



Bonn Challenge and India

Progress on restoration efforts across states and landscapes



INTERNATIONAL UNION FOR CONSERVATION OF NATURE



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Contents

Foreword	v
Acknowledgements	vi
Executive Summary	vii
1 Forest Landscape Restoration	1
2 Bonn Challenge	5
3 Restoration in India	7
4 Scope of the Report	11
5 Summary of Findings	13
6 Best Practices	17
• Joint Forest Management in Old Jalukie, Nagaland	18
• Tata Power's restoration efforts in Lonavala	20
• Nature Conservation Foundation's rainforest restoration in Valparai	22
• Foundation for Ecological Security's restoration programme	24
• Banni grassland restoration by GUIDE, Gujarat	26
7 Way Forward	29
References	30



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Siddhanta Das
Director General of Forests
and Special Secretary

Ministry of Environment, Forest
and Climate Change
Government of India
New Delhi - 110 003
December 18, 2017

Foreword

It gives me great pleasure in presenting the report “Bonn Challenge and India: Progress on restoration efforts across states and landscapes”. It is an attempt to document India’s progress towards the Bonn Challenge pledge. Recognizing the multiple benefits of restoration, the Government of India announced its support for the Bonn Challenge initiative in 2015, with a 21 million hectare restoration pledge, becoming one of the first countries in Asia to join the global commitment. IUCN has been working with the Ministry in operationalizing this pledge and documenting the progress being made. This report is a first of its kind from any of the Bonn Challenge countries. It is an ongoing process and will continue to be updated.

The report also captures a few best practices across diverse landscapes and implemented by a variety of stakeholders. It is hoped that the learnings from these case studies will inspire restoration practitioners, and that some of the learnings may be upscaled.

India’s national policies have always had a strong focus on environment and wildlife, and are some of the oldest and most comprehensive in the world. Since the 1952 National Forest Policy (NFP), there has been a strong advocacy to have minimum of one-third of the total land area of the country under forest or tree cover, while maintaining two-third of the area under green cover in mountainous and hilly regions. As per the latest Forest Survey of India report, present forest and tree cover is 24.39% of the country’s geographical area. Therefore, to bring a minimum of one-third of the total land area of the country under forest and tree cover, an additional 27.8 million hectares of land area would need to be brought under green cover. This means that we need to start looking beyond designated forest lands and business as usual scenarios.

The Government of India has been doing this already through several flagship schemes and programmes such as the National Afforestation Programme (NAP), National Mission for a Green India (GIM), National Green Highways Mission, National Mission for Clean Ganga, and National Agroforestry Policy among others. The central government has channelled funds to the States for conservation, protection, improvement and expansion of forest and wildlife resources of the country under the CAMPA Act 2016. Many successful restoration efforts are also being carried out by NGOs and private sector companies these days. This report is unique as it captures some of the restoration efforts undertaken by NGOs and private companies alongside government efforts.


(Siddhanta Das)

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Ministry of Environment, Forest and Climate Change (MoEFCC) and IUCN are thankful to all those who willingly shared data on restoration efforts and responded to the questionnaire survey on restoration which provided the basis of this report. We would like to thank Dr. Dinesh Reddy from Foundation for Ecological Security (FES); Dr. Vijay Kumar from Gujarat Institute of Desert Ecology (GUIDE); Drs. Jayendra Lakshmapurkar and Deepa Gavali from Gujarat Ecology Society (GES); Ms. Snehlata Nath and Dr. Anita Varghese from Keystone Foundation; Dr. Pankaj Joshi from Sahjeevan; Drs. V. Selvam and R. Ramasubramanian from M.S. Swaminathan Research Foundation (MSSRF) for sharing information on restoration across the coasts; Dr. Javed Rizvi and Ms. Devashree Nayak from World Agroforestry Centre (ICRAF); Drs. Divya Mudappa, T.R. Shankar Raman, Aparajita Datta and Rohit Naniwadekar from Nature Conservation Foundation (NCF); Dr. B.K. Tiwari for sharing information on activities of the Ka Synjuk Ki Arliang Wah Umiam Mawphlang Welfare Society from Meghalaya and other JICA funded restoration projects from Tripura; Ms. Deepali Rautela of Network for Certification and Conservation of Forests (NCCF) for sharing information from Society for Afforestation, Research and Allied Works (SARA), Tamil Nadu Newsprint and Papers Limited, New Ambadi Estate (P) Ltd., International Paper APPM Ltd., Tripura Forest Development and Plantation Corporation Ltd., Uttar Pradesh Forest Corporation, Agricultural Development and Training Society (ADATS), International Bank for Reconstruction and Development (IBRD), and Government of NCT of Delhi; Mr. Shankar Venkateswaran and Mr. Vishal Bhavsar from the Tata Sustainability Group for sharing information from Tata Power, Tata Steel and Tata Motors; Mr. Suneel Pandey from ITC Ltd.; Mr. Vishwa Bandhu Bhattacharya from Apollo Tyres Ltd.; Mr. Sanjay Prakash and Mr. Abhinav Pandey for sharing information on de-desertification strategies from IIT Jodhpur; Ms. Monika Shrivastava from ACC Limited; and Ms. Seema Arora and Mr. Arnab Deb from Indian Business and Biodiversity Initiative (IBBI) for sharing information from JSW Group.

IUCN would like to thank MoEFCC for supporting this unique report, a first of its kind from all Bonn Challenge countries. We are grateful to the National Afforestation and Eco-Development Board (NAEB) of the MoEFCC for compiling and sharing information on all restoration efforts of the government agencies. We especially wish to acknowledge the continuous support and guidance of Mr. Pankaj Asthana, Inspector General of Forest and Ms. M. Selvi, Technical Officer from NAEB through the entire process.

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Executive Summary

The protection and revival of degraded and deforested land is the need of the hour. In order to tackle the issues that arise as a consequence of degradation and deforestation, principles of forest landscape restoration are being globally promoted. The Bonn Challenge is a global effort to bring 150 million hectares of deforested and degraded land into restoration by 2020 and 350 million hectares by 2030. The government of India made a Bonn Challenge pledge to bring under restoration 13 million hectares of degraded land by 2020 and an additional 8 million hectares by 2030.

This report highlights the progress the country has made towards the pledge. Data was collected from government agencies, private companies and non-governmental organisations on their restoration efforts. Although not an exhaustive list, the data reveals patterns and provides a glimpse into the country's different initiatives towards restoration.

India has already brought an area of 9.8 million hectares under restoration since 2011. Of this, 94.4% are contributed by government agencies, while the surveyed NGOs and private companies contributed 3.6% and 2% respectively.

Government schemes are often implemented with a bottom-up joint forest management approach, with local communities playing a key role. Private companies and non-governmental organisations may operate at smaller scales, yet have the expertise at their disposal that can influence the success of these restoration efforts.

The case studies that the report presents have been hand picked and showcase some of the best practices on restoration from across the country. Ranging from government funded joint forest management committees to private companies and non-governmental organisations, they may vary in the details of their approach, yet are similar in many fundamental aspects and are good examples that can and should be upscaled in other restoration programmes.

The case studies cover restoration efforts from across the States of Nagaland, Tamil Nadu, Maharashtra, Madhya Pradesh, Andhra Pradesh, Gujarat and Odisha. The efforts in restoration by the Joint Forest Management Committee (JFMC) from Nagaland has been featured as a best practice. NGOs featured as best practices include Nature Conservation Foundation (NCF), Foundation for Ecological Security (FES) and Gujarat Institute of Desert Ecology (GUIDE) while The Tata Power Company Limited was the private company included in the case study.

These restoration programmes were planned to benefit biodiversity and human well-being through scientific implementation and continual monitoring. These aspects are key to achieve success in forest landscape restoration efforts. The report highlights the chosen case studies so that their learnings can reach a wider group of practitioners and be upscaled.



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1

Forest Landscape Restoration

An introduction

The delicate balance that exists between and within ecosystems has, over the course of the past century, been grossly disrupted due to anthropogenic activities. Urbanisation, expansion of agriculture, logging and hunting has severely damaged forest lands. This substantial degradation of forest landscapes has, in turn, led to several environmental problems such as disruption of water cycles, a reduced fertility of the soil, heightened loss of biodiversity and food scarcity among local communities. From 1980 to 2012, nearly 100 million hectares of tropical forests were converted to farmland¹. Selective logging impacted nearly 20% of the tropical forests globally between 2000 to 2005². Apart from fragmentation, hunting also accelerated the loss of biodiversity from these ecosystems³. It is undeniable that natural ecosystems and humans are strongly coupled, where any adverse impact on one can also affect the other⁴.

Historically, restoration was defined as the science of assisting in the recovery of damaged, degraded or destroyed ecosystems⁵. The idea of restoration seldom extended its boundaries beyond the domain of applied ecological science. However, today restoration involves elements of economics and social science, strengthened by a community-centric approach. Given the current situation, it is necessary for anthropogenic systems and processes to also be taken into consideration. It is imperative that restoration combines multiple perspectives to ensure meaningful outcomes for communities and ecosystems alike. Thus, concentrated efforts on restoration of degraded land as a collaborative approach between government agencies, local civil society organisations as well as the local communities is the need of the hour.

Ecosystems that are degraded are at risk of gradually losing the ability to harbour biodiversity, regulate ecological processes or provide services. Only when a balance between the ecological and socio-economic welfare of the natural human system is achieved, can we ensure a sustainable future for all.

Activities such as agriculture and cattle grazing greatly contribute to the degradation of forest land. With increasing pressure on protected areas, restoration efforts are finding ways to make agricultural landscapes ecologically viable. In an agricultural landscape, enhancing biodiversity, improving productivity and supporting sustainability hold as much value as maintaining ecological integrity. Reviving biodiversity greatly improves the productivity of a degraded land.

100

million hectares

of tropical forests
were converted to
farmland from 1980
to 2012

Plant communities with considerable variation in their functions can facilitate enhanced nutrient uptake and resilience towards harsher conditions⁶. Therefore, planting different species together enriches the soil with nutrients and restores water flow, allowing for the productivity of the land to rise significantly. Effective management of fallow land can greatly improve crop production and fodder creation for livestock.

Forest Landscape Restoration

Forest landscape restoration is the ongoing process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes⁷.

Most ecological and economic processes, such as movement of large animals, water and nutrient cycling, carbon sequestration and so on take place on a larger scale⁸. Modifications of natural habitats such as land conversion for agriculture also happen at a bigger scale⁹. Thus, looking beyond small-scale projects to landscape level initiatives ensures that restoration interventions are effective and impactful.

Forest landscape restoration is more than just planting trees – it is restoring a whole landscape “forward” to meet present and future needs so as to offer multiple benefits and land uses over time. Under this approach, opportunities for ecological restoration are present in vast contiguous forests, both protected and productive, and whose objective is to integrate economic functions into it. Forest landscape restoration is not restricted to forests alone but also extends to other landscapes as well.

Challenges and Potential Strategies

Ecological restoration aims to aid degraded ecosystems, often with external interventions, to return to a state where one or more of its original function is revived¹⁰. These measures could be diverse and span along a continuum. While some places could be revived by natural recovery, concerted human intervention is needed for others, such as mining sites. It could involve influencing abiotic factors such as reshaping the landform to capture rainwater or minimise soil erosion, or facilitating biotic factors like assisted colonisation by native vegetation¹¹. These measures can therefore vary depending on the motivation behind restoration, the time period of restoration as well as availability of resources¹². Integration of socio-economic aspects into ecological restoration can be a complex process. At a landscape level, multiple stakeholders may be involved and it is not necessary that their interests are always aligned¹².

For e.g., conservationists may seek to restore a landscape for biodiversity conservation and to create connectivity between habitats, private companies may seek to increase profits through timber harvesting, whereas local communities may want to increase income by utilizing forest products. These interests can oppose each other and make the restoration programme difficult to plan and implement.

Therefore, to overcome such hurdles, it is necessary that negotiations happen among the different stakeholders and trade-offs are agreed upon at the planning stage⁷. For e.g., parts of the landscape can be productive forests that could be harvested sustainably while other parts can be left intact for biodiversity conservation and regulation of ecosystem services.

Implementation of a landscape restoration programme is a labour intensive process. Ecologically, the abiotic and biotic factors of a degraded site need to be altered to facilitate restoration. For instance, the topsoil of the site may need to be treated to allow vegetative establishment and succession. Seed banks are often depleted in degraded sites, due to loss of topsoil. Natural barriers may need to be formed to arrest water flow. Also, plants that depend on animals for dispersal may not reach the site if these dispersers are missing from the sites. Thus, restoration can be assisted by replenishing the seed bank or facilitating dispersal¹³.

Restoration, when taken up at a larger scale, is fraught with many challenges. For example, costs significantly shoot up and issues of governance and management of resources arise. Moreover,

Degraded ecosystems
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the variability of many ecological processes can increase. Hence, it is necessary that restoration practices are conducted scientifically¹⁴.

One common practice is planting trees in the degraded sites to increase tree density, although this should only be considered as one among many practices and not ecological restoration per se. One of the primary aims of forest restoration is to improve the quality of trees. The planted tree community should be able to adapt to the local conditions and harbour biodiversity. Native tree community with diversity in functional roles is ideal for forest landscape restoration.

To improve quality of trees, silvicultural practices can be adopted. These include thinning, enrichment planting, reducing fire and grazing, removing invasive species among other practices. However, under a forest landscape restoration approach, implementers also have to keep in mind the economic aspirations of the people and the cultural significance of the landscape¹⁵.

Forests also have economic and social significance and different communities can be dependent on them in a variety of ways. For instance, a forest patch may have farmers depending on it for ecosystem services such as nutrient cycling, while other communities may be earning an income from the same patch through collection and sale of forest products. Thus, forests can act as a safety net by complementing incomes. Forests can also help in uplifting the livelihoods of people residing in the periphery. Therefore, while implementing any landscape-level restoration, authorities need to garner the support of the local community.

Ecological restoration opportunities also exist in other land use activities such as agricultural and pastoral lands¹⁶. Human land use activities (agriculture, urbanisation etc.) now dominate the global ecosystems (covering almost 40% of the land surface) and interact across multiple scales. Given that there is severe pressure on our protected areas, restoration efforts should strive to make these agricultural landscapes ecologically viable. Agricultural landscapes can act as corridors connecting habitat patches¹⁶. Besides, they can also offer refuge to wildlife population that can spill over from such protected areas. Similarly, in an agricultural landscape, not just ecological integrity, but productivity and sustainability should also be promoted. Biodiversity has a positive effect on productivity and it is now generally agreed upon that increasing biodiversity promotes enhanced productivity in agriculture landscapes as well.

Thus, forest landscape restoration is dynamic and forward-looking. It is a long-term process where activities are carried out over multiple years, in a way that adapts to the local conditions and results in multiple benefits to various stakeholders.

Forest landscape restoration is more than just planting trees – it is restoring a whole landscape to meet present and future needs and offering multiple benefits and land uses over time



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2

Bonn Challenge

A global partnership for restoration

Forest landscape restoration approach intends to strike a balance between environmental and social needs in order to foster sustainable development. Reviving ecosystems not only improves the productivity of land and enhances biodiversity but also presents opportunities to reap economic benefits. Forest landscape restoration, if implemented carefully and efficiently, can benefit a range of stakeholders.

Global Partnership on Forest and Landscape Restoration (GPFLR)

GPFLR is a proactive global network that unites governments, organisations, academic/research institutes, communities and individuals under a common goal: to restore the world's lost and degraded forests and their surrounding landscapes.

The GPFLR was initiated in 2003 by a small consortium of like-minded organisations and spearheaded by IUCN. Its purpose is to catalyse dynamic, voluntary action through sharing diverse experiences on restoration efforts which deliver tangible benefits to both local communities and nature through a landscape approach, while also fulfilling international commitments on forests. An important step towards this was the Bonn Challenge pledge with the underlying principles of forest landscape restoration.

The Bonn Challenge

A study in 2010 undertaken by IUCN and World Resources Institute (WRI) produced a World of Opportunity Map, which found that globally there was more than two billion hectares of degraded land offering opportunities for restoration⁷.

In September 2011, at a high-level event co-hosted by the German Ministry of the Environment and IUCN, the 2020 Bonn Challenge target was launched by leaders from around the world.

The Bonn Challenge is a global effort to bring 150 million hectares of degraded and deforested land into restoration by 2020. The target was later extended to cover 350 million hectares of degraded land by 2030 at the New York Declaration on Forests of the 2014 UN Climate Summit. IUCN is the Secretariat for the Bonn Challenge.

The Bonn Challenge is an implementation vehicle for national priorities such as boosting landscape productivity, improving water and food security, conserving biodiversity, and combating desertification, while facilitating the implementation of existing international commitments including the Aichi Biodiversity Targets, climate change commitments under the UNFCCC and the Paris Agreement related to emissions reduction from the forest and land-use sector, as well as the Rio+20 land degradation target.

The restoration of 150 million hectares of degraded and deforested lands in biomes around the world – in line with the forest landscape restoration approach – will create approximately US\$ 84 billion per year in net benefits that could bring direct additional income opportunities for rural communities.

Economics of Land Degradation Initiative (ELDI) estimated that sustainable land management globally could create an additional 2.3 billion tonnes of crop production per year worth approximately US\$ 1.4 trillion, thus addressing the prevalent food crisis¹⁷.

Response to Bonn Challenge

The Bonn Challenge has been met with enthusiasm by the international community with over 47 commitments totaling 160.02 million hectares¹⁸.

In Latin America, support for the Bonn Challenge was expressed in a regional Bonn Challenge ministerial meeting in El Salvador in August 2015. In Africa, a high-level Bonn Challenge roundtable was convened by the Government of Rwanda, the East African Community, and IUCN in July 2016. A key outcome of this meeting was the Kigali Declaration on forest landscape restoration in Africa signed by 13 countries and later endorsed by the Central African Forests Commission (COMIFAC). The Kigali Declaration is a reflection of and catalyst for pan-African leadership on restoration action.

Momentum for forest landscape restoration in Asia is also growing, with the first Asia Bonn Challenge roundtable held in May 2017 in South Sumatra, where the Bonn Challenge pledge crossed the 150 million hectare milestone with new pledges. The roundtable was attended by representatives from 11 Asian nations, including Pakistan, Bangladesh, Sri Lanka and Mongolia, who pledged their commitments for the Bonn Challenge. India hosted a South Asia regional consultation on Bonn Challenge and forest landscape restoration in August 2017. The consultation was attended by government and non-government representatives from Bangladesh, Bhutan, India, Nepal and Sri Lanka.

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3

Restoration in India

Existing policies and practices

The landscape of India is as diverse as it is rich. It ranges from the tropical rainforest of the Andaman Islands, the Western Ghats, and North-East India, to the coniferous forest of the Himalayas¹⁹. Between these, lie the moist deciduous Sal forest of eastern India, the dry deciduous Teak forest of central and southern India, and the Babul dominated thorn forest of the central Deccan and western Gangetic plain. Approximately 24.39% of the country's geographical area is under green cover²⁰.

A globally megadiverse country, India hosts 8.6% of all mammalian, 13.7% of all avian, 7.9% of all reptilian, 6% of all amphibian, 12.2% of all piscine, and 6% of all flowering plant species. Approximately 28% of the total Indian flora is endemic²¹.

However, India is also the second most populous country in the world and a sizeable portion of the country's population is heavily dependent on resources and services provided by the natural ecosystems²². The country's forests, grasslands, coasts and other ecosystems are now increasingly threatened with deforestation, degradation, fragmentation and other anthropogenic habitat modifications.

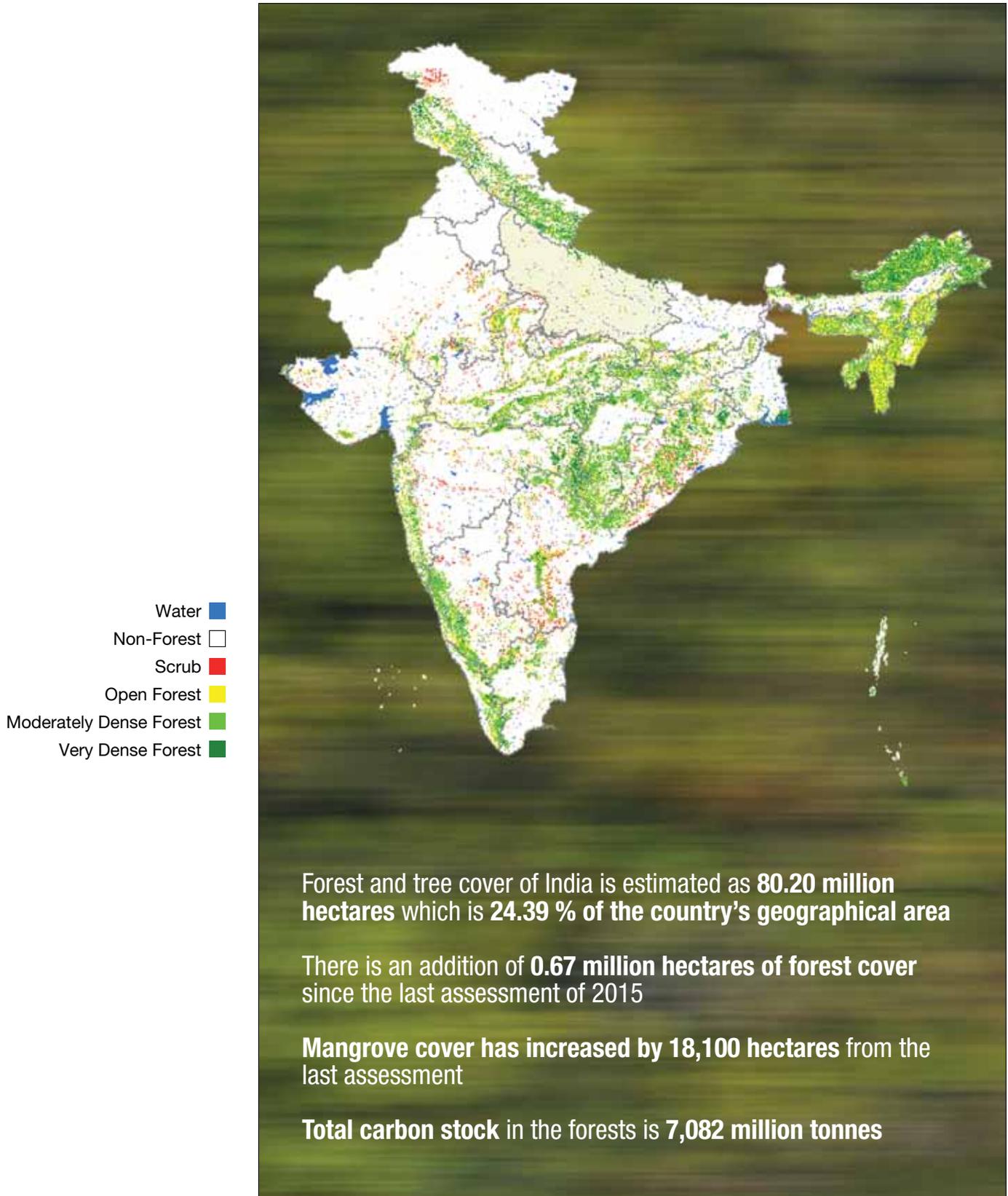
Addressing and reversing the negative impacts of unplanned growth and development can be achieved by adopting the forest landscape restoration approach.

Existing Frameworks

The country already has a slew of policies and laws in keeping with the principles of restoration. Notable among them are the National Forest Policy, 1988 and the recent National Agroforestry Policy, 2014. The Wildlife Protection Act, 1972 is one of the oldest and most comprehensive wildlife laws in the world.

The National Forest Policy (NFP) aims to substantially increase tree cover in the country through afforestation and social forestry programmes, especially on denuded, degraded and unproductive land. It strives to restore forested landscapes to a state where it can provide benefits such as biodiversity conservation, disaster mitigation and livelihood enhancement. The policy advocates to have minimum of one-third of the total land area of the country under forest or tree cover, while maintaining two-third of the area under green cover in mountainous and hilly regions.

FOREST COVER OF INDIA



India State of Forest Report 2017, Forest Survey of India

This would mean that an area of approximately 108 million hectares would need to be brought under green cover. Presently, the forest and tree cover of India is 24.39% or 80.20 million hectares according to the India State of Forest Report (ISFR) 2017. This further classifies the forests into 2.99% Very Dense forest (more than 70% canopy cover), 9.38% Moderately Dense forest (40% to 70% Canopy cover), and 9.18% Open forest (10%-40% canopy density)²⁰.

Given that 60% of land in India is utilised for agriculture, the National Agroforestry Policy (NAP), launched in 2014, is directed at promoting sustainable and resilient agricultural practices that generate income and improve livelihoods. At the same time it aims to promote ecological stability in these agricultural landscapes by increasing forest cover. This is of particular significance in a densely populated country like India where habitat connectivity is especially under threat. However, it is still in its nascent stage with release of funds to only eight States in 2016.

The Forest (Conservation) Act, 1980 regulates diversion of forest land for non-forestry purposes and provides for compensatory afforestation. On the issue of forest use, a historic step was taken in 2006 with the enactment of the Forest Rights Act (FRA). This landmark Act recognises both individual rights to cultivated land in forestland and community rights over common property resources. The act enables forest communities to secure livelihoods and allows for governance of forests and natural resources to be strengthened. These laws guide protection of forest lands and encourage sustainable use by forest-dependent communities.

The restoration efforts in India extend beyond national policies and programmes. India is party to various international commitments and forums such as Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD), United Nations Forum on Forests (UNFF), and Bonn Challenge among others.

Current Trends

Forest restoration in India involves different agencies. Prominent among them are the State forest departments. They work to revive forest landscapes, often through engagement and involvement of the local communities. There are several non-governmental organisations who work in the field of forestry, biodiversity conservation and social upliftment and have specific restoration programmes and activities as part of their mandate. Additionally, there are many private companies in India that also engage in restoration programmes. The environmental, social and economic benefits that come with the restoration of degraded lands have prompted several stakeholders to become part of the restoration process.

India has pledged to restore 13 million hectares of degraded and deforested land by 2020, and an additional 8 million hectares by 2030



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Scope of the Report

Reviewing restoration efforts in India

In keeping with India's national targets such as Nationally Determined Contribution (NDC) and National Biodiversity Targets (NBTs) as well as international commitments towards restoration, multiple organisations across the country have been actively engaged in various restoration initiatives. Each initiative is unique in that it covers a varying size of land supported by different stakeholders. The time span covered also differs across programmes. This report is an ongoing process, a first glimpse of restoration efforts within the country by various stakeholders, and will continue to be updated.

Data Collection

Information on restoration efforts was collected from different agencies across India who pursue restoration activities. Target groups included government agencies, private companies and non-governmental organisations (NGOs).

The National Afforestation and Eco-Development Board (NAEB) of the Ministry of Environment, Forest and Climate Change (MoEFCC) is the focal agency for restoration of the Government of India. Data on restoration efforts of the Government was provided by NAEB, while for the private companies and NGOs, online survey forms were used to collate data on their restoration efforts.

Given the plethora of restoration efforts across India, a decision was taken to collect information that would be common to all and therefore meaningful to interpret. With each project proponent, enquiries were made regarding the area that was restored, whether it was previously a forest patch or any other ecosystem (grassland or mangrove), the type of land tenure, duration of the project, amount spent on restoring the area (per hectare) and taxonomic names of plant species that were used for plantation. The efficacy of projects was collectively assessed using these responses.

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■

The area of the restored site represented the extent of each of the restoration efforts. Area, duration and cost could indicate the logistical requirements of any restoration project and whether they varied across different implementing agencies and types of land tenure. It was important to consider all such factors especially since government-funded projects on government owned land dominated restoration activity in the country.

Grasslands are unique ecosystems which are often neglected or not included when one looks at restoration programmes. It was decided to survey for information on restoration targeting this specific ecosystem as well.

Inferences that can be drawn from this document are completely based on secondary data provided by the surveyed agencies from the year 2011 onwards.

Dataset

A major portion of the data covers programmes that started in 2011, the year the Bonn Challenge was launched. However, a few programmes initiated before 2011 and continued beyond 2011 were also included, especially in the section on best practices or in cases where year-wise segregated data was unavailable.

In several instances, plantation was the model that was adopted for restoring degraded or deforested land. This involved planting saplings and maintaining them for a certain period (2-3 years for government agencies). Plantation of saplings, when carried out scientifically and not just to meet prior targets, accelerates recovery of vegetation in degraded areas. Also, setting aside areas where natural vegetation can recover without any plantation creates heterogeneity of habitats which can be beneficial for biodiversity.

Initially established with the objective of poverty alleviation but also including the mandate of environment protection and afforestation, the Government of India's Twenty Point Programme was analysed to gauge the restoration efforts undertaken by Government agencies. Private and non-governmental organisations' data came from individual entities.

5

Summary of Findings

Analysing restoration efforts in India

In total 9,810,944.2 hectares of area was brought under restoration across India (from 2011 till 2016-17). Figure 1 represents the percentage of land restored by government agencies, NGOs and private companies.

Of the total restoration efforts carried out across the country, 94.4% (9,264,976 hectares) were by government agencies, 3.6% (352,667.9 hectares) by NGOs and 2% (193,290.3 hectares) by private companies as seen in Figure 1.

This stark contrast in area brought under restoration by the three implementing agencies can be explained by the fact that private companies and NGOs generally carry out their restoration in small land holdings. However, they play a vital role in the planning and implementation of any restoration programme thanks to their technical expertise and knowledge of the local conditions. It is also important to note here that the data collected was secondary and thus, could be biased towards any one of the implementing agencies.

While the private companies and NGOs can benefit from the vast resources that the government agencies possess in terms of land, labour or capital, the latter can profit from the insights and experiences of the private companies and NGOs. Therefore, collaboration between government, non-government and local communities on restoration initiatives is recommended for optimum results. The following sections take a closer look at the three agencies' restoration efforts in India.

GOVERNMENT AGENCIES

The restoration targets, as stated in the Twenty Point Programme, are determined by the Ministry of Environment, Forest and Climate Change (MoEFCC) in consultation with the States.

Data was collected on the Twenty Point Programme across all States from 2011 till 2016-17. There was a sudden decrease in the area being restored under the Twenty Point Programme after 2012-13. Determining the cause for this decrease is not within the scope of this report. In 2016-17, the area being restored under the Twenty Point Programme increased in comparison to past years. Some of the flagship afforestation programmes detailed out in the report include:

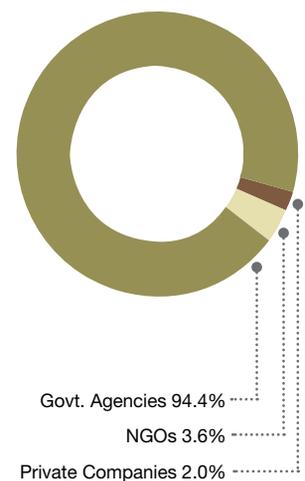


Figure 1: Restoration efforts by the three leading agencies in India

From 2012 to 2016-17, under NAP, a total of 282,389 hectares of degraded forests were restored, while under GIM 32,066 hectares of degraded land were afforested and restored

■ National Afforestation Programme

The National Afforestation and Eco-Development Board (NAEB), of the MoEFCC, through its flagship scheme “National Afforestation Programme” (NAP), plans rehabilitation of degraded forests and afforestation around forests.

Implemented by the State governments, the overall objective of the scheme is to promote participatory and sustainable management of degraded forest areas and adjoining lands with special focus on improvement in livelihoods of the forest-fringe communities. From 2012 to 2016-17, a total of 282,389 hectares of degraded land was restored and afforested under NAP across the country.

■ Green India Mission

India has also initiated the National Mission for a Green India (GIM), under National Action Plan on Climate Change (NAPCC) to mitigate climate driven changes such as water and food scarcity, threats to biodiversity etc. GIM has been operational since 2015-16.

The mission aims to increase tree cover on 5 million hectares of forest or non-forest lands and improve quality of forest cover on an additional 5 million hectares (a total of 10 million hectares), while increasing the forest-based livelihood income of about 3 million households living in and around the forests. Under GIM, which is still in its fledgling state, 32,066 hectares of degraded land were afforested and restored (GIM data is from 2016-2017).

■ Compensatory Afforestation Management and Planning Authority

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) Act 2016 seeks to provide, both at the Centre and in each State and Union Territory, an appropriate institutional mechanism for ensuring appropriate utilisation of funds realised in lieu of forest land diverted for non-forest purpose in an efficient and transparent manner for creation and maintenance of compensatory afforestation and execution of other activities for conservation, protection, improvement and expansion of forest and wildlife resources of the country.

Under Forest (Conservation) Act 1980, when forest lands are ‘diverted for non-forest purposes’, compensatory afforestation of equal sizes have to be taken up. The parties involved are also liable to pay the monetary value of the ecological services the diverted forests would have otherwise provided (for the next 50 years).

Some other relevant schemes and programmes include National Agroforestry Policy, National Bamboo Mission, National Green Highway Mission, National Mission for a Clean Ganga, Nagar Van Yojana among others. These are all included under the umbrella of the Twenty Point Programme.

NAP and Joint Forest Management

The Joint Forest Management Committee (JFMC) along with the Forest Development Authority (FDA) is responsible for on ground implementation of the plans and objectives of National Afforestation Programme. While the FDA is constituted at the territorial/wildlife forest division level, JFMC operates at the village level. This decentralised approach for realising forest restoration targets was introduced as recommended after the mid-term evaluation of NAP.

■ Joint Forest Management

The Indian Forest Service, constituted in 1966, was traditionally the primary authority overlooking the implementation of the National Forest Policy. Under the policy, forests were managed scientifically and in a sustainable manner for primary timber products. The initiation of the Joint Forest Management (JFM) in 1990 allowed for more involvement of the local village committees in restoration programmes undertaken by the forest departments. JFMC is a democratic,

decentralised and transparent local institution of forest and forest fringe dwelling communities, that is part of the Gram Sabha fully or partially and set up as per the provisions of applicable JFM guidelines of the State.

Along with biodiversity conservation, livelihood aspirations of the people was also taken into consideration. Other forest regulatory services such as water flow and carbon sequestration were also positively impacted.

Under the Joint Forest Management model, local communities are given access to sustainably harvest forest products such as non-timber forest products (NTFPs) but at the same time, they bear the onus to conserve the forest. Hence by giving them a sense of ownership, JFM encourages a more participatory management. An Eco-Development Committee (EDC) is similar to JFMCs, but meant for villages in protected areas and their buffer zones.

■ Plantation models

Afforestation and restoration activities carried out under National Afforestation Programme have used different plantation models such as aided natural regeneration, artificial regeneration etc. Various plantation models under NAP have been analysed and are presented in Figure 2.

Of the total restored area, a large portion of the area was restored and afforested under aided (103,523 hectares, 36.7%) and artificial (104,500 hectares, 37%) regeneration. Bamboo (22,568 hectares, 8%), mixed plantations (30,642 hectares, 10.9%) and silvipastures (21,156 hectares, 7.5%) contributed to the remaining restoration and afforestation activities under NAP.

Transformational Changes

Several studies revealed that the JFM participatory model of forest conservation has led to increase in biodiversity and forest productivity²³. This has also managed to create livelihood opportunities in remote areas by linking villages to markets for sale of NTFPs, better irrigation facilities for crop production, improved transport and health care facilities.

By providing villagers with opportunities to participate in micro-plans, the JFMC model has succeeded in involving communities to protect and sustainably harvest their natural resources. It has also brought in expertise and aligned interests of multiple stakeholders in forest restoration, thereby making it socially more inclusive.

Although participatory forest protection involving the local communities is not an alien idea to India, JFMC has nevertheless ushered in a new era of forest protection in the country.

From the dataset, it is evident that the government (through different agencies) is the single largest stakeholder in forest restoration in India. Therefore, it is critical that the Government continues to bear the responsibility of restoring large portions of degraded areas while reaching out to different agencies and impacted communities.

PRIVATE COMPANIES

Currently, the dataset has entries by 11 private companies (although there are many more private companies in the country restoring degraded areas). Many private companies undertake restoration of forests or other ecosystems as part of their corporate social responsibility (CSR). CSR as envisaged by the Companies Act 2013, looks beyond the business goals of corporates and encourages them to engage in activities that can benefit the society.

Afforestation and restoration activities undertaken by private companies are often a result of legal compliance (for e.g., compensatory afforestation for forest land diversion) or personal philanthropy. However, a more bio-centric approach has the potential to motivate private companies to adopt more sustainable and ecological models of restoration. One such approach would be the use of a mixed plantation model. The data available from the private companies highlights the proportion of area restored and afforested using mixed plantation model as against area under mono plantation model.

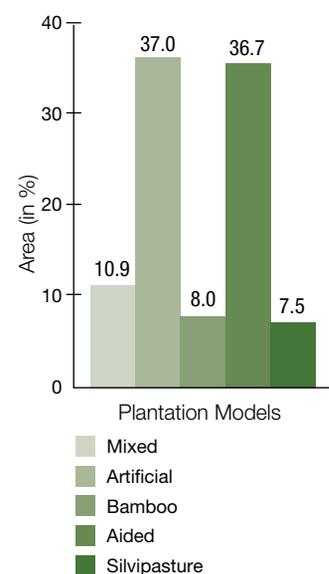


Figure 2: Restoration efforts by NAP using different plantation models

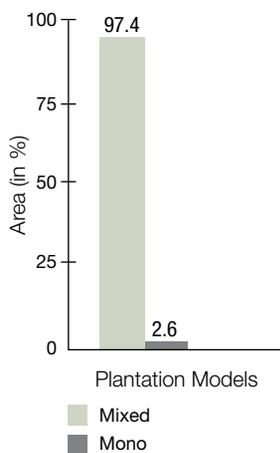


Figure 3: Restoration efforts by the private companies using different plantation models

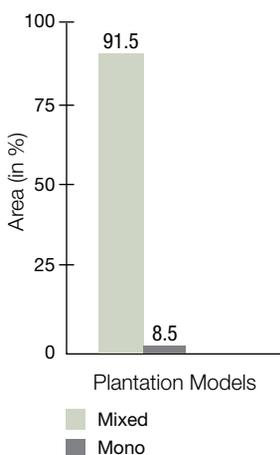


Figure 4: Restoration efforts by the NGOs using different plantation models

Of the total 193,290.3 hectares of land restored and afforested by the private companies, a large area of 188,226.3 hectares was under mixed plantation of different types (97.4%), whereas mono plantations covered only 5064 hectares of the total area (2.6%) as seen in Figure 3. Mono plantations mostly comprised of species that were cash crops (such as *Hevea brasiliensis*), that generated income and provided other economic opportunities for growers. However, restoration using monocultures can be detrimental to biodiversity conservation and provides limited to nil ecological services and few economic benefits. On the other hand, as discussed in previous sections, a diversity of species in plantations inevitably benefits wildlife as well as the local communities by providing ecological and economic benefits.

However, a point of concern that was revealed in the data from the private companies (this could also be relevant for other implementing agencies, particularly government efforts) was the use of exotic species in some mixed plantation models. Exotic species such as *Leucaena* spp. and *Casuarina* spp. were used for assisting recovery of degraded sites. Although the motivation behind using these species could not be assessed, it is assumed that easy availability of these species, their fast growth and resilience to harsher environment made them a popular choice.

Although exotic species are not unequivocally associated with any negative connotation, their use in restoration is discouraged, as time and again, it has been reported worldwide how exotic species, once released from the biotic pressures of their home environment can invade the novel environment, replacing and damaging native biodiversity (the invasive *Prosopis* will be spoken of in the grassland best practices section). In a majority of cases, however, it was the use of native species that dominated the restoration activities of private companies under the mixed plantation model. Native species are adapted to the local conditions and therefore are better suited to assist recovery of faunal diversity. Such species also ameliorate soil and water conditions apart from offering multiple economic benefits to communities.

NON-GOVERNMENTAL ORGANISATIONS

Non-governmental organisations play a small but active role in restoration of degraded lands, including unique and threatened ecosystems such as grasslands and mangroves. Fifteen organisations submitted entries on restoration efforts, of which 14 were from the 2011-17 period, and hence relevant for this report. The data detailing the proportion of mixed and mono plantation models used for restoration was analysed.

Of the total 352,677.9 hectares restored by NGOs, a total of 322,610.9 hectares (91.5%) was restored using mixed plantation model and a total of 30,067 hectares (8.5%) was restored using mono plantation model as seen in Figure 4. In the case of NGOs, the mono plantation was mainly contributed by restoration activities in coastal areas where only one species of mangroves (*Avicennia* spp.) was planted.

The limited contribution in terms of overall area restored on the part of private companies and NGOs is not a measure of the value of the work engaged in. As repositories of knowledge they often act as links between communities and the government.

6

Best Practices

Learnings for future restoration initiatives

A brief overview of a few select restoration programmes that have all the indicators of a good restoration model have been highlighted as Best Practices. These were identified from the datasets across various agencies and different ecosystems, and have been elaborated on in the following chapters. It is hoped that the best practices would serve as learnings for future restoration initiatives in the country.

GOVERNMENT RESTORATION EFFORTS

Joint Forest Management in Old Jalukie, Nagaland

Working with local communities to achieve restoration goals



Members of the Old Jalukie JFMC, Nagaland

Background

Located in the north-eastern part of the country, Old Jalukie is a village in Nagaland, India. The village falls within an important watershed area. The five rivers that flow through the area make the soil extremely fertile. The villagers depend on the forests for wild fruits, vegetables and engage in hunting wild animals for food.

Challenges and Issues

Old Jalukie is remotely located with limited market access. In the absence of schemes that provide alternate livelihood opportunities, villagers turn to the forest for sustenance.

Farming is performed by slashing and burning the forests, an old technique called *jhum*, where the land is often left fallow for its recovery. Traditionally practiced, *jhum* was gradually becoming unsustainable in this fragile region as increasing demand for lands led to burning of newer forest patches and reduced fallow period for old cultivated land.

Increased hunting and *jhum* cultivation have over time rendered the surrounding forests vulnerable to degradation. Thus, Old Jalukie was troubled with numerous issues and the lack of regulations and rules exacerbated them.

Restoration Activities

- The village council declared an area of 370 hectares as Community Biodiversity Reserve and agreed to impose a total ban on *jhum* cultivation, hunting, logging and tree felling within the declared area.
- Fallow lands were afforested using locally available species that can be used in construction and are commercially viable. Native saplings from species such as *Aquilaria agallocha*, *Terminalia myriocarpa* and *Parkia speciosa* were used for plantations.
- Community engagement in restoration activities also became a means for providing employment to locals.
- A total of 291 hectares was planted using saplings that were germinated from seeds

collected from the nearby forests.

- Introduction of alternate small livelihood activities like livestock rearing and 'kitchen garden' farming reduced dependence of the villagers on wild meat and fruits.
- The distribution of Liquefied Petroleum Gas (LPG) connections for cooking helped reduce the extraction of fuelwood from forests.
- Campaigns and camps to spread awareness among villagers about the benefits of preserving biodiversity and restoring degraded lands were also conducted.
- The JFMC met every quarter to discuss the progress of these efforts.

Changes

The combined efforts of the local community along with JFMC have had a positive impact on the ecosystems of Old Jalukie.

■ **Ecological changes:** Observable changes in canopy and tree density as well as increase in faunal population, especially birds. Abiotic properties of the area like soil quality and water availability have also seen considerable improvement.

■ **Socioeconomic changes:** Locals received daily wages for forestry activities like planting, fire line cutting, weeding etc. Apart from daily wages, residents of Old Jalukie also generated income through sale of NTFPs in local markets in addition to selling seeds to the Forest Department nursery in Jalukie.

The continuous patrolling by local forest guards and volunteers drastically reduced hunting in the area. The increased level of awareness among villagers is reflected in their transition away from age-old practices such as hunting, *jhum* cultivation and green felling.

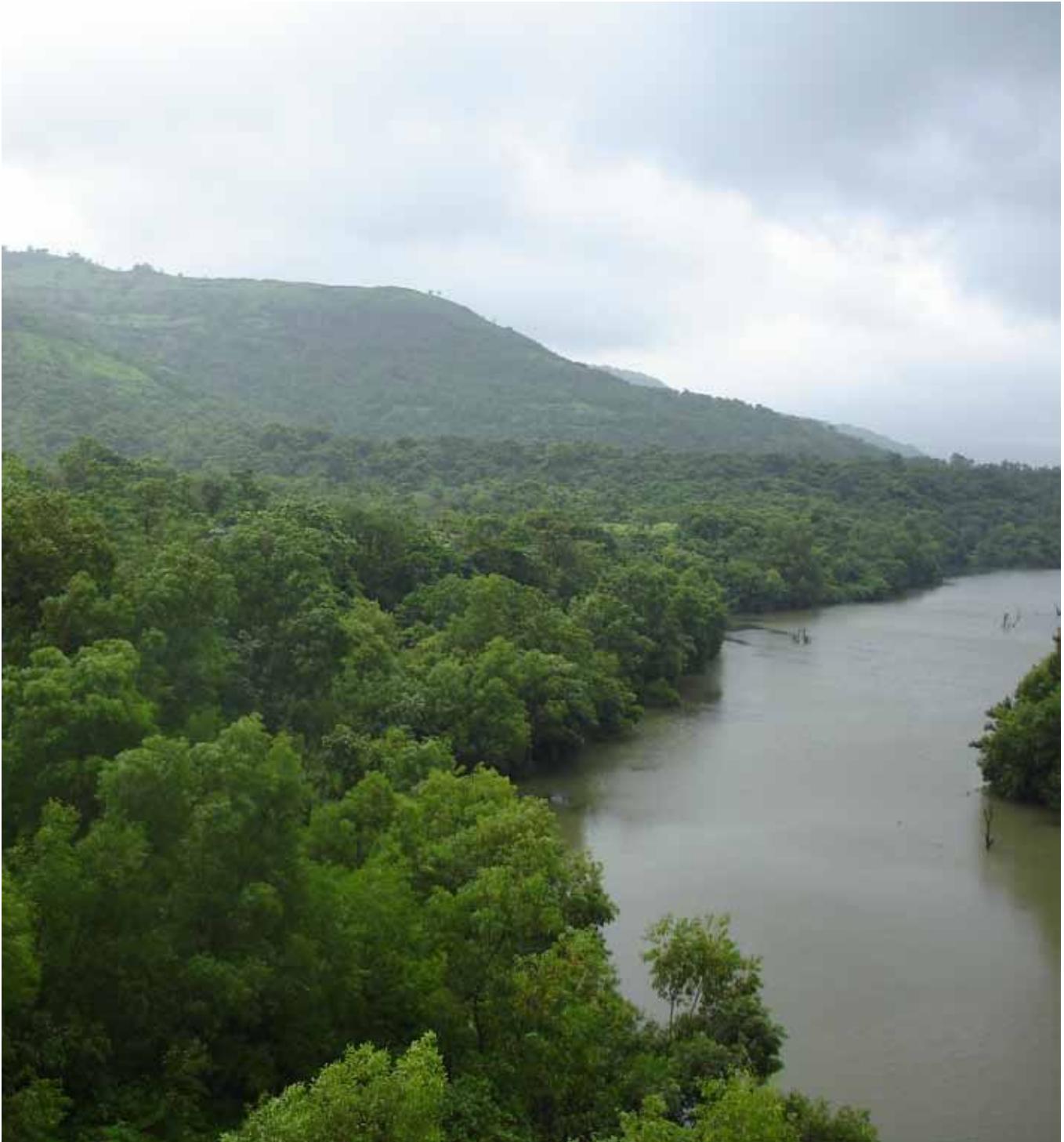
Old Jalukie, having won the India Biodiversity Award 2014 and Governor's Award 2014, serves as a model JFMC. Local community involvement in restoration, afforestation and other activities were valuable in bringing about major changes in surrounding forest landscapes.

Planning	Yes
Baseline data	No
Community participation	Yes
Livelihoods	Yes
Sustainable	Yes
Replicable	Yes
Policy advocacy	Yes
Monitoring	Yes

PRIVATE COMPANY RESTORATION EFFORTS

Tata Power's restoration efforts in Lonavala

Reversing the effects of unsustainable development in the region



Restored landscape by Tata Power at Lonavala, Maharashtra

Background

Lonavala, situated in Maharashtra, India is part of the global “biodiversity hotspot”, the Western Ghats. The forests around Lonavala are home to large fauna like Indian Gaur and Great Hornbill. In the past, the population of Lonavala comprised of agriculturalists, dairy farmers and fishermen with high dependency on the local forest resources and water bodies.

Challenges and Issues

Lonavala’s growing popularity as a site for both tourism and developmental projects such as construction of roads, railways, industries supplemented by an ever increasing population has negatively impacted surrounding forest landscapes.

Delving into the past uncovers other factors that led to environmental degradation in Lonavala. The Valvan Dam, built by Tata Power to supply power to Mumbai, inundated portions of forests in and around Lonavala. Apart from impounding the river Indrayani (that flows through Lonavala) it also contributed to making forest resources even scarcer.

Restoration Activities

Since the 1970’s, Tata Power has been planning and implementing several restoration efforts in the area in collaboration with other organisations.

- The company targeted to achieve a minimum of 33% forest cover in all project sites through plantation of native trees by employing local villagers.
- A total of 400 hectares was afforested by native species such as *Saraca asoca*, *Terminalia bellirica* and *Terminalia chebula*. Nurseries were set up and native saplings were raised with the assistance of the local communities.
- The company also planned to lessen the dependence of local people on agriculture and other intensive land use activities by providing employment opportunities. Skill development workshops were organised and members of the local population were absorbed into the company.

- Special efforts were made to protect the endangered Golden Mahseer fish in the local lakes and rivers. An artificial hatchery was set up and Mahseer hatchlings were distributed in the local village ponds.
- To make the restoration process sustainable and community driven, Tata Power also organised awareness campaigns among villagers.

However, only 30% of the planted saplings survived in the unprotected areas due to cattle grazing and uncontrolled fire, while the survival rate in the protected areas was around 80%. This difference in survival rates reiterates the complexity of restoration activities and the necessity for ancillary measures such as fire prevention and protection of planted saplings to accompany restoration.

Changes

The changes that came about because of these various restoration activities were gradual. Green mapping using satellite images comparing the forest cover of 1990, 2000 and 2010 reflect the increase in green cover in the afforested areas.

- **Ecological changes:** Native vegetation cover increased significantly and with it the diversity of fauna. Wildlife habitats were restored gradually and corridors were created to assist their movement. Recovery of soil fertility and ground water level contributed towards increasing agricultural productivity.
- **Socio-economic changes:** The increased productivity of the forests meant the villagers now had more fodder, fuelwood and other forest products. This complemented their income and facilitated improved socio-economic conditions.

As a result, the perception of the villagers towards the restoration programme gradually evolved. They approved of the various activities taken up not only in company owned lands but also in community lands.

Tata Power’s restoration activities in Lonavala, owing to increased community involvement, have proven to be ecologically and socially effective.

Planning	Yes
Baseline data	Yes
Community participation	Yes
Livelihoods	Yes
Sustainable	Yes
Replicable	Yes
Policy advocacy	No
Monitoring	Yes

NGO RESTORATION EFFORTS

Nature Conservation Foundation's rainforest restoration in Valparai

Reviving rainforests around plantation lands



Plantation of native species in restoration plots

Background

Valparai, a hill station in the southern State of Tamil Nadu, is part of the Anaimalai Hill range of the Western Ghats. The rainforest fragments found here form the last viable habitats for large forest dwelling wildlife like Asian Elephants and are catchment areas of important streams in the area. Plantations of tea, cardamom and vanilla are also part of the surrounding landscape.

The rainforest restoration programme was started by Nature Conservation Foundation in collaboration with Hindustan Unilever Limited (HUL) to conserve the biodiversity in the forest fragments present in the company owned land within the landscape. Later other companies such as Bombay Burmah Trading Corporation Ltd. (BBTC), Tata Tea and Coffee, and Parry Agro joined the initiative.

Challenges and Issues

These fragments are remnants of once contiguous rainforests and their existence is continually threatened by the clearing of forests for plantation lands, expansion of roads, spread of invasive species and collection of fuelwood.

Valparai plateau also faces low to medium levels of extractive pressure from locals. Collection of fuelwood and NTFPs have significant influences on the recovery of vegetation.

Any restoration process must take these factors into consideration and strive towards lessening these demands through alternatives such as cooking gas. These alternatives often can be expensive and may necessitate integration with formal machinery to make them sustainable, such as government welfare schemes or corporate social responsibility.

Such integrations are important as lack of reliable and long term funding opportunities is reported as a major hindrance in the restoration process.

Restoration Activities

NCF carried out the restoration process meticulously, following scientific methods. After plots were chosen, a reference system based on the intact forests in the landscape was selected. Based on this reference system,

it was decided that attributes such as native tree density and species composition will be restored. Clear targets were established before implementation of restoration projects.

- NCF set up a nursery of native plants such as *Toona ciliata*, *Filicium decipiens*, *Dimocarpus longan*, *Trichilia connaroides* and *Ormosia travancorica*. This nursery provided the saplings for the restoration plots. These saplings were planted in rows after clearing out invasive species.
- The removal of *Lantana* and other invasive species contributed towards a high survival rate of native saplings. NCF reported that 70% of the planted saplings survived.
- NCF conducted periodic surveys for fauna such as birds as their recovery plays a major role in forest restoration through processes such as seed dispersal.
- NCF introduced the Rainforest Alliance certification to engage and motivate private companies. The certificate is granted to firms that meet economic, social and environmental sustainability in their operations. It is becoming increasingly popular among environmentally conscious customers.

Changes

NCF's persistence in the restoration efforts brought about major changes and helped the vegetation in the fragments to recover.

- **Ecological changes:** There was a substantial increase in tree density, basal area and canopy cover. Active intervention measures such as weeding out invasive species helped protect the native species.
- **Socio-economic changes:** NCF was able to alter people's perception towards biodiversity conservation. Local communities are now more tolerant towards the wildlife in the area and actively take part in conservation efforts.

Restoration of the forest fragments of Valparai plateau, if carried out successfully, will prove to be both socially and ecologically beneficial. It will create corridors for wildlife movement and habitat patches for vulnerable species, increase carbon sequestration, improve soil and water conservation and reduce human-wildlife conflict.

Planning	Yes
Baseline data	Yes
Community participation	No
Livelihoods	No
Sustainable	Yes
Replicable	Yes
Policy advocacy	Yes
Monitoring	Yes

NGO RESTORATION EFFORTS

Foundation for Ecological Security's restoration programme

Working to restore degraded lands with community institutions



FES restoration sites before (above) and after (below) restoration

Background

Restoration initiatives by Foundation for Ecological Security (FES) spanning thirty years across three Indian States were selected as best practices. These included the following sites: Thamballapalle and Peddamandyam in Andhra Pradesh; Angul, Dhenkanal, Koraput and Keonjhar in Odisha; Indravan, Mandla and Agar in Madhya Pradesh. These forests are mostly deciduous and are highly exploited for their resources.

Challenges and Issues

Extraction of fuelwood, fodder and NTFPs contributed greatly to the degradation of these forests.

Such degradation also led to soil erosion and depletion of water table in addition to the loss of habitats for wildlife (many of which were increasingly raiding crop fields for forage leading to human-wildlife conflict).

All sites in Madhya Pradesh reported invasion by *Lantana camara*, an exotic species that thrives well under disturbances, and causes changes to local soil and moisture properties apart from altering native plant communities²⁴.

Sites in Andhra Pradesh reported higher frequencies of fires that damage wild vegetation and planted crops. Thus, forest degradation in these areas triggered a complex series of reactions, impacting biodiversity, ecological processes and the local people.

Restoration Activities

FES realised that the dependency of the local communities on the forests was high and any threat to forests would only make them more vulnerable. Collaborating with forest dependent communities ensured that the restoration process was inclusive and meaningful.

- Committees were formed with local village representatives as members. These committees decided what plantation model would be adopted for restoration, how stressors such as grazing, uncontrolled fire, collection of fodder and fire wood should be regulated and how profits generated from a revived

forest land could be distributed among all stakeholders.

- Before restoration was implemented, data on biodiversity and climatic conditions was collected so as to set a reference point for implementers to aspire for.
- In total; 1,002,446 hectares of forest land was restored of which 30,856 hectares belonged to sites from Madhya Pradesh, 632,413 hectares were from Odisha and 339,197 hectares belonged to sites from Andhra Pradesh.
- Restoration activities were carried out by local work force with wages fixed under the prevailing government schemes.
- Sites were prepared through soil treatment and removal of invasive *Lantana*. Native species such as *Ficus religiosa*, *Holoptelea integrifolia* were selected and planted.
- A nursery of native saplings was established in Agar district of Madhya Pradesh.
- Village committees ran awareness campaigns and skill development workshops for forest dependent communities.
- Sites were regularly monitored with the aid of local villagers. Survival rate of saplings from all sites across three States was reported to be nearly 70%.

Changes

Substantial changes were documented and reported post restoration.

- **Ecological changes:** Native vegetation cover increased. Soil erosion and degradation of water sources was considerably reduced. Sites in Madhya Pradesh also reported a decrease in human-wildlife conflict.

- **Socio-economic changes:** As forest productivity improved and villagers gained more access to fodder, fuelwood and NTFPs, their livelihood was enhanced. These economic benefits managed to bring about a change in the perception towards restoration activities.

FES advocates the consultation of local bodies such as Gram Sabhas to ensure that restoration efforts help to regain productivity, revive ecological processes and ensure the well-being of both man and biodiversity.

Planning	Yes
Baseline data	Yes
Community participation	Yes
Livelihoods	Yes
Sustainable	Yes
Replicable	Yes
Policy advocacy	Yes
Monitoring	Yes

NGO RESTORATION EFFORTS

Banni grassland restoration by GUIDE, Gujarat

Restoration of a unique grassland ecosystem



Restored sites in Banni grassland

Background

Grasslands are dynamic ecosystems. Their vegetation mainly consists of grasses, forbs and shrubs, and occasional trees. Grasslands regulate water and nutrient cycles and can play a major role in carbon sequestration²⁵.

In India, 24% of the geographical area is covered by grasslands²⁶. Grasslands support a wide variety of browsers and grazers, and the predators that depend on them. Thus, in India, grasslands constitute major habitats for species such as Hangul, Brow-antlered Deer, Great Indian Rhinoceros, Swamp Deer and Indian Wolf among others. Critically endangered species such as the Great Indian Bustard is dependent on Indian grasslands.

Declared a protected forest in 1995, Banni grassland covers about 11.71% of the mainland area of Kutch district in Gujarat. It is a dry savannah type grassland interspersed with wetlands in low lying areas, with vegetation dominated by grass species and a rich community of flora and fauna. The critically endangered Indian Vulture and White-rumped Vulture are among the 262 bird species found here, apart from reptiles and other fauna.

Thirteen different communities commonly known as Maldharis, traditional nomads, reside here and are involved in livestock grazing, water harvesting, and collecting grassland products.

Challenges and Issues

The construction of six medium sized dams in the area has greatly impacted surrounding grasslands and increased soil salinity. Apart from changing vegetation composition, it has led to the loss of many wetlands as well as the disappearance of winter migrating wetland birds. *Prosopis juliflora*, earlier introduced by the forest department for restoring the site due to its ability to withstand salinity, has started taking over the grassland flora and converting grasslands into woodlots.

The traditional nomadic tribes of Banni region have now settled down to live a sedentary life. The livestock is now concentrated in small pockets, causing additional pressure on the

grassland. They also drive out wild herbivores, which often come into conflict situation with villagers.

It was also observed that post the milk revolution, several pastoral communities residing in the area switched to buffalo rearing for greater economic benefits, adding to the existing pressure on the grasslands.

Restoration Activities

GUIDE has been actively working towards restoring and reviving the grasslands of Banni by including members from the local communities in all aspects of restoration.

- GUIDE along with the Forest Department, held meetings to discuss restoration plans with village heads and other local villagers.
- Relevant ecological information such as soil data, woody vegetation dynamics including biomass, diversity of the floral and faunal communities was collected.
- Livestock proof fences and trenches were constructed to exclude grazing and browsing.
- Invasive species were uprooted and native species planted in the degraded sites.
- Different soil treatments were done to improve permeability and reduce salinity.

Changes

To understand the success rate of the restorative efforts, monitoring was undertaken for the developed grass plots and areas under restoration.

■ **Ecological changes:** In the sites undertaken for restoration, native species such as *Acacia* were seen growing after conditions were made favourable.

■ **Socio-economic changes:** Several villages restored small plots of around one to five acres in Banni. These plots, by creating a network in this arid landscape, served as sources of valuable fodder for livestock, a habitat for wildlife and provider of other ecological services.

For Banni grasslands to recover from the damages caused in the past, restoration practices must continue to be implemented with a community centric approach.

Planning	Yes
Baseline data	Yes
Community participation	Yes
Livelihoods	Yes
Sustainable	Yes
Replicable	Yes
Policy advocacy	Yes
Monitoring	Yes



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7 Way Forward

The international community has set itself ambitious restoration goals, including reaching land degradation neutrality by 2030 (Target 15.3 of the Sustainable Development Goals) and restoring 350 million hectares by 2030 (Bonn Challenge). While experts from various sectors (forests, water and agriculture) have developed solutions to recover degraded lands and habitats, there continues to be challenges in effective implementation. Some challenges include land-tenure rights, lack of capacities in planning, implementing and monitoring restoration activities, unsustainable land use practices as well as limited finances.

India's forest policies (with focus on restoration) have evolved over time to ensure that the benefits from restoration activities are available to local communities and habitats over the long-term. These policies provide an enabling environment for the country to meet its national (NDC, NBTs) and international restoration commitments (e.g. CBD Aichi Target 15, the Bonn Challenge pledge etc.).

This report is a collaborative effort to document ongoing efforts within the country in restoring degraded landscapes and improving their productivity. In this regard, it is heartening to note that India is appropriately positioned to meet its restoration commitments under the Bonn Challenge pledge, with 9.8 million hectares already brought under restoration from 2011-17. This report is also unique as it has successfully managed to bring in the restoration efforts led by NGOs and private companies along with the government agencies. While majority of restoration efforts in the country are being implemented by government agencies, the efforts undertaken by NGOs and private companies are also important, as NGOs bring in technical knowledge and scientifically robust monitoring protocols, while private companies have greater access to resources.

We acknowledge that given the time constraints in putting this report together, it has not been possible to comprehensively capture the restoration efforts being undertaken by all private companies and NGOs. IUCN will continue to engage with agencies involved in restoration efforts to ensure that they are included in future stocktaking reports.

Going forward, it will be important to verify the quality of the restoration efforts where possible, and document in finer detail the restoration efforts being carried out by agencies across the country. One of the key learnings is the need to have a robust monitoring, evaluation and learning (MLE) system for restoration efforts in the country. This is where NGOs and research organisations can possibly lead with their strong technical expertise. It is equally necessary to continue to identify best practices of restoration efforts from across ecosystems so that the learnings from them can reach a wider network of restoration practitioners and successful restoration models may be upscaled in the future. It is necessary to move beyond the business-as-usual model to create robust restoration models involving variety of stakeholders.

This report is an ongoing process, a first glimpse of restoration efforts within the country by various stakeholders, and will continue to be updated. IUCN will continue to engage with the MoEFCC to improve the documentation framework for restoration efforts being carried out in all the States by the various agencies. IUCN will also continue to promote cross-learning between States and across agencies so that India's progress towards the Bonn Challenge pledge continues unhindered.

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INTERNATIONAL UNION
FOR CONSERVATION OF NATURE

INDIA COUNTRY OFFICE
C-10, Gulmohar Park,
New Delhi 110049, India
Telefax - +91 11 2652 7742
www.iucn.org/india

