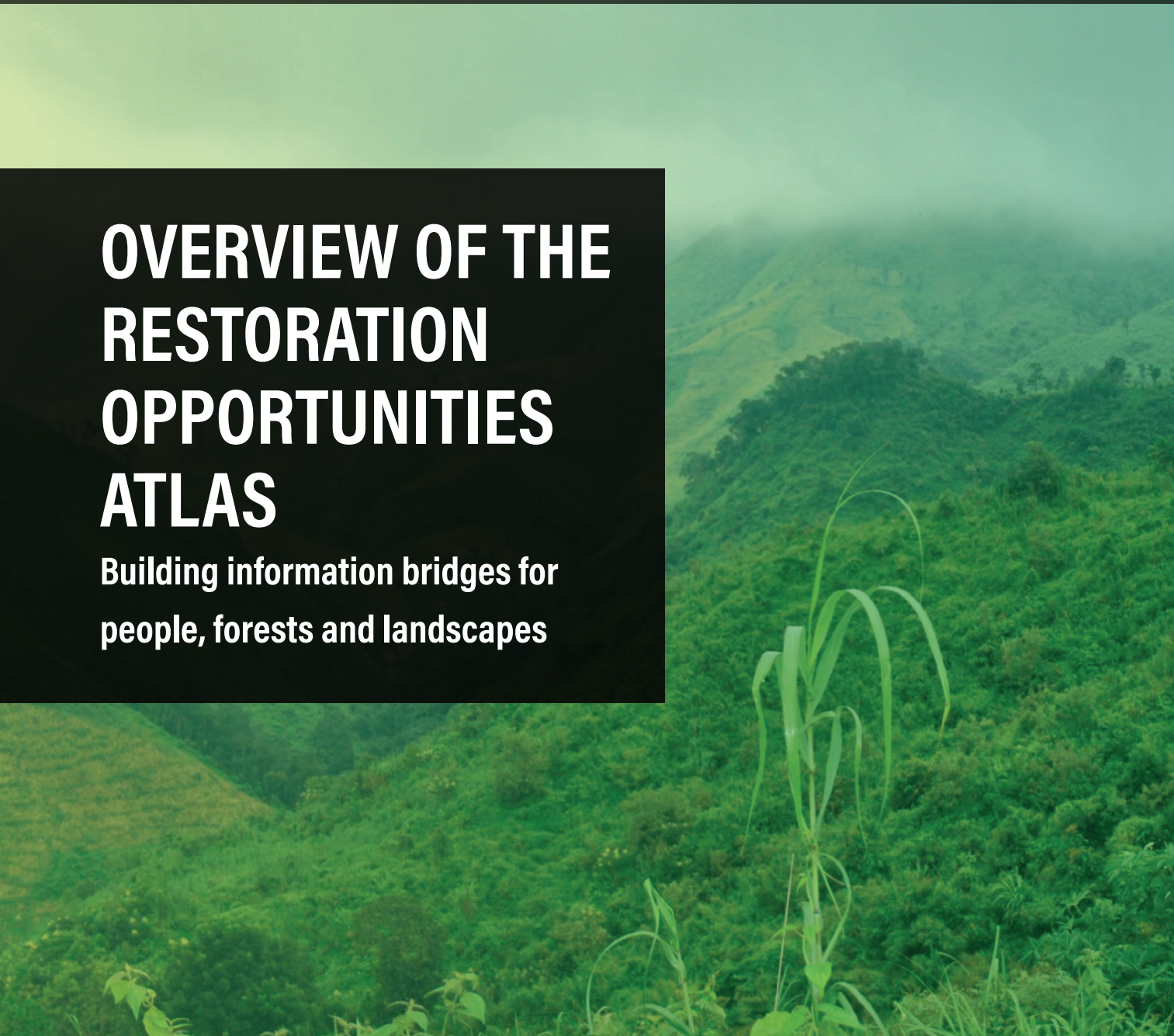
WRI INDIA

RESTORATION OPPORTUNITIES ATLAS



OVERVIEW OF THE RESTORATION OPPORTUNITIES ATLAS

Building information bridges for people, forests and landscapes

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Forest protection and tree-based landscape restoration underpin many domestic policy goals and international commitments made by the Government of India. The National Forest Policy, 1988 aims to establish forest and tree cover over 33 percent of India's geographical area. India's Nationally Determined Contribution (NDC) as part of the Paris Agreement on climate change commits to sequestering an additional 2.5 to 3 billion tons CO_2 equivalent by 2030 through improved forest and tree cover. Official estimates suggest that achieving this target requires protecting and improving existing forest cover while also extending tree cover in more than 25 to 30 million hectares (MoEFCC, 2017). Forest protection and landscape restoration are also essential components of the Sustainable Development Goals especially SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 13 (Climate Action) and SDG 15 (Life on Land). With over 700 million people in rural India economically dependent on forests and agriculture, improving forest and tree cover at scale can make a transformative contribution to strengthening rural economy, with benefits for local communities including women, tribals and other marginalized groups.

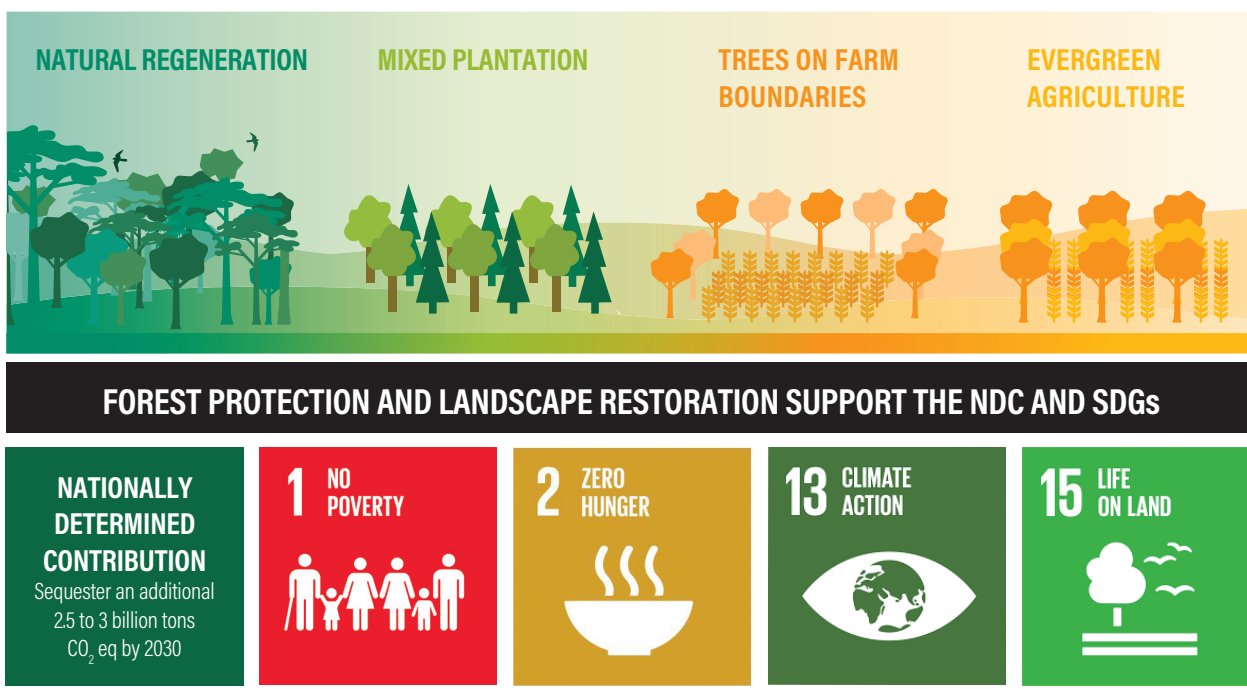


Figure 1: Forest Protection and Landscape Restoration

To support strategic planning for forest protection and landscape restoration, WRI India has developed a Restoration Opportunities Atlas that brings together best available data and rigorous analysis to answer three questions:

- Where can forest and tree cover be protected and increased, and how much carbon sequestration will this result in?
- Which tree-based restoration interventions have been implemented in different states? Who are the principal actors who have implemented these projects?
- What necessary enabling conditions need to be in place and what risks addressed to ensure achievement of protection and restoration goals?

The Atlas comprises twenty spatial layers organised into seven thematic sections. Each layer allows users to view and download national as well as state level statistics. The Atlas also provides state level thematic reports that compile information from the different layers into a downloadable document.

The Restoration Opportunities Atlas is built using the Global Forest Watch Map Builder tool which is powered by ArcGIS. The Atlas brings together publicly available data sets as well as national level data, which is largely shared by partners under different data sharing agreements. Data sharing partners include the University of Hyderabad, the IUCN, Bharti Institute of Public Policy at the Indian School of Business (BIPP-ISB) and the Land Conflict Watch. The Atlas was developed with guidance from a technical working group that comprises leading organisations and experts in the environment and development fields. Its methodology was reviewed by ten experts within WRI as well as several members of the technical working group. The Atlas provides a methodological note that details its architecture, lists the different datasets used for the development of spatial layers and the assumptions embedded in the analysis.

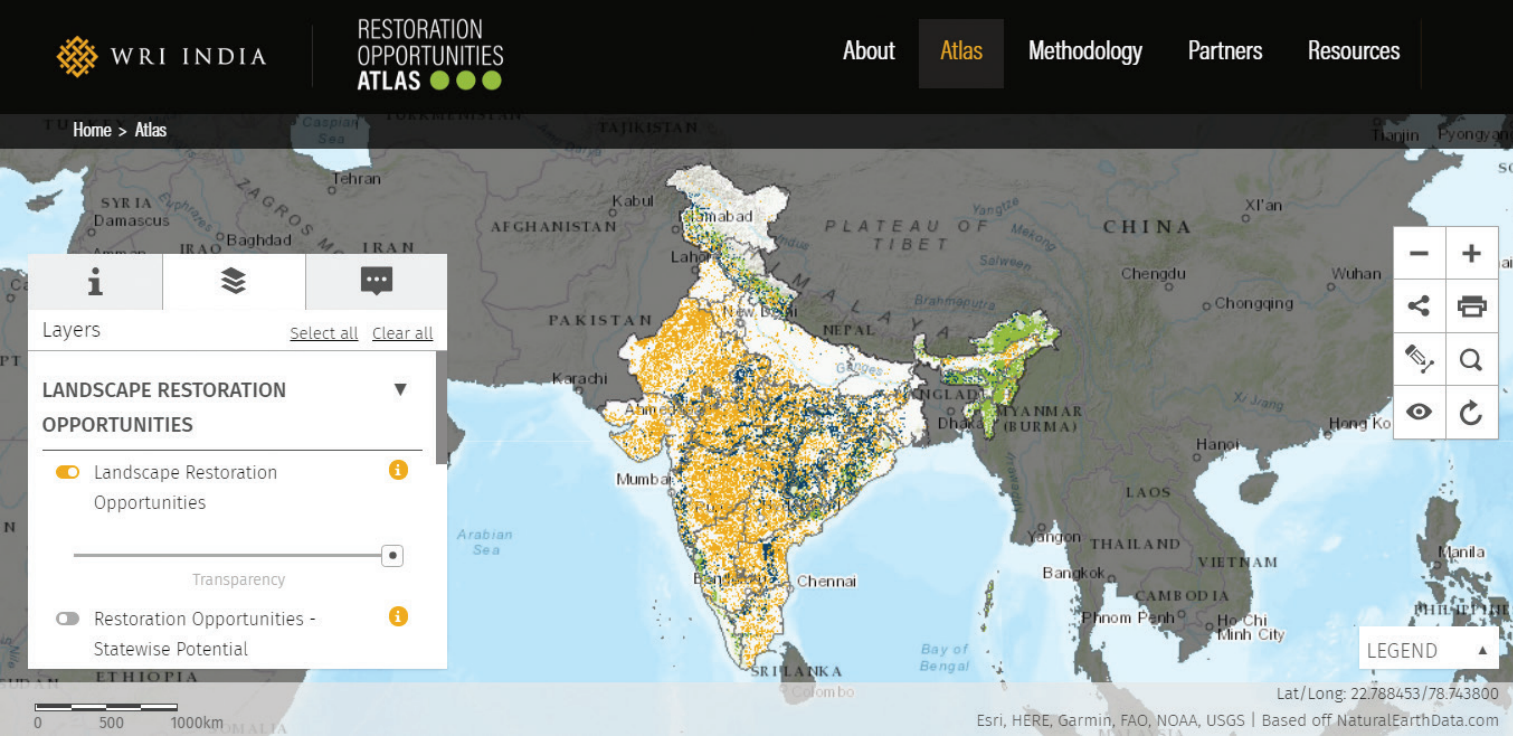


Figure 2: Screen Shot of Restoration Opportunities Atlas

SECTIONS AND LAYERS OF THE ATLAS

Landscape restoration opportunities

- Landscape restoration opportunities
- State boundary

Potential for increase in forest and tree cover

- Potential for increase in forest and tree cover where maximum tree cover in cultivated areas is capped at 20%
- Potential for increase in forest and tree cover where maximum tree cover in cultivated areas is capped at 40%

Potential for increase in above-ground carbon sequestration

- Potential for increase in above-ground carbon sequestration where maximum tree cover in cultivated areas is capped at 20%
- Potential for increase in above-ground carbon sequestration where maximum tree cover in cultivated areas is capped at 40%
- State boundary

Past and on-going initiatives

- Restoration initiatives
- Actors involved in implementation of restoration projects

Risk factors for restoration

- Overview of potential risk factors in the states
- Average incidents of forest fire per ha
- Diversion of forest land for development
- Land and forest conflicts

Tenure and resource rights

- Percentage of recorded forest area under JFM
- Potential for recognition of CFRs
- Recognized CFR areas
- Fifth and Sixth schedule areas

Finance for restoration

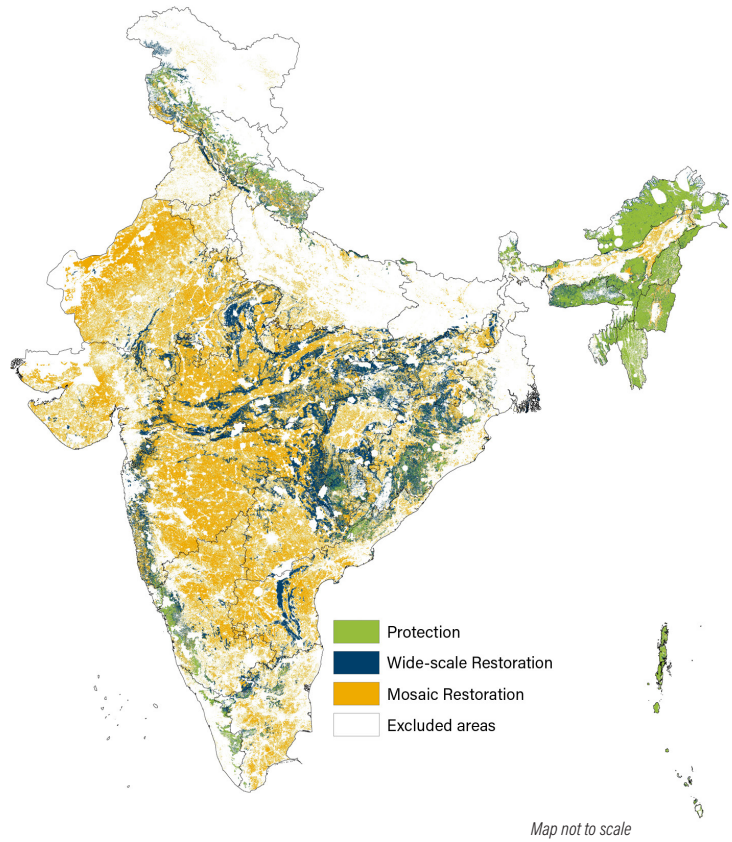
- Allocation of public finance to states excluding MGNREGS
- Allocation under MGNREGS
- States' share in the CAF

India has nearly 140 Mha of potential for forest protection and landscape restoration.

Protection areas have forest cover with a density of more than 40 percent. These forests can be maintained by mitigating risks such as fire, land diversion and fragmentation. In addition to national parks, sanctuaries and other conservation areas, India has nearly 18 Mha of forests that need to be protected. Arunachal Pradesh, Assam and Manipur have the highest potential for protection.

Areas suitable for wide-scale restoration are those where near contiguous tracts of forest and tree cover can be established. The existing tree density in these areas is less than 40 percent and the population density is less than 200 persons per square kilometre. Madhya Pradesh, Chhattisgarh and Maharashtra have the highest potential for wide-scale restoration.

Mosaic restoration is the integration of trees in a patchwork of different land uses including rainfed cultivated areas. These areas have tree cover density of less than 40 percent and population density of less than 400 persons per sq.km. Rajasthan, Maharashtra and Madhya Pradesh have the highest potential for mosaic restoration.



Forest Protection	Wide-scale Restoration	Mosaic Restoration
18 Mha	34 Mha	87 Mha

Map 1: Potential for Forest Protection and Landscape Restoration
Source: WRI India

Improving forest and tree cover can deliver critical co-benefits. The interventions in protection and wide-scale restoration areas for instance are key for supporting the livelihoods of nearly 275 million people who are dependent on forest and tree cover for food security, fuelwood, fodder, nontimber forest produce, economic opportunity and sustenance. In rainfed cultivated areas, agroforestry interventions can improve the productivity of land and diversify livelihood opportunities of dependent farmers, particularly small holders. A database of past and on-going initiatives for protection and landscape restoration shows that these initiatives have led to multiple benefits including water recharge, biodiversity conservation, increased supply of fodder and nontimber forest produce, and access to fuelwood. This database can be accessed through the Atlas.

Figure 3: Benefits of Forest Protection and Landscape Restoration

Initial estimates suggest that forest protection and landscape restoration can sequester 3 and 4.5 billion tons of above-ground carbon by 2040. The total carbon sequestered in other carbon pools is expected to be at least two to three times more than the above-ground carbon alone (FSI, 2017). The amount of above-ground carbon sequestered will depend upon the tree species as well as the extent of improvement in tree cover. If for instance, in rainfed cultivated areas, trees are planted on field boundaries, the improvement in tree cover will be about 20 percent. As a result, the above-ground carbon sequestration per hectare will be 11 tons. If, however the tree cover is improved by 40 percent through agri-horti-silviculture interventions the per hectare increase in above-ground carbon sequestration can be 25 tons.

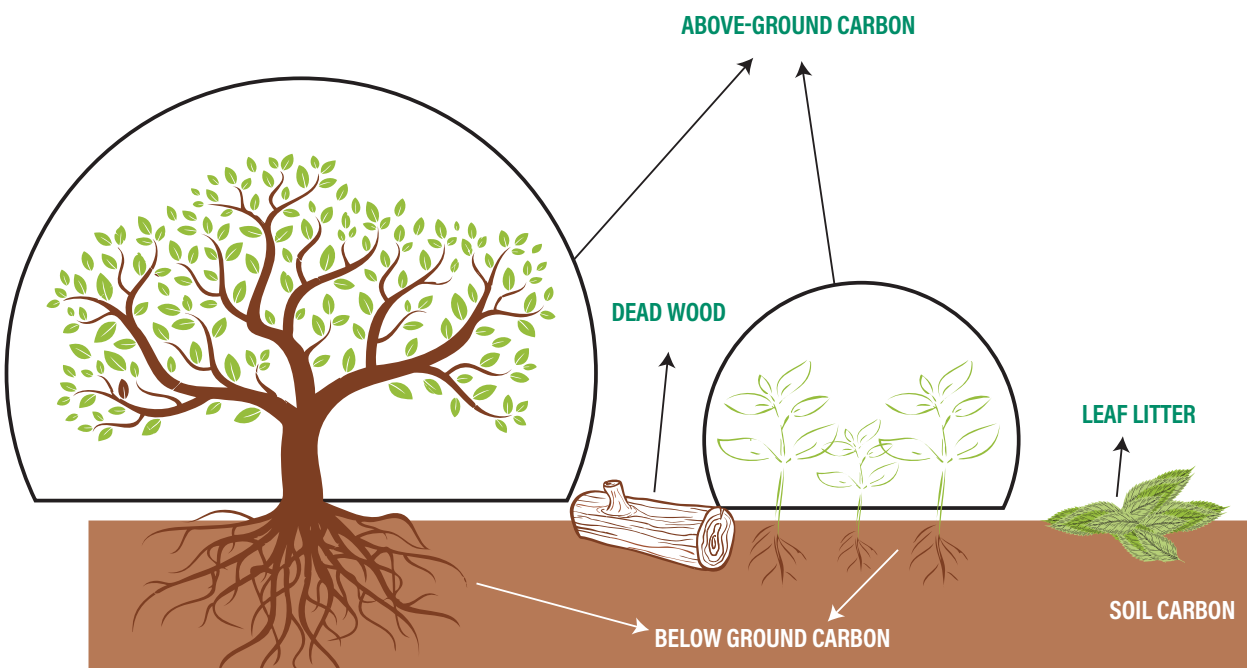
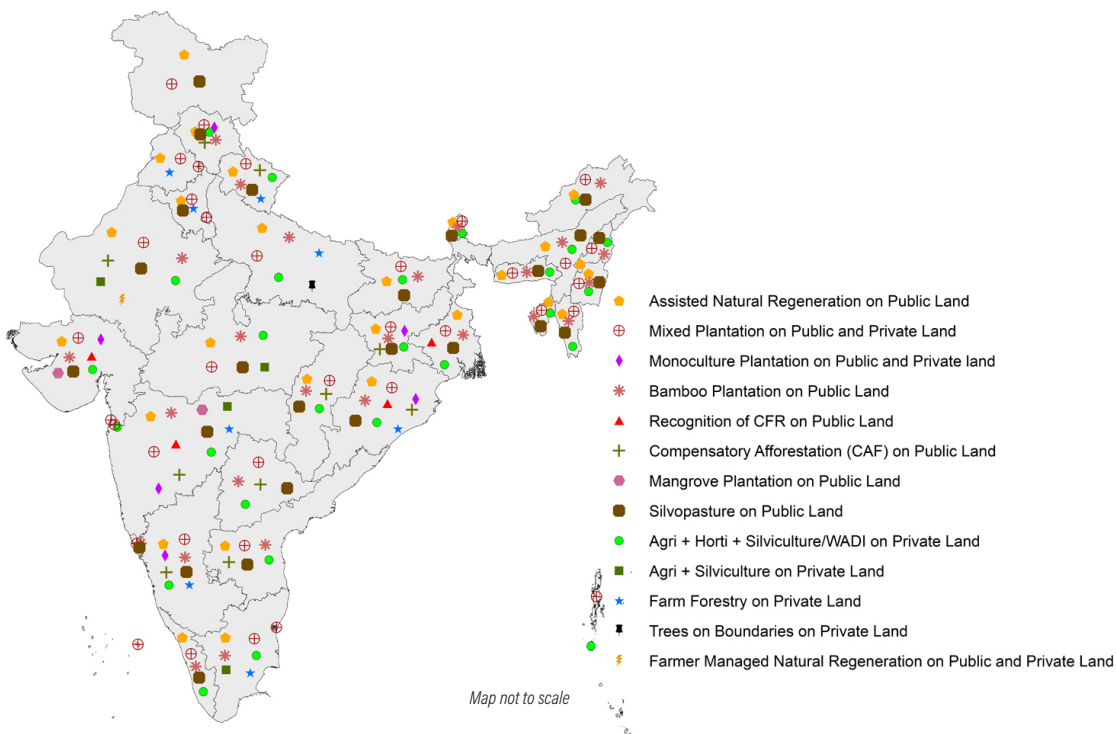


Figure 4: Sources of Carbon Pool

Source: Adapted from the Forest Survey of India, 2017

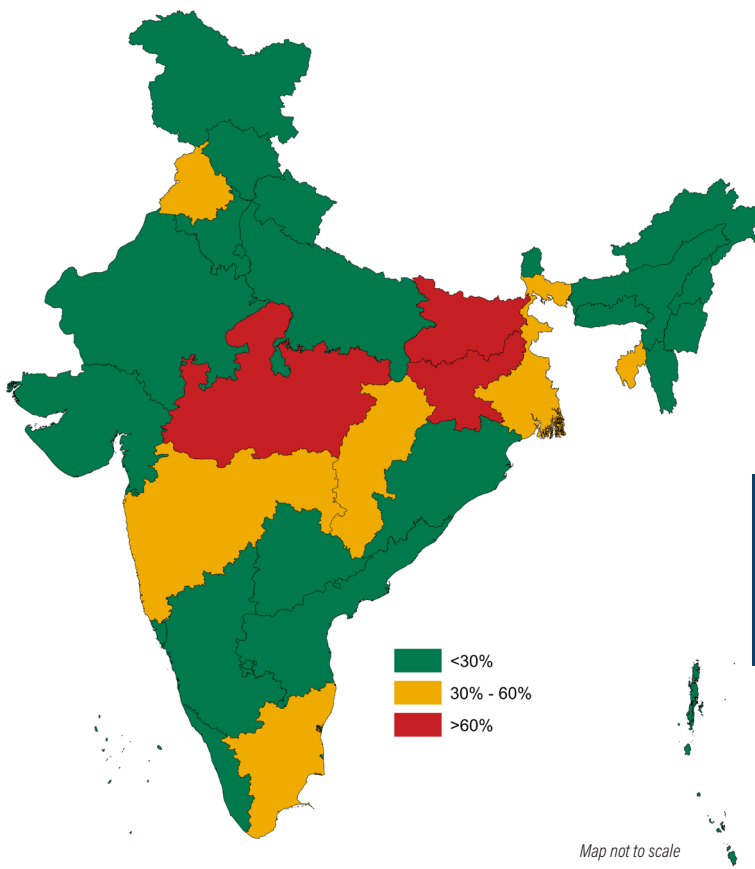
India's extensive and varied experience of initiatives for improving forest and tree cover provide a strong foundation for planning programmes and projects at scale. A growing database of past and on-going initiatives comprises 200 projects with details of their objectives, interventions, actors, benefits realised, and business models, if any. The database shows that a variety of restoration interventions have been implemented across the country. These include natural regeneration, monoculture and mixed plantation, compensatory plantations, bamboo plantation, silvopasture development, planting trees on field boundaries and bunds, agri-horti-silviculture interventions including WADI and farm forestry. In some cases, the recognition of community forest rights was the starting point for forest restoration. Two programs, namely the Government of India's National Afforestation Program for strengthening the forest sector and the NABARD's WADI program for agroforestry linked livelihoods development of tribals, are spread across all states.



Map 2: Restoration Interventions Implemented in the Different States

Source: WRI India

Local communities play an integral role in protecting forests and restoring forest and tree cover. India's policy framework recognizes local communities as key stakeholders in forest and tree management. In many parts of the country, communities have traditionally managed resources upon which they depend, through diverse institutional arrangements. Since 1990, the Joint Forest Management (JFM) policy has facilitated participatory protection and restoration of forests. Through JFM, agreements are made between local communities and state forest departments to jointly protect adjacent forest lands. More than 100,000 Joint Forest Management Committees have been created covering nearly 23 million hectares of recorded forest area (MoEFC, 2011).

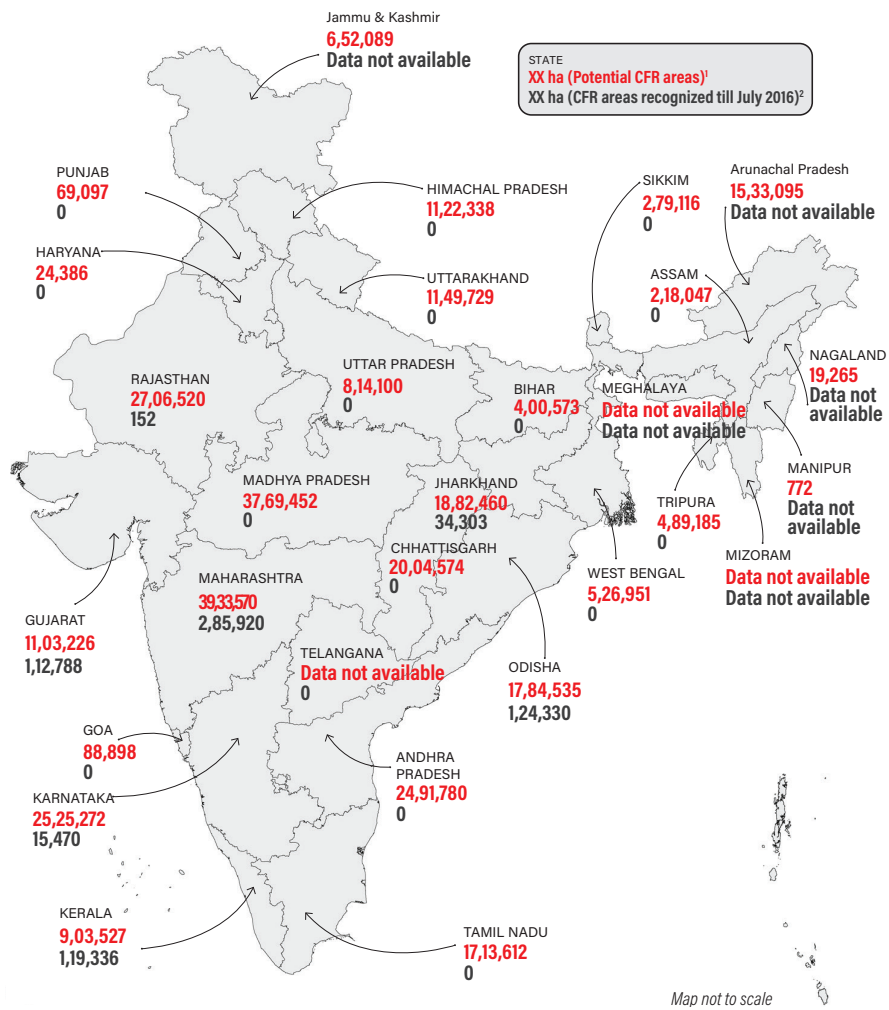


Jharkhand, Bihar and Madhya Pradesh have brought more than 70 percent of their recorded forest area into Joint Forest Management

Map 3: Percentage of Recorded Forest Area Under JFM

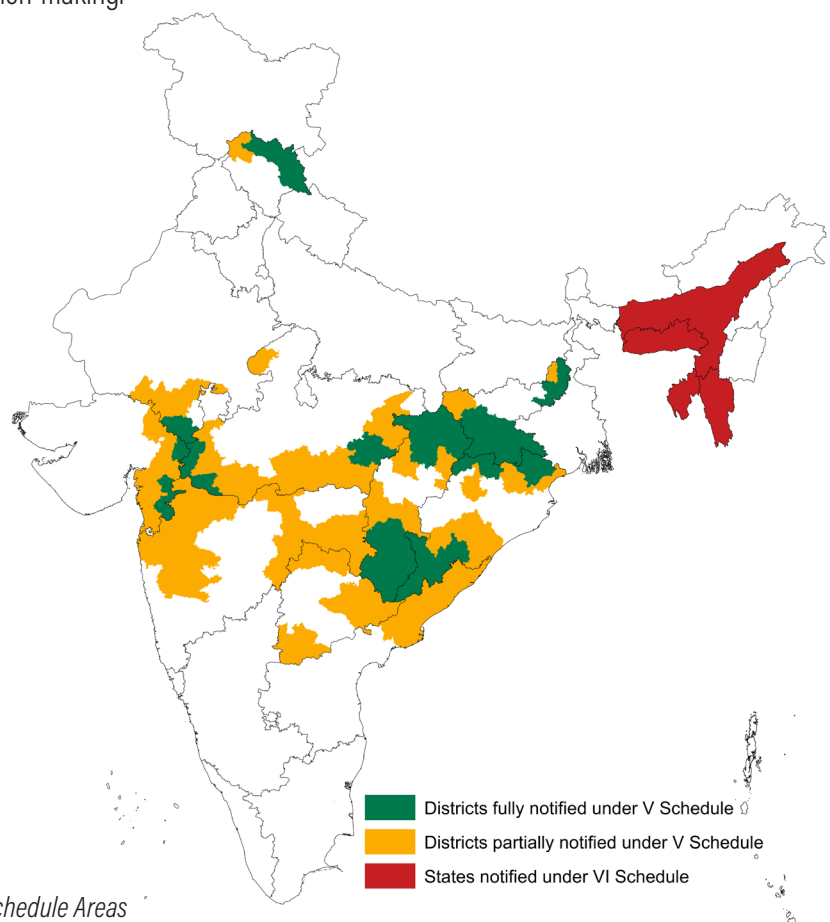
Source: MoEF, 2011

Secure tenure is essential for sustained involvement of local communities in forest protection and landscape restoration. Globally, there is growing evidence that community forest lands with secure tenure are often linked to lower deforestation rates, significant increase in forest cover and sustainable production of timber and other forest products (Ding, et al. 2016). The Forest Rights Act, 2006 enables recognition of Community Forest Resource Rights (CFR) for conserving, protecting, regenerating and sustainably utilizing forest resources upon which communities have traditionally depended. The BIPP-ISB estimates that there is potential to recognise CFRs in more than 32 million hectares. Madhya Pradesh, Maharashtra and Chhattisgarh have the largest potential for CFR recognition. CFRs have been recognised on more than a million hectares, with Maharashtra leading in this process (Agarwal and Saxena, 2018). However, many states with tremendous potential, have not recognised any CFRs. These include Madhya Pradesh, Chhattisgarh, and Andhra Pradesh.



Map 4: Potential and Recognized CFR Areas
Map adapted from Agarwal and Saxena, 2018
Source: 1. BIPP-ISB, 2016
2. Agarwal and Saxena, 2018

The Restoration Opportunities Atlas also draws attention to the special tenurial arrangements in Constitutionally defined Scheduled Areas by identifying districts that are wholly or partially notified in the Fifth Schedule as well as states that are covered under the Sixth Schedule. In Fifth Schedule areas, the Panchayat (Extension to Scheduled Areas) Act, 1996 decentralizes forest management and control, along with providing ownership rights over nontimber forest produce. In Sixth Schedule areas, the Constitution of India provides for the creation of decentralized autonomous institutions that can, among other things, exert full control over forests and land related decision-making.



Map 5: Fifth and Sixth Schedule Areas

Source: Data compiled from Constitution of India, 1950 and Ministry of Panchayati Raj, 2018

Map not to scale

A mix of budgetary support, compensatory mechanisms and incentives for forest cover provide financial support for forest protection and landscape restoration.

In the period 2011-2016, the Government of India allocated upwards of INR 1,02,505 crores (USD 13 billion) to protecting and improving forests as well as extending tree cover. More than 75 percent of this allocation was made through MGNREGS components associated with tree planting. The remaining allocations comprise multiple programs and schemes including the National Mission for a Green India, Integrated Water Management Programme, and the National Afforestation Programme. They also comprise bilateral and multilateral projects as well as grants in aid recommended by the XII and XIII Finance Commissions. The Restoration Opportunities Atlas presents data on states' share in budgetary allocations. The largest share of public finance for restoration related activities was allocated to Madhya Pradesh, Rajasthan and Maharashtra.

As a measure to balance environment and development demands on forest lands, Indian law requires a compensatory afforestation payment when forest lands are diverted to development projects like infrastructure development, mining and others. These compensatory payments have accumulated into a Compensatory Afforestation Fund, which presently holds INR 66,000 crores or USD 10 billion. A large part of CAF is legally required to be invested in recreating lost forest ecosystem services and strengthening forest management in the states where diversion has occurred. Odisha has the largest share in this fund, followed by Chhattisgarh, Madhya Pradesh and Jharkhand. Together these four states account for more than 40 percent of the CAF.

Since 2005, inter-governmental fiscal transfers recommended by successive Finance Commissions have provided incentives to states for maintaining forest cover. The XIV Finance Commission included a 7.5 percent weightage for forests in the tax devolution formula. The Government of India estimates that as a result of this weightage, USD 7-12 billion per year will be distributed among the states between 2015 and 2020 based on their forest cover.

Notably, it is seen that the states with the highest potential for protection and landscape restoration also have the largest financial allocations. However, understanding the extent to which this available funding responds to states' differentiated forest protection and landscape restoration needs requires further analysis. Unlocking finance so that it meets ground-level demands in a timely manner as well as provides the basis for enlarged fund flows will be important components of India's pathways for achieving forest and tree cover goals.

xx crores Allocation of public finance to states excluding MGNREGS

xx crores Allocation under MGNREGS

xx crores States' share in the CAF

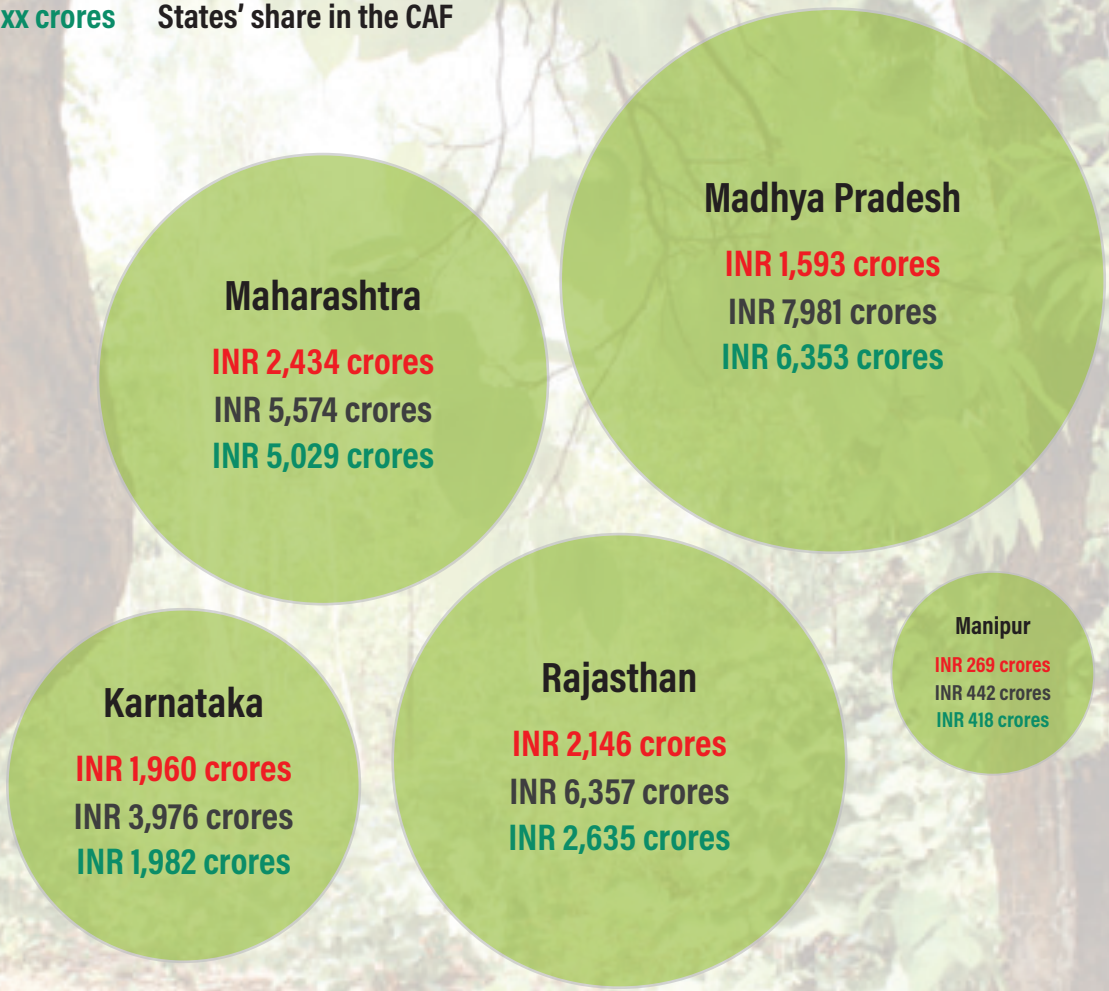


Figure 5: Financial Allocation to States for Forest Protection and Landscape Restoration

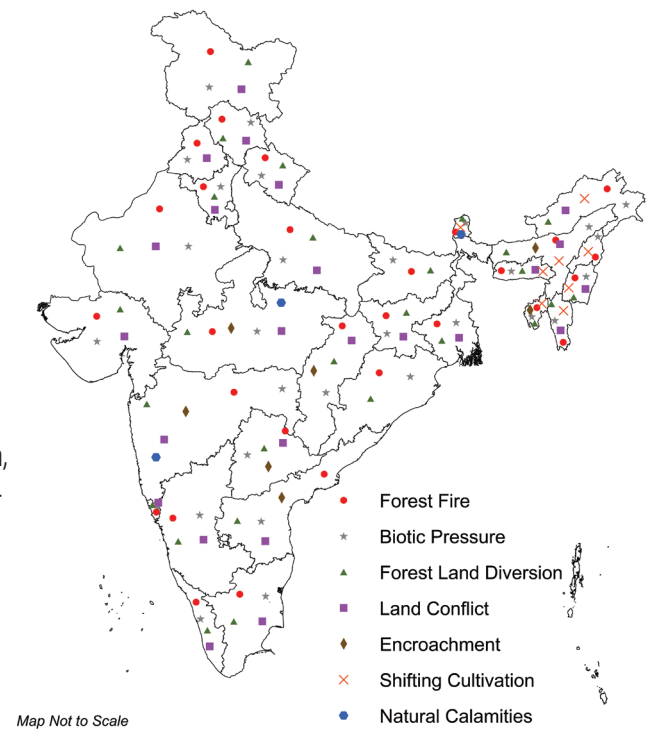
Size of the bubble indicates the size of forest protection and landscape restoration opportunity

Source: WRI India

Multiple risks will need to be addressed for successful protection and landscape restoration. The Restoration Opportunities Atlas provides an over- view of the principal risks that can potentially constrain forest protection and landscape restoration. Forest fires, fuelwood extraction and open grazing emerge as risk factors across all states. With the exception of Nagaland, diversion of forest land for development projects is also a risk across all states. The Atlas also presents additional available information related to forest fires, diversion of forest land for development and, land and resource rights related conflicts.

Incidents of forest fire: The Forest Survey of India estimates that more than 60 percent of forests are vulnerable to fire. Meghalaya, Tripura, Mizoram and Nagaland have the highest number of fire incidents per hectare, largely due to the practice of shifting cultivation.

Diversion of forest land: Since 1980, India has diverted 1.5 million ha of forest land for development projects. Out of this, nearly 1 million ha has been diverted after 2000, with the highest diversion occurring in Arunachal Pradesh, Punjab, Karnataka and Gujarat which together account for more than half the forest land diverted.



Land and forest conflicts: Data compiled by Land Conflict Watch shows that across 23 states land conflict could pose a critical threat to protection and landscape restoration. These land conflicts are primarily between state agencies and local communities, on matters of land acquisition, violation of tenure and resource rights as well as afforestation through CAF. Achieving India's forest and tree cover goals requires risk management strategies and strengthening of conflict resolution mechanisms, particularly at the local level.

Map 6: Overview of Potential Risks

Source: FSI, 2017; MoEFCC, 2018; Land Conflict Watch, 2018

The Restoration Opportunities Atlas is an initial attempt to bring together data from various sources to support planning for the NDC and SDGs. It shows that India has nearly 20 Mha potential for forest protection which will be critical for maintaining carbon stock while also providing other services such as biodiversity and water. The Atlas further shows India has more than 120 Mha of potential for landscape restoration. Much of this lies in rainfed cultivated areas where a variety of tree-based interventions can strengthen food security and rural livelihoods.

The Atlas also shows that all states will play an important yet differentiated role in fulfilling these commitments. While some states have higher potential for forest protection, others have greater potential for landscape restoration. Across all states many different interventions are already in place and these provide a strong foundation for planning programs and projects at scale. Substantial allocations, particularly through budgetary sources can be innovatively leveraged to finance forest protection and landscape restoration.

Local communities have been and must continue to be an integral part of efforts to protect forests and restore lands in India. Active community involvement requires secure tenure. While India's regulatory framework provides the necessary basis for securing tenure, there remains tremendous scope for implementation.

The analysis presented in the Atlas will be refined as new data becomes available. If you would like to collaborate on developing the Atlas further, please contact us on landscapes@wri.org.

PHOTO CREDIT

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The World Resources Institute India (WRI India) is an Indian environmental organisation with experts and staff who work closely with leaders to turn big ideas into action to sustain a healthy environment – the foundation of economic opportunity and human well-being. WRI India envisions an equitable and prosperous planet driven by the wise management of natural resources, and aspires to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

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