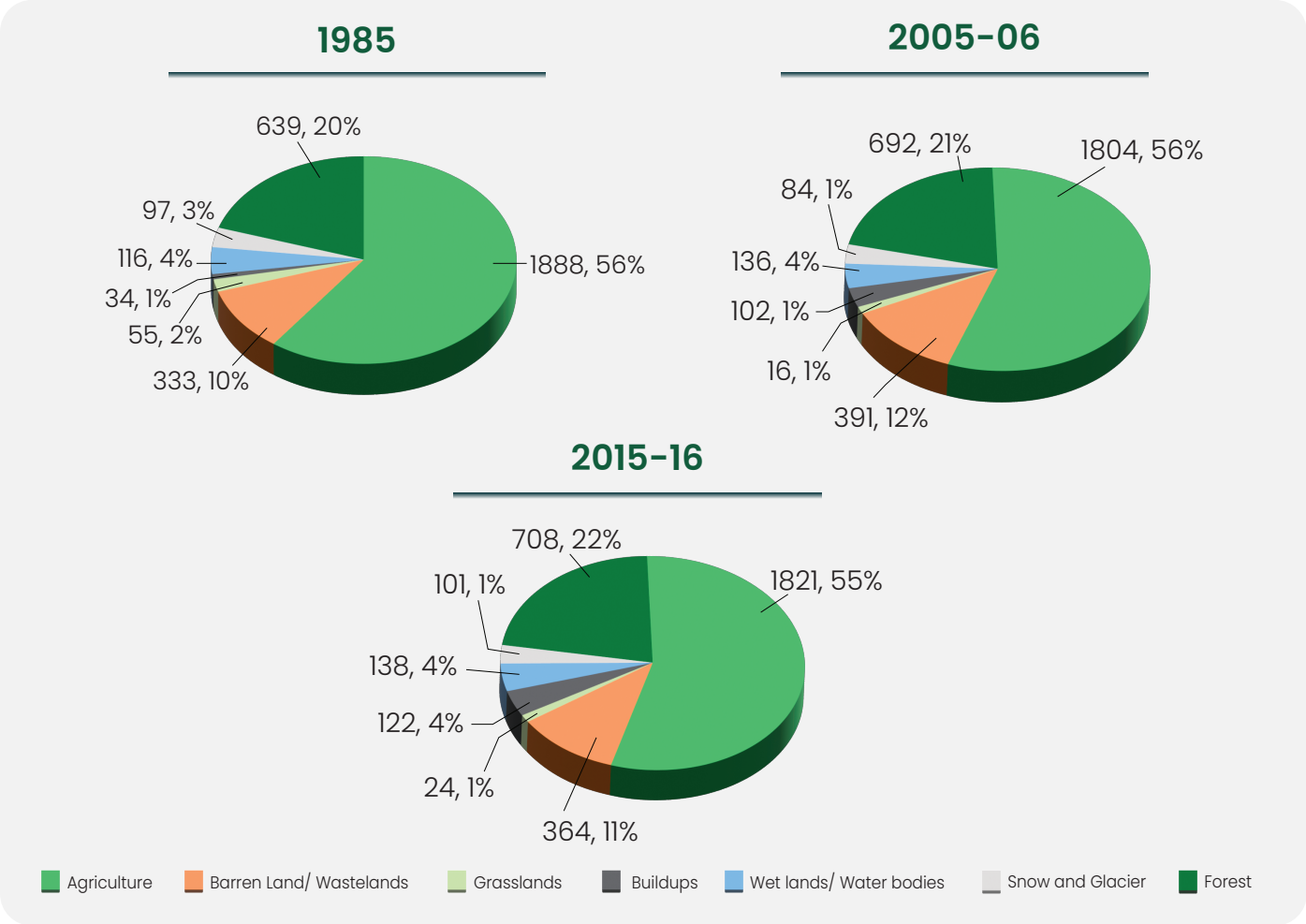


Figure 1: Change in land area by land cover classes (in '000 sq. km and % of area)

5 https://agriwelfare.gov.in/en/NaturalResource#:~:text=The%20increasing%20human%20and%20animal,0.15%20hectare%20during%20this%20period.
6 https://www.niti.gov.in/sites/default/files/2024-02/Grow%20Report%2020.02.2024.pdf
7 EnviStats 2020- Vol. 1, EnviStats 2023- Vol. 1, Forest Survey of India

Between 1985 and 2015-16, India saw notable changes in land use, mostly significantly in agriculture land and built-up area. The majority land use class in India is agriculture. Since 1985, the share under agricultural land has been declining, and as of 2015-16, it constituted 55% of the country's land cover or 1,821 thousand sq.km. Another land class that has been declining is grassland which fell from 55 thousand sq.km of land to 24 thousand sq. km. At first glance, barren lands or wastelands have increased since 1985. However, it is worth noting that in comparison to 2005-06 and its adjacent years, land cover under wastelands is declining again. Significantly, the share of built-up land has been at a consistent increase and is only set to expand as the country grows and develops further.

According to the Periodic Labour Force Survey (PLFS) about 45.76% of the total workforce is engaged in agriculture and allied sector during 2022-23[8], indicating that this workforce is primarily dependent on the majority share of India's land cover. With the pressure of population, climate change and declining per capita land availability, this changing land use cover pattern raises concerns on food security and rural livelihoods. Similarly, grasslands and forests are incredibly important for pastoral communities, to gather natural resources, rural economies and carbon sequestration.

The Significance of Wastelands

In 2022-23, 11% of land was classified as wasteland. The NRSC defines wastelands as degraded lands which can be brought under vegetative cover with reasonable effort and which is currently underutilized and land which is deteriorating for lack of appropriate water and soil management or on account of natural causes. However, some studies indicate that certain areas classified as wasteland overlap with open natural ecosystems, which are rich in biodiversity, provide for grazing habitats and do support people, particularly pastoralists

As land is being diverted to meet various needs, these changing patterns raise questions on how the land is changing, for what purposes and what implications it may have.

The unprecedented pressure on the land beyond its carrying capacity is resulting in degradation of lands.[9] According to the Desertification and Land Degradation Atlas of India, land degradation and desertification in the country has been estimated to be 97.84 million hectares in 2018-19. Degraded lands are often water stressed, can exacerbate environmental damage, and reduce the carbon sequestration capacity of the land. A study estimates that the annual costs of land degradation and land use change in 2014-15 was Rs 3,177 billion, or 2.5% of India's GDP in 2014-15.[10] In addition to hefty economic costs, land degradation has a significant impact on food security, livelihoods, biodiversity and human health as well.

2.2 Aligning Competing Land Requirements with Climate Goals

The competition for an already scarce resource like land will only intensify in light of the nation's decarbonisation goals, as some forms of climate action do require land, such as for setting up renewable energy parks, creating carbon sinks and other adaptation activities. Given the limited availability of land, they will necessitate land use transitions. The challenge lies in the diverse characteristics of different land types and locations, which are not equally suitable for all purposes. Therefore, appropriate land-use planning, monitoring and management, will be required for sustainable land use and accounting for the major impacts it will have on people and their livelihoods.

Given the vastness of land, its multitude of uses and varied transitions, a singular approach to sustainable land management cannot be undertaken. Moreover, the impact of these changes on people and ecosystems will be multifold, which means planning and preparing for them will require a more local and contextualized approach. To further break this, we have identified three main components where land becomes a central piece in India's low carbon and development journey- Renewable/Clean Energy deployment, agriculture and Nature based solutions.

8 https://www.mospi.gov.in/sites/default/files/publication_reports/AR_PLFS_2022_23N.pdf?download=1
9 https://pib.gov.in/PressReleseDetailm.aspx?PRID=1590395#:~:text=The%20per%20capita%20availability%20of,of%20lands%20in%20the%20Country.
10 https://www.teriin.org/sites/default/files/2018-03/life-on-land-exec-summary1.pdf

Renewable Energy

The push for clean energy will require setting up of renewable energy parks which requires huge areas of land to be diverted from existing agricultural land, fallow or wastelands. According to estimates, the amount of land required to meet net zero renewable energy targets in 2050 will be between 50,000 and 75,000 km2 for solar energy, ie. 1.7% to 2.5% of the country's surface area, and 15,000-20,000 km2 under total project area for wind energy.[11]

To meet this large land requirement, land use efficiency practices and multifunctional land uses[12] are suggested, including use of barren lands, or implementing integrated food-energy systems (IFES) combining production of both food and energy on the same plot of land[13]. However, land earmarked for such projects can potentially, regardless of its classification, have certain social and environmental impacts, particularly on rural livelihoods and communities living or getting sustenance from the land.

Stakeholders Impacted
Farmers, communities dependent on non-timber forest produce, landless labourers, pastoralists and grazers

Impact on Biodiversity
due to installation of RE infrastructure could lead to loss of biodiversity in the area which could have a cascading effect on ecosystem health / balance of the region

Pressure on resources
Strain on local resources like water (used for cleaning of solar panels) will be detrimental to local communities. Natural resources in the region could also be impacted during the construction and operation of the RE plant

Disproportionate impacts
Agrarian land acquired for RE projects might impact smallholder farmers and landless disproportionately as compared to large land holders

Land acquisition
Renewable energy projects require large tracts of land with an average 3-5 acres of land per MW. Approximately 81 percent of India's current solar capacity derives from land-intensive ground-mounted installations

Displacement
Displacement of land owners which could possibly have social ramifications

Livelihoods
54.6% of the population in India is dependent on agriculture and allied activities For its livelihood. Additionally, the economic value of forest products (like fuelwood, fodder, small timber and bamboo) is estimated to be Rs 6.58 lakh crore at the national level*. Therefore, changes in current land use may affect the communities livelihoods

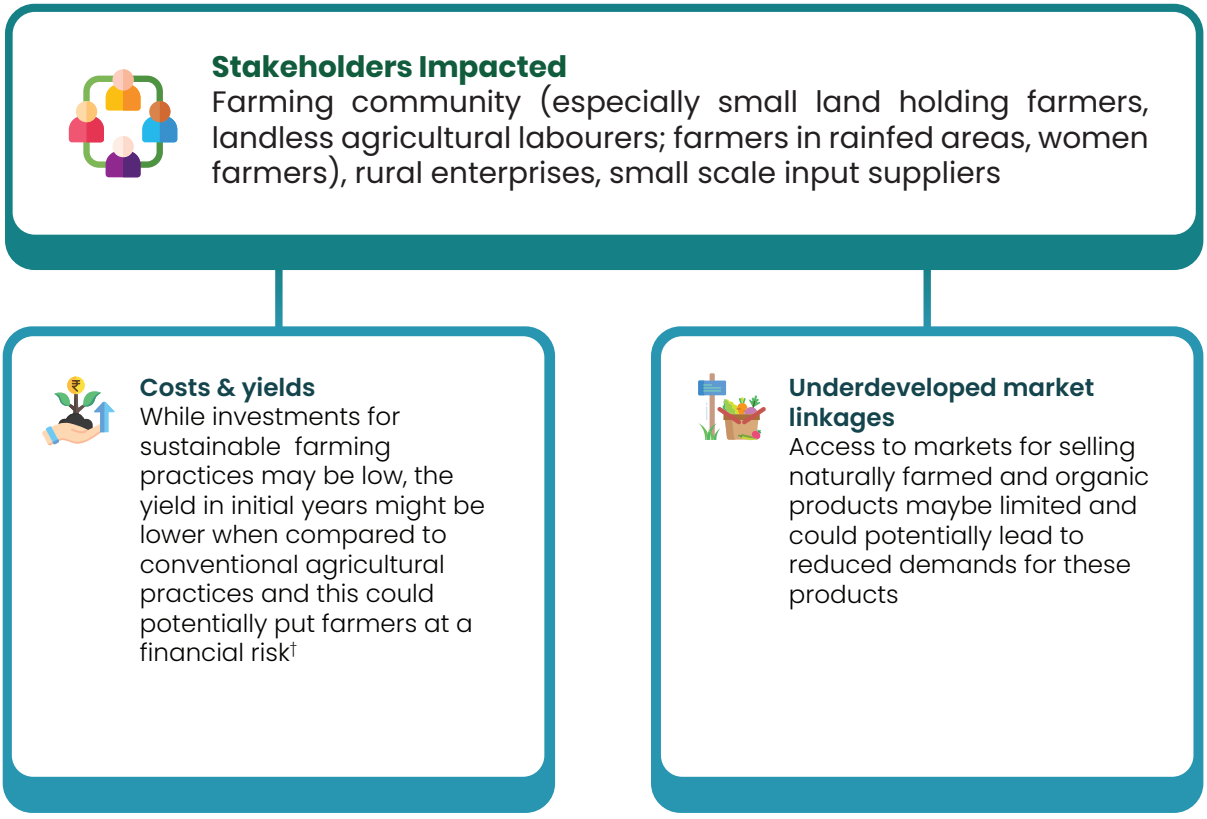
11 https://ieefa.org/wp-content/uploads/2021/09/Renewable-Energy-and-Land-Use-in-India-by-Mid-Century_September-2021.pdf
12 Defined as the combination of different socio-economic functions in the same area
13 https://www.agriculturejournal.org/volume12number1/sun-soil-and-sustainability-opportunities-and-challenges-of-agri-voltaic-systems-in-india/#:~:text=Microclimatic%20Changes%20and%20Their%20Effects,activity%20beneath%20an%20APV%20array.
* Assessment of Dependence of Inhabitants of Forest Fringe Villages (FFVs) on Forests for Fuelwood, Fodder, Small Timber & Bamboo: Quantified Estimation of Removals, Forest Survey of India, 2020

Agriculture

This sector is in a unique position as there are multiple land-based transitions within the sector itself, depending on the state's vision, targets and pathways to reduce its emissions footprint while also ensuring food security. The excessive use of chemical fertilizers, intensive water and cropping patterns and variability due to climate change, is causing production losses and degradation of agricultural land[14] . Recognising this, the government is promoting natural farming among farmers, and organic farming is also gaining traction.

However, food and nutrition security also remain a concern. A growing population means our food requirements are bound to increase. The total foodgrain production in the country in 2022-23 was approximately 330.5 million tonnes (MT). While the cultivable agricultural land in 2019-2020 was 179.9 million ha[15] agricultural land continues to shrink due to urbanization and climate change. An estimate provided by the Vision 2050 document by ICAR states that the food demand is expected to rise up to 400 million tonnes of food grain along with 650 million tonnes of fruits and vegetables by 2050.[16] This means we shall require more cultivable land to meet the food requirement in the future.

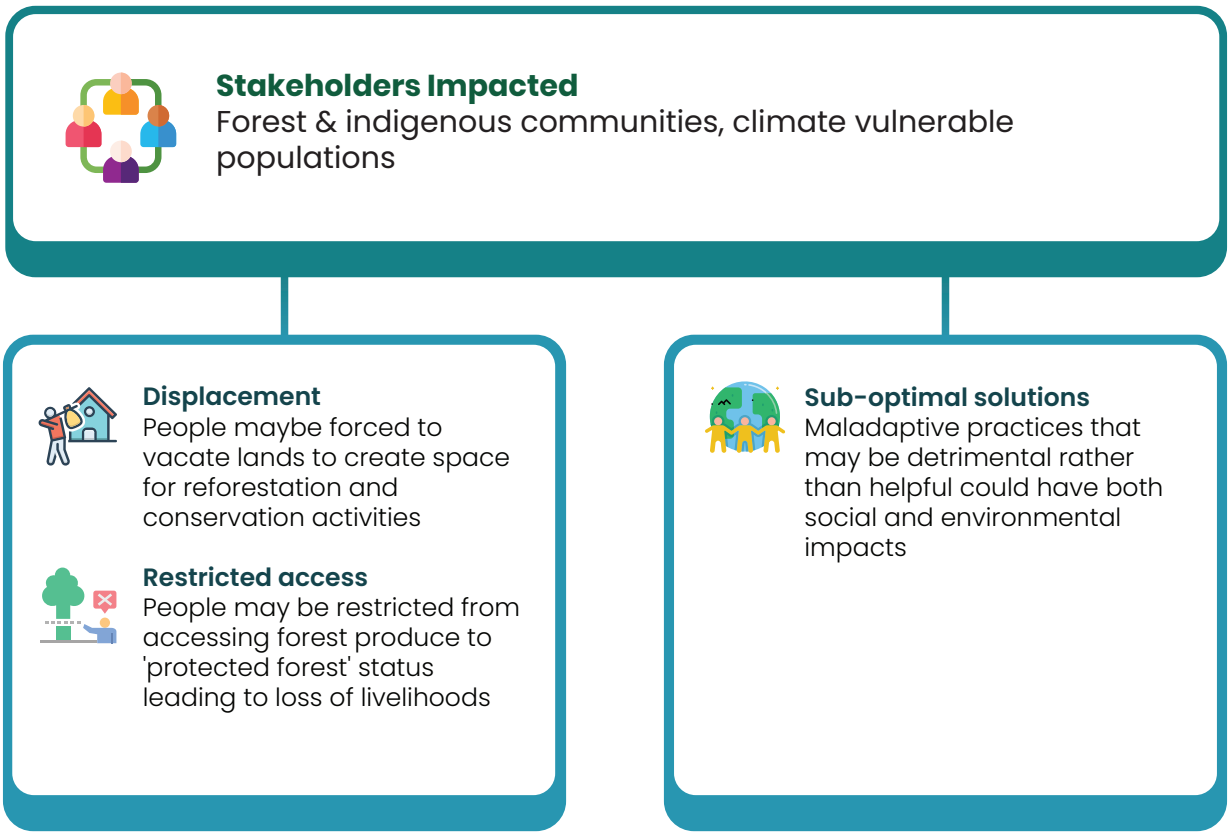
Meeting food security requirements while also transitioning away from chemical-based and energy intensive agricultural practices will require exploration and investment to new technologies and methods of farming like climate smart agriculture, zero budget natural farming, organic farming etc. The different players along the agricultural value chain need to be given the proper monetary and technical support to support them through the transition. The main issues they may face are listed below.



14 efaidnbmnnnibpcajpcglclefindmkaj/https://www.faidelhi.org/member/AR-22-23.pdf
15 https://desagri.gov.in/wp-content/uploads/2023/05/Agricultural-Statistics-at-a-Glance-2022.pdf
16 https://www.iari.res.in/files/vision/vision-2050.pdf
† https://www.niti.gov.in/sites/default/files/202303/Adoption%20of%20Natural%20Farming%20and%20its%20Effect%20on%20Crop%20Yield%20and%20Farmers%27%20Livelihood%20in%20India.pdf

Nature Based Solutions[17]

For this paper we are looking at some nature-based solutions for both climate mitigation and adaptation based on terrestrial ecosystems with a focus on forests. Since India's third quantifiable NDC target stipulates sequestration of 2.5 to 3 billion tonnes of carbon dioxide equivalent by 2030, increasing carbon sinks is important. This requires the conservation and protection of various ecosystems such as forest, grasslands, wetlands, peatlands etc. Carbon sequestration, particularly through existing forest lands and newly planted forest areas are seen as easy and effective solutions with multiple benefits ranging from carbon capture, soil binding, improved water and air regulation among others. Given the large number of Forest Fringe Villages in India, any programs to enhance carbon sink must take into account forest folk and communities which are dependent on these forests. Some of the threats they may face during the implementation of NBSs are listed below.



17 Defined by the World Bank as actions to protect, sustainably manage, or restore natural ecosystems, that address societal challenges such as climate change, human health, food and water security, and disaster risk reduction effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.

3. Paving the Way for Land Use in a Fair and Equitable Manner

Given the impacts described in the previous section, people, community and the significance of community resources need to be centered in the transition processes. The following section aims to explore some good practices and examples, based on previously delineated components, which provide some insight into how transitions can be done in a positive and inclusive manner.

A. Renewable Energy

Integrating renewable energy with existing land-based resources requires collaborative actions in order to ensure that the affected stakeholders are adequately compensated and provided for long term social and economic security. Prioritizing community engagement, awareness generation, skill development, and equitable benefit-sharing can become a catalyst for clean energy deployment and social progress. Some of the examples are presented below.

Community-based approaches to renewable energy projects can help reduce friction, especially over land rights, between the companies and local communities.[18] A good approach is to foster the local economy as done in the case of the **Kurnool Ultra Mega Solar Park** in Andhra Pradesh. A collaborative effort between the government implementing agency and private developers raised money to create a fund for local area development to improve roads, drains and drinking water facilities in not just the park but also its surrounding areas. A rainwater harvesting system was also installed to meet the overall water requirement as well as for cleaning of the panels, thus, addressing water scarcity issues and retaining the ground water level. A significant aspect of the park was that it created 2500 jobs during the construction period. An innovative skill development center was also established at the site by Greenko for conducting training for local workers.[19]

Providing skills and building the capacities of the local people is extremely critical, given that many are engaged in agriculture and allied activities, and these skills may not necessarily be transferable to other jobs. Similar to the skilling center by Greenko, BluPine Energy has established **state-of-the-art skill development centres** as part of a social investment program in Gujarat where students are trained, free of cost, for the installation and operation of utility-scale renewable energy projects. These centers are located in three villages of the Patan and Banas Kantha districts, and in two villages in the Gir Somnath district. , thus encouraging local involvement of youth and women in the upcoming renewable energy sector.[20]

Other inclusive approaches to land use in renewable energy expansion can also be considered such as promoting mixed land use, as in the case of the **Gagad Wind power plant** in Karnataka[21]. Here one acre of land was purchased per turbine, while the farmers could continue farming beneath the turbine. Additionally, land was bought from the farmers at a rate higher than stipulated market rates. Preference was also given to local people for jobs which ensured employment for many. This example showcases how cooperation, mutual trust can enable collaboration where both parties are able to benefit.

Other mixed land use projects are also being experimented in a similar manner like the development of land-neutral **new and innovative solar applications (NISAs)** while addressing the issues associated with land use, land acquisition, and right-of-way. These include a variety of integrated PV models such as Agri PV, Floating solar, Building integrated PV, Canal PVs etc. The implementation of these nascent models should be backed with testing and research on the ideal conditions for the identified area, along with

18 https://www.usip.org/publications/2021/10/navigating-land-rights-transition-green-energy
19 https://www.nrdc.org/bio/anjali-jaiswal/worlds-largest-solar-park-kurnool-india
20 https://bwpeople.in/article/blupine-energy-completes-its-utility-scale-renewable-energy-technician-training-program-in-gujarat-525339
21 https://wwfin.awsassets.panda.org/downloads/renewableenergytoresponsibleenergy_fullreport_lr.pdf

monitoring of changes in farm management practices, technical challenges and the impacts of such applications on microclimatic factors, cropping and grazing patterns, and crop production and yield.[22] Such data and information can help scale up the efficiency of such technologies while addressing concerns of both food and energy security simultaneously.

B. Agriculture

At the heart of any transition process happening in this sector, are the farmers, farming community and agricultural laborers. For many of them, it is a matter of survival and sustenance. With no other safety net or income sources to rely on, they are justifiably hesitant to take up changes without any guarantee of benefits. Given the multi-faceted and disaggregated nature of the sector, a one-size fits all solution cannot be adopted for transforming the agricultural sector. Most success stories and examples are the ones that take on an approach which is centered around galvanizing the farmers, guaranteeing their economic security and enabling development of the farming community.

Farmer Centric Approaches for agriculture transitions

Successful models like **Andhra Pradesh Community-Managed Natural Farming (APCNF)** program and the Maendeleo project in Kenya demonstrate the importance of empowering farmers through capacity building, knowledge sharing, and community-driven initiatives.

The APCNF program initiated by the state government with the help of a CSO, Rythu Sadhikara Samstha (RySS) takes a bottom up approach focused on providing long term handholding support and guidance to farmers as they transition away from excessive use of chemicals to natural practices. In addition to material inputs, the project trains the farmers and farmer master trainers to build their capacity in natural farming methods and create their own organic inputs. Notably, adding to the program's success was collaboration and support of other state and civil society entities, scientific research and innovation, and engagement of women Self Help Groups to channel community funds, monitor progress and engage in marketing.[23] The project has been successful in scaling up the adoption of natural farming while reducing farmer distress. This program has also been followed by multiple impact assessments and studies to examine impacts particularly of farmer incomes and crop yields, given the priority of economic and food security. This data has been an integral aspect of understanding the successes and shortcomings of the program. Similarly, initiatives need to similarly be backed with research and evidence to ensure developmental priorities like food security and income, farmer well-being and energy goals are balanced.

Another similar example is of the **Maendeleo project in Kenya** supported by Aga Khan Foundation. This project is training youth and unemployed agricultural technicians to become "Green Champions", who then teach farmers about regenerative farming practices. An integrated farming approach is encouraged which promotes diverse crop cultivation and recycling available by-products from livestock or manure to make natural pesticides and fertiliser. Additionally, farmers are being enabled to make informed decisions by helping them strategize and financially account for their input purchases like fodder, thereby reducing input costs and encouraging saving.[24] Therefore, the project is creating opportunities for the youth, aiding local communities to switch to better farming practices, while improving community health and nutrition and replenishing the natural environment.

22 https://www.agriculturejournal.org/volume12number1/sun-soil-and-sustainability-opportunities-and-challenges-of-agri-voltaic-systems-in-india/#:~:text=Microclimatic%20Changes%20and%20Their%20Effects,activity%20beneath%20an%20APV%20array.
23 https://naturalfarming.niti.gov.in/andhra-pradesh/
24 https://www.akf.org.uk/dawa-a-recipe-for-a-sustainable-future/

Agroforestry as a solution

Agroforestry emerges as a promising land-use practice that integrates livelihoods, agriculture and forests. Initiatives like NABARD's WADI project with Development Alternatives, promoted the development of **1,700 wadi plots** for marginalized tribal families in Uttar Pradesh and Madhya Pradesh[25]. Wadi is a traditionally practiced tree-based farming system in India to promote agroforestry by integrating agriculture, horticulture, silviculture and animal husbandry practices at the local/ micro level.[26] For this initiative a collective cluster approach was undertaken with each cluster being given handholding support and provisions to access technical inputs. This approach is said to have aided in the economic upliftment of the communities by offering them a better deal, while also restoring the environment.

Building farmers resilience to adapt to changing climate

Another important aspect required for the agriculture sector is educating farmers about the effects of climate change given that it poses one of the biggest threats to agricultural productivity, rural livelihoods, food and nutrition security. In Cambodia, where agricultural communities are being forced to leave their age-old profession due unpreparedness in dealing with climate change, the Cambodian Farmer Federation Association of Agricultural Producers (CFAP) has initiated the **"Farmers Advisory Services"** project focused on increasing farm adaptation to climate change. Significantly, the CFAP conducted studies and meetings with these farmers to build an understanding of the challenges they were facing. The CFAP is also giving training and capacity building courses to its members on climate-appropriate technical farming techniques and agroecological practices, as well as funding advisory support to farmers on techniques to address funding problems.[27] A crucial aspect identified during this project was the need to build the capacity of farmers to understand climate change and its effects on their agricultural practices and crops, and accordingly provided them with requite tools to address it.

C. Nature Based Solutions

Land-based NBSs, can be extremely useful for disaster risk prevention, carbon capture, climate resilience and ecosystem restoration. However, they need to be cognizant of the social, environmental and economic characteristics of the land. They must follow due process to prevent maladaptation and ensure that the local ecological and social conditions are accounted for.

There is a reliance on forests to create carbon sinks for sequestering emissions. However, concerns arise when unscientific or unplanned interventions are carried out such as planting non-native species or large scale mono plantations which threaten biodiversity, risk ineffective carbon sequestration and threaten community access to common forest resources.

Indigenous community driven practices for land regeneration

Proper planting techniques and community approaches should be taken during afforestation and forest regeneration as done by the Mirema Community Forest Association (CFA) in Kenya. The **Mirema initiative** tackled deforestation and has been able to regenerate 50% of deforested land by aiding natural regeneration and planting saplings from the community tree nurseries. Significantly, an appeal was made to the community first to stop encroachment of the land. After they were able to understand and were onboarded, they started investing in regeneration activities making it a successful community driven initiative.[28]

In addition to regenerating forests, conserving natural forests in itself is an effective method for climate mitigation and adaptation. It also has numerous social and environmental benefits, especially if local communities are involved in the process.

25 https://www.tara.in/assets/pdf/Sustainable-Agriculture/Wadi-Enabling-Small-Farmers-to-Secure-their-Livelihoods-A-Photobook.pdf
26 https://icfre.gov.in/slem-product/slem_product24.pdf
27 https://www.theclimakers.org/wp/wp-content/uploads/2019/12/The-Climakers-Stories-from-the-Field-Volume-1.pdf
28 https://news.mongabay.com/2022/02/in-kenya-a-community-regrew-its-forest-and-redefined-reforestation-success/

Similar to this is the **co-management of Amarakaeri Communal Reserve in Peru** where the Peruvian government along with three tribes -the Harakbut, Matsiguenka, and Yine Peoples have monitored and protected their ancestral territories.[29]

Leveraging forest based income sources

In Palampur, Himachal Pradesh, where both rural populations and the surrounding urban inhabitants were dependent on the Bheerni forest for natural resources and as a water catchment area, a forest management plan was created based on a **payment for ecosystem services (PES) model** to compensate villagers if they helped in the conservation of the forest and recharge of the spring. The villagers were organized into a mandal and properly briefed on the forest management plan. Exposure visits were also organized to familiarize them with the PES model[30]. This case highlights a collaborative approach where rural and urban stakeholders, government departments and rural communities were able to work together.

Forest carbon credits or offsets are also gaining attention as a financial mechanism that can aid forest conservation. Having a system which involves local communities, follows an established framework and maintains a proper repository of data and monitoring parameters will strengthen the regulation for issuing equitable carbon credits.

Need for right adaptive strategies

There are other nature-based solutions that are focused on adaptation activities through land. Here, the concern arises where the initiative isn't done in a proper manner, causing more environmental and social damage. For example, in Odisha, to prepare against cyclones and rising sea level, mangrove plantation was done in a village close to Chilika lake. Despite mangroves being recognised as an effective adaptation solution, in this case, the mangroves were not native to the area. As a result, when cyclone Fani hit, these trees were uprooted and salt water entered the lake, disbalancing its salinity levels. Therefore, this adaptation effort affected the natural conditions, as well as threatened the livelihoods of the dependent fisherfolk.[31]

Solutions for climate adaptation therefore need to be mindful of local conditions and circumstances. Not all activities will suit every region. For example, in the Monarch Butterfly Biosphere Reserve in Mexico different types of restoration for the recovery and maintenance of endemic trees in the region were being experimented on. This includes a mix of natural restoration, soil conservation and active reforestation methods on the degraded forest land which had been used for illegal logging activities. It was discussed which methods would be the better method for forest recovery. After five years of the initial intervention it was observed that natural regeneration of forests was not the most effective course of action. The trees planted by the restoration method had a survival rate of 83 to 84% while the natural regeneration method, not a single seedling could be found. This is because the trees were severely degraded and also under pressure of climate change.[32] Cases like this, indicate the need for other approaches to be explored, based on the circumstances, to achieve the best outcomes.

29 https://www.earthdefenderstoolkit.com/wp-content/uploads/2021/08/ECA-Amarakaeri-Earth-Defenders-Toolkit-EN-June-2021.pdf
30 https://www.downtoearth.org.in/environment/payment-for-ecosystem-services-palampur-in-himachal-has-a-model-in-place-65908
31 https://www.downtoearth.org.in/climate-change/climate-crisis-increased-evidence-of-maladaptation-says-ipcc-synthesis-report-88345
32 https://news.mongabay.com/2022/01/heres-how-science-is-trying-to-conserve-the-monarch-butterflys-forests/

4. Framing a Fair and Equitable Land Use in the Indian Context

The three components of RE expansion, Agriculture, Nature-based solutions explored above shed some light on the kind of transitions and its impacts that can be expected to take place in the coming few years. Solutions to ensure that land transitions are just and fair are often context specific, influenced not only by physical land characteristics but also by the local communities and indigenous peoples of the region.

Presented below is 5-C strategy to consider while framing approaches for fair and equitable land use transitions:

1. **Collect Data** and employ tools to build a comprehensive understanding of the social economic dependence on various ecosystems:

   Data plays a crucial role in providing the vital context needed for effective, inclusive and equal land management planning and informed decision making.

   - ***Mapping the location, extent, and status of the ecosystems*** with significant carbon sequestration potential with inputs from existing information, field research, and other studies.
   - ***Primary data collection*** of various social, economic and physical parameters to understand local communities and their natural, human and capital resources and use of satellite data to monitor LULC changes over time.
   - ***Mapping the relevant stakeholders*** based on their engagement with land - direct (who use the targeted land), indirect (who are impacted by the action of the land transition), and interest groups (concerned parties for conservation and scientific use of land), as well as the associated risks and vulnerabilities.
   - ***Using tools for planning land use changes*** like SiteRight tool, Restoration Opportunities Assessment Methodology (ROAM), Common Land Mapping tools etc. can help in identifying potential land parcels that will aid in responsible land management & planning along with potentially minimizing conflicts.

2. **Catalyse** Socio Economic Assessments

   The collection of information should be further geared to gaining an understanding of local communities and their natural, human and capital resources. This could include data on the community structure, in order to estimate the living conditions, gender and youth -related information, class and ethnicity, labour availability for new job opportunities , data on agricultural or other land-use practices and data on access to land, land tenure and holding size, livestock, infrastructure; amongst others.

3. Enhance **Community** Engagement and Participation

   - ***Community consultations*** need to be more targeted to enable informed decision making. It is pivotal to ensure adequate representation from different stakeholder groups and further provide an opportunity for stakeholders to negotiate in the decision making process.
   - ***Bridging information gaps*** on existing government schemes and programs for skilling, livelihood support, financial assistance etc. which can support them during the transition process. Additionally, important decisions and judgements related to land use and availability should trickle down to the community and impact stakeholders.
   - ***Recognising, utilizing and sharing traditional knowledge*** and indigenous practices can help conserve natural ecosystems and involve communities.
   - ***Incentivising stakeholders*** with additional livelihood and economic benefits can help other stakeholders in the transition process. For example, through application of a model like 'payment

for ecosystem services' can provide sufficient incentives to farmers and rural communities to undertake informed land management practices.

- ***Identifying and working with CSOs and grassroots organisations*** who are uniquely equipped to understand local contexts and bridge the gap between the government and community to ensure transitions where 'no one is left behind'.

4. Develop ***Capacities*** of Affected Parties
    - ***Upskilling or training*** based on the opportunity and interests- with the RE sector growing rapidly in India and given that agricultural skills are non-transferable there is a need to ensure that local livelihoods; particularly small and marginal farmers are provided the necessary support and training to sustain or diversify their livelihoods.
    - ***Empower communities through financial literacy*** for effective and equal negotiations of land purchase/lease, financial planning for future and investment gains. Communities should be provided with both short-term and long term financial and advisory support during the transition phase.

5. Facilitate **Collaboration among** all relevant stakeholders in order to ensure inclusive and fair land use transitions. Collaboration & coordination with all stakeholder and across all levels of administration, will aid in enhancing community participation and foster knowledge sharing.

Given that these transitions are often context specific, the 5Cs approach elucidated above is proposed to serve as an indicative framework to approach transitions in an equitable and inclusive manner. This approach can be amended to suit local circumstances that take social, economic and environmental realities into account.

5. Call to Action

Realizing the importance of land stewardship, there's a growing national commitment to regenerative and responsible land practices. However, this will not happen on its own. It's long drawn and a complex process, powered by people – principally, the landowners, farmers and their communities. There is a need for consistent support to bridge information gaps, build capacities and provide reasonable finance to upgrade practices.

Each land parcel is different, so the support cannot come in the form of a predefined one-size fits all solution, but a whole package of solutions that can be delivered as a system. This requires a nuanced approach tailored to individual contexts and a continuous collaboration between policymakers, farmers, researchers, communities and other stakeholders. A bottom-up planning, goal alignment and clearly defined decision sequence between centre and sub-national entities (Center-state-district-block-Village-farm) can further steer a more balanced and inclusive transition. Elucidated below are few high level actionable strategies that can aid on the path to a fair & equitable people centered transition in the context of land transitions:

1. Supporting research to identify potential project sites, map affected parties and better understand social, economic and ecological impacts of land-based transitions.
2. Building a cross-disciplinary platform/muti-disciplinary task force that brings together various experts- land, gender, economists, social scientists, academia and the private sector to provide tailor-made holistic approaches for a people-centered land transition. The platform can further engage with different stakeholder groups (direct, indirect, interest groups) to define goals, objectives and standard operating practices for meaningful stakeholder participation.
3. Policy advocacy to leverage existing Central and State programs (Watershed Development Component– Pradhan Mantri Krishi Sinchayee Yojana 2.0, National Rural Livelihoods Mission, and Mahatma Gandhi National Rural Employment Guarantee Scheme) for undertaking programs which promote sustainable land use practices, livelihood programs etc.
4. Scaling up business models for implementation of Agrivoltaics in India- Agrivoltaics is an innovative solar application getting traction in India that meets the twin objectives from the same land – solar power and agricultural production. However, there is a need for piloting and scaling up new business models by testing in different agro economic contexts, understanding its long term implications on soil and water, aligning farmer and developer perspectives etc.
5. Developing innovative financing models to promote and pilot the use of innovative solutions to mainstream a people-first approach to land use transitions. Blended finance models where private investors/impact investors and philanthropic grants can come together to support on ground implementation of projects in specific regions, vulnerable stakeholders like smallholder farmers,women etc[33].
6. Seed partnerships between CSOs and the private sector to promote best practices in responsible land-use while improving outcomes for communities.
7. Supporting capacity building, training and skill development programs to help affected/displaced communities.
8. Providing long term technical and financial support to local cooperatives, SHGs and farmer producer organizations for economic diversification.

33 Oorja Development Solution has raised USD 1.5M through a blended finance mechanism for expanding their Farming-as-a-Service model meant to decentralize solar infrastructure and provide affordable irrigation, and milling service to smallholder farmers. USD 1.2M has been raised through equity funds from impact investors, while USD 3,00,000 in non-dilutive funds from Swiss Re Foundation.

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