REPORT

INCENTIVE-BASED ECOSYSTEM RESTORATION

Restoring Kerala for Climate Resilience

2023

SUS TERA

Transporting mangrove saplings for replanting

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Cover Photo: Kumarakom bird sanctuary, Alappuzha, Kerala

It is one of the most well-known bird-watching locations in Kerala. One can find several endangered avian species in this area, spread across 14 hectares. Various migrating birds gather in their hundreds from locations like the Himalayas and Siberia. Kumarakom bird sanctuary is situated on the shores of the Vembanad-Kol Ramsar site.

Thanks to **Purpose Climate Lab India** for supporting the launch of this document. Special thanks to the Community Environment Center of Ashoka Trust for Research in Ecology and the Environment in Alappuzha and all other contributors.

SUSTERA Foundation

Photo: Mangrove Saplings from the restoration drive at Vypin, Kerala

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FOREWARD

The health of the earth, the well-being of humans, and universal economic prosperity all depend on biodiversity. However, in the last couple of years, we have been transforming our planet and pushing several species to extinction due to over-exploitation. As a result, we have already exceeded several planetary boundaries and lost large areas of critical habitats such as wetlands, mangroves, peatlands, coral reefs, and other habitats.

To ramp up restoration efforts, we must raise financial resources, which will need realignment of incentives, funding of necessary infrastructure, identifying innovative finance mechanisms, and public-private partnerships for restoration. Identifying ways to incentivize restoration efforts for local communities can increase the number of green jobs and create resilient livelihoods. According to the State of Finance for Nature 2021 Report, approximately 20 million jobs will be created by tripling investments in NbS by 2030 to achieve climate change mitigation, biodiversity, and land restoration goals. Of which 12.6 million are likely to be created in Asia. We need to grab this opportunity as it will help the state create more jobs, and restoration efforts will help achieve all 17 SDGs. Restoration and related planning can empower women and girls, and they should be actively included in planning and decision-making. The local community needs to be at the center as they have local knowledge, which will help co-create innovative practices and knowledge.

The whole SUSTERA team has been working together to gather inputs to make this document available in the public domain. We intend to portray how restoration can be scaled up while also achieving the goal of creating more jobs in Kerala. Even though the inputs are Kerala-specific, the solutions suggested here can be replicated worldwide. We are also committed to converting research into action and thus inviting you all to join us in restoring and repairing the damage we have caused.

Sanju Soman
CEO, SUSTERA Foundation
UN India Youth Climate Leader

We are living in a decade of crisis and action. While the pandemic of 2020 may be slowly moving behind us, the climate crisis continues to accelerate its impact altering geographies and impacting populations across the globe. The climate crisis is certainly not new, but its intensity is increasing each year. Hence, this decade is also a decade of action on climate change.

Nature-based solutions (NBS) are important contributors to the fight against climate change. In highly vulnerable regions like South Asia, we need a collaborative, participatory approach to addressing climate change and implementing NBS widely. This requires us to bring key stakeholders like farmers, indigenous communities, young people, entrepreneurs, and women to support large-scale efforts and contribute to ecosystem restoration efforts.

This research conducted by Sustera Foundation and supported by Purpose Climate Lab is an effort to examine the viability of an incentivized approach to encourage ecosystem restoration efforts. Through months of dialogue with experts, practitioners, researchers, young people, and authorities, our research has identified that incentive-based restoration has multiple benefits ranging from preserving ecosystems to creating additional income for communities and generating green jobs.

We are delighted to have partnered with Sustera Foundation in this intense effort, and we hope to take these insights to key stakeholders and citizens across the state and country.

Vincy Abraham
Purpose Climate Lab - India Lead

EXECUTIVE SUMMARY

Devastating floods and landslides in Kerala between 2018 and 2019 are only a few of the iterating consequences of environmental degradation. Despite its location in a high-rainfall area, Kerala faces water shortages, loss of paddy fields, and shrinking forest cover coupled with rapid urbanization. Between 2001 and 2011, the urban population in the state increased by 47.7%, and the number of municipalities grew from 27 in 1961 to 54 in 2011. The loss of the ecosystems' ability to recover from degradation increases vulnerability to disasters and endangers the state's basic ecosystem services like food, clean water, and air. Ecosystems recovery is of utmost importance to build resilience.

Ecosystem restoration comprises practices assisting in the recovery of the environment.

While there are several frameworks in Kerala to keep environmental degradation and destruction in check, our findings and deliberations suggest that the state will benefit from an integrated approach to ecosystem restoration through incentivized models that focus on job creation.

The central focus of the deliberations contained in this report is, therefore on the creation of jobs through incentive-based models for ecosystem restoration and conservation efforts.

This document outlines how local self-government institutions and community members can facilitate the development of efficient and effective incentive-based models for ecosystem restoration with the help of grassroots organizations, practitioners, and the education system in the state. The outcome of these deliberations and proposals for incentive-based models are presented in this report. While Ecosystem restoration will improve resilience to climate-related disasters, job creation will help build resilient communities. Restoring the ecosystem is also a cost-effective climate solution for the government and the state, as it would help avoid the need for expensive human-made interventions. Thus, the proposed ecosystem restoration models can support the creation of a resilient Kerala.

Incentive-based Ecosystem Restoration

GLOBAL IMPORTANCE OF ECOSYSTEM RESTORATION

The 17 Sustainable Development Goals(SDGs) formulated by United Nations General Assembly in 2015 provide a shared blueprint for peace and prosperity for people and the planet, now and into the future. This document and its content align with Goals 8, 13, 14, and 15.

The UN Decade of Ecorestoration is an initiative led by UNEP and FAO with the objective of building strong global movements to ramp up global restoration efforts. It's a global call to prevent, halt, and reverse the degradation of ecosystems on every continent and in every ocean.

UNITED NATIONS DECADE ON ECOSYSTEM RESTORATION 2021-2030

COP 15, the UN biodiversity conference held in Montreal towards the end of 2022, emphasizes the need for building a shared future for all life on earth. World leaders agreed on a historic package of measures to address the dangerous loss of biodiversity and restore the natural ecosystem. The conference emphasized the need to support indigenous communities involved in conservation efforts.

The United Nations Climate Change Conference, COP 27 in Sharm El-Sheikh, which ended in 2022, extensively proposed nature-based and ecosystem-based approaches to mitigate future disasters. It emphasized the need to invest in a more sustainable and resilient future.

COP27 SHARM EL-SHEIKH EGYPT 2022

Global hashtags used to communicate the message:

#generationrestoration #decadeofecorestoration

INTRODUCTION

Kerala is home to different types of unique ecosystems - Forest, Wetland, Mangrove and Marine ecosystems.

-ENVIS Hub:Kerala

Our environment is degrading at a distressing rate on a global scale. The very services we depend on are at risk by taking ecosystem services like food, clean water, and air for granted, coupled with the pressure to meet developmental needs and the overexploitation of the world's ecosystems (UNEP 2021). Global Footprint Network 2021 suggests that ecosystem services worth the equivalent of 1.6 Earths are being used up to keep up the pace of our present lifestyle. The growth of the global economy has come at the expense of the world's natural assets. To ensure a safe ecological future, it is of utmost importance to strike a healthy balance between development and conservation (Dasgupta 2021). Safeguarding biodiversity can be ensured by conserving the natural ecosystems that remain. But large-scale ecosystem restoration is key in limiting climate change and species extinction. Thus, the need of the hour is to build a pathway valuing conservation and restoration to recover degrading ecosystems. Ecosystem restoration and nature-based solutions should be a key agenda for the state in its development trajectory.

Even though the land area of Kerala is only 1.2 percent of India , the forest cover is 2.30 percent of the national average.

-ENVIS Hub:Kerala

Incentive-based Ecosystem Restoration

It is estimated that **60 %** of expected species extinctions could be avoided through the effective restoration of **15 %** of converted lands.

The Western Ghats region in Kerala experienced large-scale reductions in forest cover in the last nine decades. Among the six states sharing the Western Ghats, the historical loss of forest cover in Kerala (1920-2013) was 62.7%. In 2010, Kerala had 2.01Mha of natural forest, extending over 60% of its land area. (Global Forest Watch forest change data) The Western Ghats Ecology Expert Panel (WGEEP) reported that the various human interventions in the ecologically-sensitive areas of Kerala and the resulting change in land use patterns had given rise to flow fluctuations, a decrease in water quality, and water table changes.

Unplanned development and changes in land use in the past few years have made these regions more vulnerable to climate-based disasters. Other major changes are alterations in river courses due to dam construction and increasing urbanization trends converting wetlands for construction. The changes in land use/land cover between 1995 and 2018 with the transformation of different classes of lands like croplands, grasslands, wetlands, mangroves, paddy fields, coastal regions, and the varied landscapes of the state exacerbated the severity of the floods of 2018(Dixit et al.,2019).

The Kerala floods of 2018 are therefore considered a climate-related disaster that aggravated due to local environmental degradation. Studies also highlight a significant decrease in the mangrove habitat in Kerala (Hema et al.,2013). Around 100 years ago, the mangrove cover in the state was 700 sq km which has come down to 24 sq km at present, reports Mongabay.

Such losses of the diverse ecosystems in the state also change the ecological capacity to recover from environmental fluctuations exacerbating them into disasters. Thus, the need of the hour is to embark on ecosystem restoration, nature-based solutions, and conservation efforts with timely planning and the efficient use of the available resources to ensure that the lost ecosystems have ample time to recover. These ecosystem restoration efforts will be the way forward for the state of Kerala to attain resilience, withstand and recover from future environmental challenges. Such a framework can be formulated with the UN Decade of Ecosystem Restoration mandates.

Incentive-based Ecosystem Restoration

Relevance of incentive-based ecosystem restoration efforts in Kerala

- Creation of job opportunities and additional income for the communities.
- Improve resilience to environmental fluctuations.
- Enhance food security and self-sufficiency of the state.
- Prevent species extinction and protection of biodiversity.
- Reduce the impact of climate disasters and build resilience.
- Contribute to climate change mitigation efforts at the global scale.

Ecosystem Restoration is any act of assisting in the recovery of an environment that has been damaged, degraded, or destroyed. It encompasses a range of practices depending on the context.

-UNEP, 2021

Incentive-based Ecosystem Restoration

Bamboo planting in Wayanad in collaboration with Uravu

Land degradation is a pervasive, systemic phenomenon occurring on a global scale, and addressing it is of high priority to protect the biodiversity and ecosystem services that are vital to all life on Earth and to ensure human well-being(IPBES, 2018). The positive impact of the development will be futile if we fail to address degradation promptly. To prevent endangering the well-being of today's youth and future populations, there is an immediate need to cultivate a balanced relationship with nature, conserving the existing healthy ecosystems and urgently restoring degraded ones. While ecosystem restoration alone cannot solve the crisis we face, it is key to averting the worst of them, according to the UNEP report 2021.

Incentive-based Ecosystem Restoration

The smallest efforts of restoration can go a long way. For example, ecosystem restoration in 15% of converted lands in priority areas of the world could avoid as much as 60% of expected extinctions while sequestering 299 gigatonnes of CO2, i.e., 30% of the total CO2 increase in the atmosphere since the Industrial Revolution! Furthermore, ecosystem restoration at any scale can significantly mitigate climate change at relatively low costs if these restoration efforts are accompanied by solid reductions in fossil fuel emissions (Strassburg et al., 2020).

Such ecosystem restoration efforts require the following:

- Planning and decision-support tools at the local, regional, and national levels.
- Addressing local socio-ecological contexts.
- Implementing through partnerships with indigenous and local communities(Reyes-García, V. et al., 2019).

Building on these principles, restoration efforts, if undertaken cumulatively in a mosaic strategy at a large scale in the state, can have the following impact:

- It will reinstate ecosystems back to their natural state and regain their productivity. Case studies show that ecosystem restoration effort, when put in place with proper planning and understanding under the right circumstances, not only improves land productivity but also promotes economic growth and social cohesion (Caspari et al.,2014).

- It can be a promising approach for reaching some Sustainable Development Goals (SDGs) because they provide multi-scalar benefits. These include local enhancement of food security and smallholder resilience, improved water provision at the regional level, and global benefits like biodiversity conservation and climate change mitigation.

Rejuvenation of waterbody in Vannappuram panchayat by MGNREGA members l Photo by Agnus M

RESTORATION APPROACHES SUITED FOR KERALA:

- Restoration of Coastal biodiversity.
- Restoration of marine and aquatic ecosystem.
- Forest and landscape restoration.
- Agroforestry and conservation agriculture.
- Restoration of wetlands and watersheds.
- High mountain ecosystem restoration.

CURRENT POLICIES ON ECOSYSTEM RESTORATION

Identifying ecosystem restoration as one of the important ways forward, several political authorities at the international, national, and local levels alike have made declaratory commitments to engage in ecosystem restoration to address global environmental change. In this way, Climate change mitigation is increasingly relying upon restoration efforts. Examples include reforestation to ensure carbon sequestration or restoring wetlands for flood protection. Here is an outline of such policies that make ecosystem restoration a priority.

INTERNATIONAL POLICY: UN DECADE ON ECOSYSTEM RESTORATION

The United Nations declared 2021–2030 as the United Nations Decade on Ecosystem Restoration *"to halt, prevent and reverse ecosystem degradation, and to effectively restore degraded terrestrial, freshwater and marine ecosystems across the globe."*(UNEP, 2021)

To support the implementation of this resolution, the UNEP emphasizes the need for a shared vision of ecosystem restoration and outlined the following principles:

- Integration of all types of knowledge – including, but not limited to, Indigenous, traditional, local, and scientific ways of knowing – and practices in order to achieve greater kinship with nature, cooperation, and effectiveness.

- Ecosystem restoration is contextual– tailored to the local ecological, cultural, and socioeconomic contexts while considering the larger landscape or seascape.

- Ecosystem restoration is enabled by policies and measures that promote its long-term progress, fostering replication and scaling up.

To meet these goals, the three main pathways to action defined by the UNEP are:

- Generating a global movement,
- Fostering political support
- Building technical capacity (Aronson et al., 2020)

UNITED NATIONS DECADE ON ECOSYSTEM RESTORATION 2021-2030

10 guiding principles that underpin Ecosystem restoration by the UN

1 **Global Contribution**

2 **Broad Engagement**

3 **Continuum of Activities**

4 **Benefits to Nature and People**

5 **Addressing causes of Degradation**

6 **Knowledge Integration**

7 **Measurable Goals**

8 **Local and Land/Seascape Context**

9 **Monitoring and Management**

10 **Policy Integration**

Incentive-based Ecosystem Restoration

The Kunming-Montreal Global Biodiversity Framework (GBF) announced a new deal to protect 30% of nature by 2030 with the following targets:

Target 2

Ensure that by 2030 at least 30 percent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

Target 3

Ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected, and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories.

In 2011, 196 countries agreed to abide by the Convention on Biological Diversity (CBD), which cites reviving ecosystem restoration as converting land into fit ecosystems and repairing the degenerated ones under Target 15 of Aichi Biodiversity targets formulated for 2011-2020. Additionally, almost 137 countries have understood the need of the hour and have called attention to restoration in their plans under the Paris Climate Accord in 2015. The declaration of a Decade on Ecosystem Restoration by the United Nations in 2021 can serve as a guide to incentivize restoration efforts, formulate smarter monitoring and better accountability frameworks, encourage research into restoration effectiveness, and create better integration among researchers, practitioners, policymakers, and the public.

Most recently, in November 2022, India joined the Mangrove Alliance for Climate(MAC) as a partner at the 27th Session of the Conference of Parties(COP27), UN Climate Summit 2022. It aims to strengthen the conservation and restoration of Mangrove ecosystems and spread awareness of the role mangroves can play as a potential solution for climate change and to curb global warming.

NATIONAL-LEVEL POLICIES

At the national level, India has recognized the need for scaling-up conservation and restoration activities through the implementation of several action plans in the last two decades along with amendments to the existing ones.

A few of them are as follows:

- The National Afforestation Programme 2000 (NAP) for the rehabilitation of degraded forests and afforestation around forests.
- The National Mission for a Green India (GIM) 2014 under the National Action Plan on Climate Change (NAPCC) 2008 to improve and increase tree cover as a climate adaptation and mitigation strategy.
- The National Biodiversity Action Plan 2008 implements strategies for reducing degradation rates, fragmentation, and loss of natural habitats.
- The Mahatma Gandhi National Rural Employment Guarantee Act Scheme (MGNREGA) and the National Rural Livelihood Mission (NRLM) recognize that natural resources and rural livelihoods are intrinsic to each other. These schemes encourage restoration activities like drought-proofing through afforestation and tree planting, and the conservation of water bodies, among others.

Incentive-based Ecosystem Restoration

UNION BUDGET 2023-24

GREEN GROWTH PLAN

As part of the green growth plan, union finance minister Nirmala Sitharaman announced new schemes to promote incentive-based ecosystem restoration

Amrit Dharohar

The scheme focuses on encouraging the optimal use of wetlands and generating eco-tourism-based income for local communities.

MISHTI

MISHTI, or Mangrove Initiative for Shoreline Habitats & Tangible Incomes, is a scheme that will facilitate mangrove restoration through convergence with MGNREGA and other sources across the coastline of India and on saltpan lands.

STATE-LEVEL POLICY LANDSCAPE IN KERALA

Commendably, Kerala has recently launched India's first large-scale ecosystem restoration policy in Eco-restoration policy 2021 by the Kerala Forests and Wildlife Department. The policy emphasizes carbon-neutral panchayats/corporations and the implementation of ecosystem restoration projects on a priority basis. (Eco-restoration Policy, 2021)

Since 2019, the UN Environment Programme (UNEP) and Kerala Institute of Local Administration (KILA) have been implementing Ecosystem-based Disaster Risk Reduction (Eco-DRR) measures through the Mahatma Gandhi National Rural Employment Guarantee Act Scheme (MGNREGA) and Ayyankali Urban Employment Guarantee Scheme (AUGES) in Kerala. Eco-DRR is based on the idea that "*ecosystem interventions are best suited for mitigating the impact of natural disasters in the short and long term*." It is a people-centric disaster risk management strategy executed through local communities and institutions, in addition to the safety mechanisms inherent in the environment. (KILA, 2020)

Similarly, there are a number of frameworks instituted in Kerala to check environmental degradation and destruction.

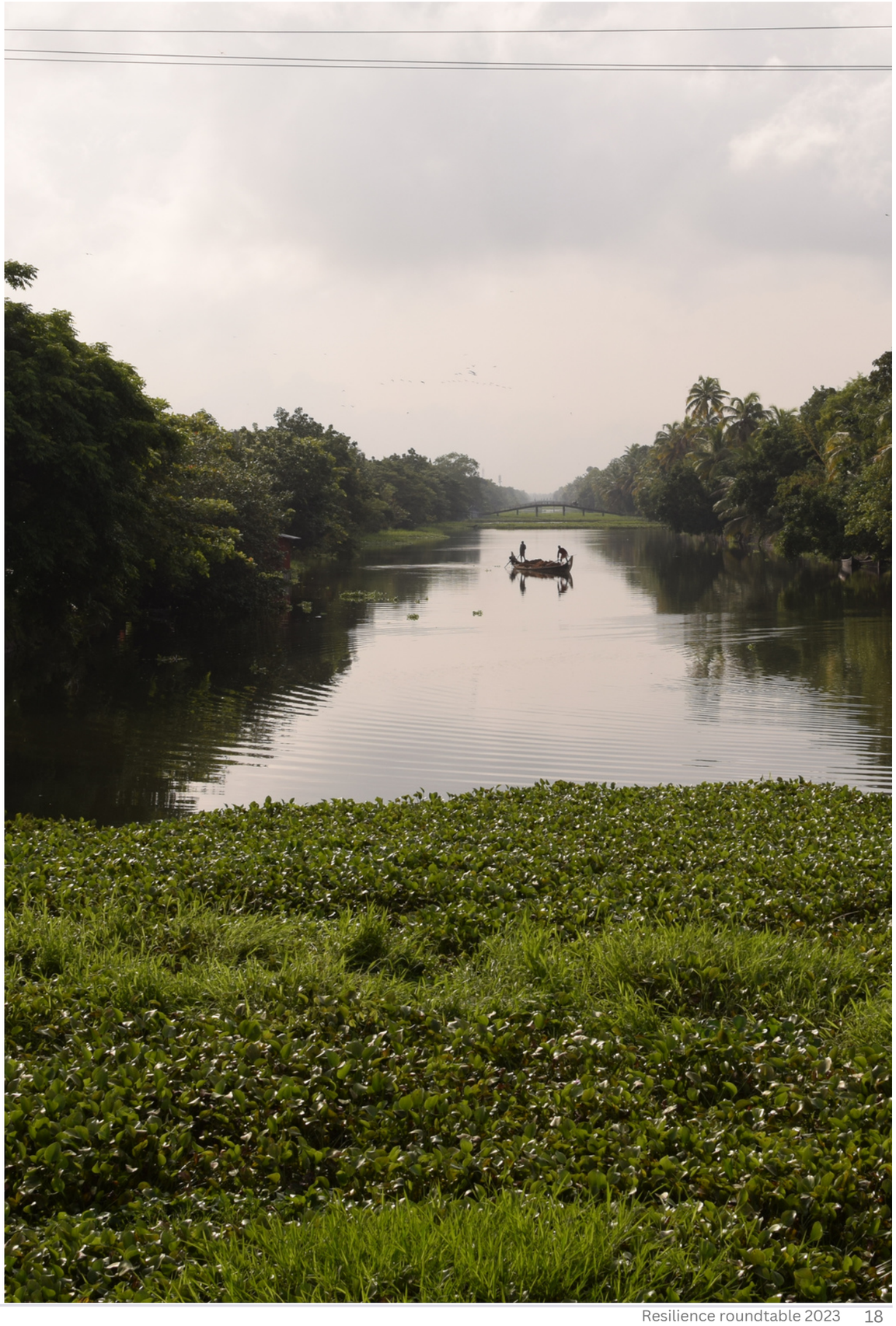
- The efforts taken in this regard can be dated back to the Kerala Forest Act of 1961. Kerala Forest Vesting and Management of Ecologically Fragile Lands Act, 2003, which governs the forests and asserts the government's control over all natural resources, came later.

- Legislations like the Wetland (Conservation and Management Rules) 2017, Kerala Conservation of Paddy Land and Wetland Act, 2008, and Coastal Zone Regulation Notification, 2011 cater to the ecological needs of its numerous coastal wetlands, lagoons, mangroves, and beaches.

- The Kerala Protection of River Banks and Regulation of Removal of Sand Act, 2001, was formulated to address the issues related to the dredging of sand from river banks and river beds.

- As discussed earlier, Kerala launched a policy for forest restoration with community participation in 2021 to improve the condition of degraded forests in the state.

A review of these policies illustrates that there exists a comprehensive policy aimed at conserving the at large. However, incorporating strategies specific to ecosystem restoration is required to build resilience and address environmental degradation in the state. Similarly, Local communities must be provided with capacity building to lead restoration movements. Restoration planning should be participatory, inclusive, and balanced in nature, thus facilitating faster scaling up.



Incentive-based Ecosystem Restoration

Incentive-based Ecosystem Restoration

Alappuzha

CHALLENGES FOR SCALING-UP ECOSYSTEM RESTORATION EFFORTS

Although there is global recognition of the urgency for ecosystem restoration efforts, the two main challenges are **coordination and financing.** While the number of restoration projects is on the rise worldwide, alongside several national pledges like the Great Green Wall (2010), Bonn Challenge (2011), New York Declaration on Forests (2014), African Forest Landscape Restoration Initiative (2015), scaling-up of these efforts has been significantly low. (Sewell et al.,2016)

In Kerala, eco-restoration efforts face similar challenges:

- There is a knowledge gap between what is required for viable restoration and the implementation on the ground.
- Implementing projects aimed at restoring ecosystems is undertaken in fragments without effective coordinated action of its stakeholders.
- The documentation, proper planning, and designing of context-specific solutions for implementation may yield only short-term impacts.

- Restoration projects are resource intensive in terms of time, funding, and labor. This requires a robust knowledge and material infrastructure for successful restoration efforts.
- Lack of baseline data.

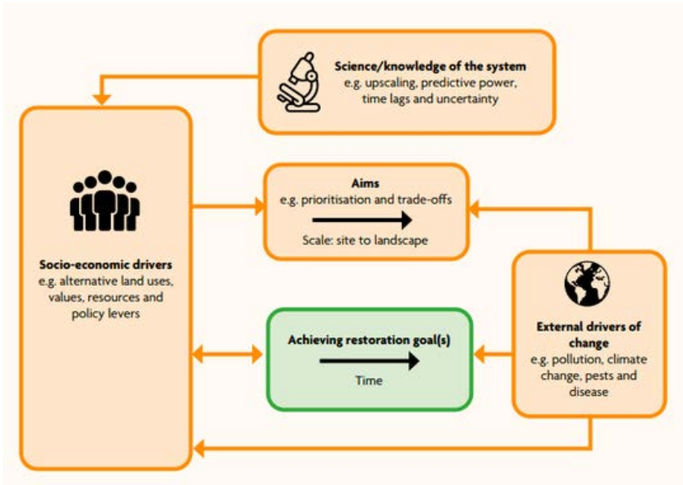
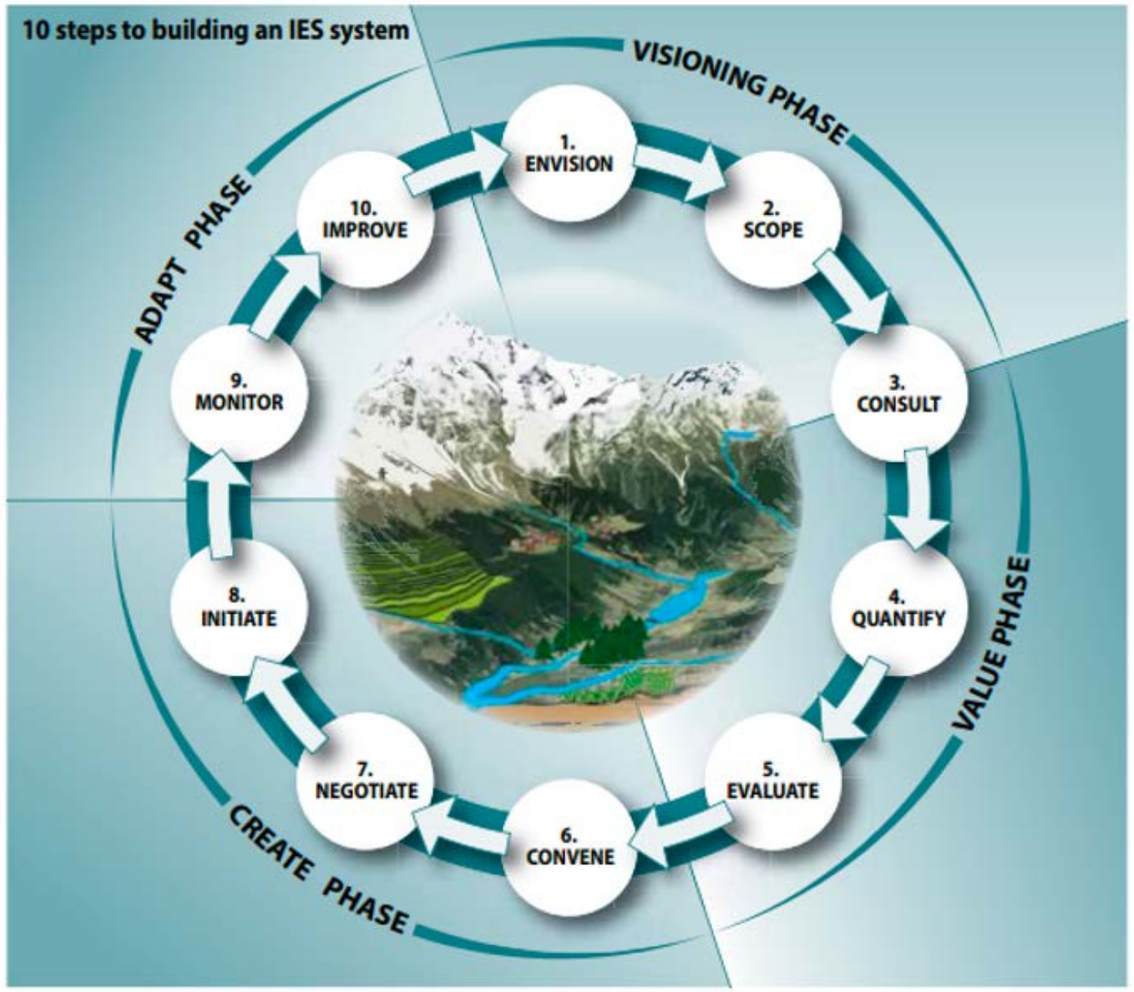


Figure: Park et al, Conceptual figure illustrating the key drivers influencing the success or otherwise of restoration goals,2022

Source:Park et al, *Challenges of ecosystem restoration, the Institution of Environmental Sciences,2022.*

INCENTIVE-BASED MODELS FOR ECOSYSTEM RESTORATION



The 10 basic steps of designing and implementing an Incentive Ecosystem Service process. Source: GRID-Arendal, *Incentives for Ecosystem Services (IES) in the Himalayas: A 'Cookbook' for Emerging IES Practitioners in the Region,*2017

WHY INCENTIVE-BASED MODELS FOR ECOSYSTEM RESTORATION?

Incentives can primarily mean associating monetary benefits to successful restoration efforts by which stakeholders gain a source of income and also a source of motivation to pursue it. These can be economic incentives, regulations, information, or a composite based on the context. (Parker et al., 2000).

Case studies suggest that the possibility of scaling up is immense using the method of monetary incentives provided the people working at the level of execution on the ground are passion driven and technically trained. However, incentives need not always be monetary. For example, case studies discussed show that incentives can also enhance a place's visibility, thereby improving the scope of tourism through ecosystem restoration efforts. Restored ecosystems increase tourism prospects and employment opportunities for local communities and help scale up and sustain these efforts long-term. (See Table 1 on case studies)

While incentivizing restoration efforts is a promising approach to scale up restoration efforts in the state, it is important to address the possibility of stakeholders viewing associated incentives merely as a profit and forgetting their commitment to continue the efforts. This is where incorporating a mix of diverse incentives beyond just the monetary become necessary. Other possible methods of incentivizing efforts include issuing certificates of appreciation to people and communities who undertake the restoration of their own land and recognize them as leaders for the larger community. Incentives can also be direct or indirect co-benefits to the community or group engaged in the restoration effort.

Valam Waterfall, Kozhikode

Co-benefits of Ecosystem restoration

1. Generate additional income for communities dependent on agriculture, eco-tourism, and fishing.
2. Reducing impacts of natural disasters.
3. Enhancing Food security
4. Preserve the natural heritage.
5. Improve carbon sequestration
6. Coastal protection and reduce soil erosion
7. Water, Soil, and air quality regulation
8. Health co-benefits
9. Climate Change mitigation
10. Biodiversity and species conservation

VALUATION OF CO-BENEFITS IN THE PLANNING PHASE

Evidence-based studies drive key decision-making. Multiple co-benefits to ecosystem restoration make restoration-based solutions desirable for broader impact from a policy perspective. It is, therefore, essential to identify and establish the co-benefits of a restoration project and discuss them with stakeholders during the proposal stage. This can be done by quantifying the direct ecosystem services gained through restoration projects or assessing the value attributed to being able to use a service in the future.

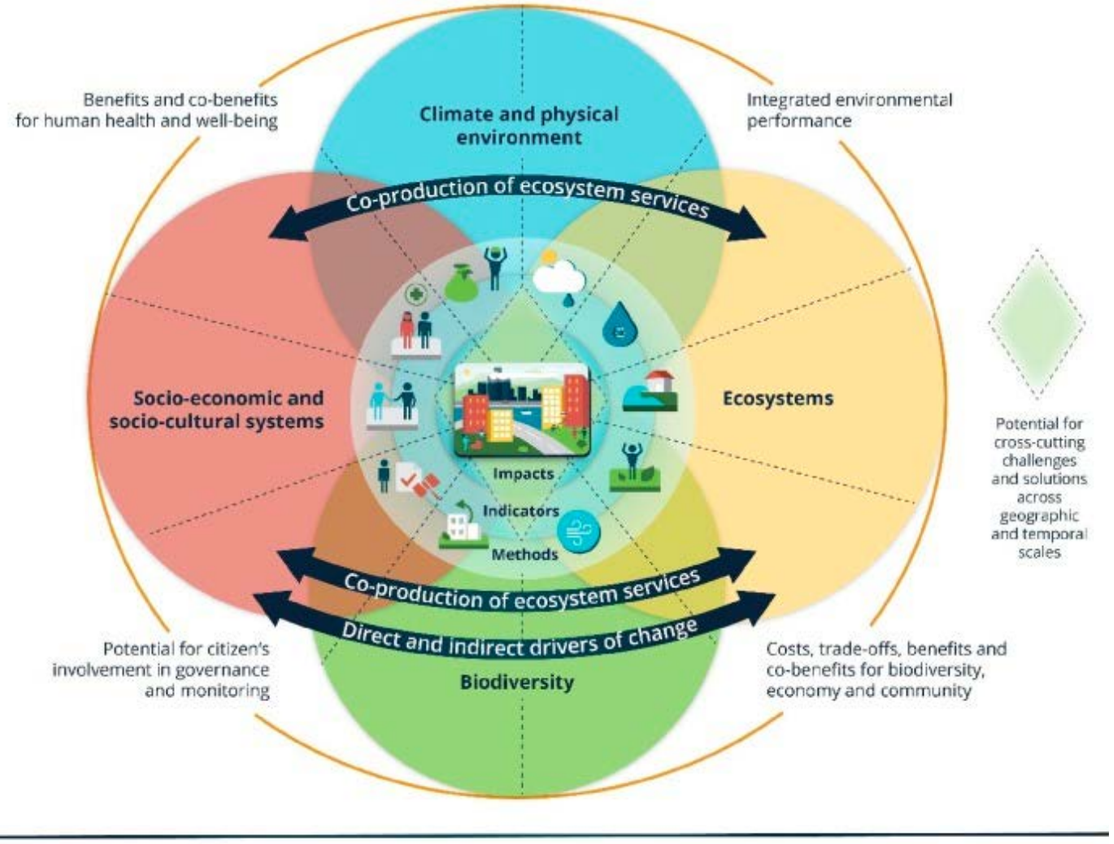
Another way is to identify the indirect benefits in relation to indicators such as the creation of jobs, reduction of fertilizers, reduction in emissions, water management, air quality regulation, etc.

A simple and effective way to conduct an evaluation of co-benefits at the planning stage is by organizing small focus group discussions on the proposed project with the following stakeholders:

- Community experts and leaders
- Non-governmental organizations
- Young learners from schools and colleges
- Community members.
- Academic and scientific experts that work in the domain of environment, economics, or allied areas.

ECOSYSTEM SERVICES

Ecosystem services are the multitude of benefits that nature provides to society. Ecosystem services make human life possible by providing nutritious food and clean water, regulating disease and climate, supporting the pollination of crops and soil formation, and providing recreational, cultural, and spiritual benefits. Problems that are solved by technological intervention can be highly useful in the short term but damaging to nature in the long and counter-productive to the services that we derive from them. Thus valuing the services in monetary terms can help us understand the importance of various ecosystem service providers. Despite an estimated value of $125 trillion, these assets are not adequately accounted for in the political and economic policy, which led to poor conservation efforts in the past.



One example of an assessment framework is shown above. The Nature-Based Solutions assessment framework considers different elements of the system, the 10 challenge areas and indicators and methods for assessing impacts within and across challenge areas.

Source: Raymond et al. A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas, 2017.

*This cartoon by **Seppo Leinonen**, www.seppo.net portrays the hidden and unknown benefits that several species provide us.*

Incentive-based Ecosystem Restoration

PROPOSALS FOR INCENTIVE-BASED MODELS OF ECO-RESTORATION

Model	Description	Models/ Examples
Agro-forestry & Ecosystem Restoration	Generating income by interlinking tourism activities with conservation agriculture and agro-forestry.	• Agro-forestry with Bamboo • Model Wetland Village, Muhamma • Subhiksham Surakshitham Project
Mangrove restoration	Generating employment opportunities and enhancing Ecosystem-based Disaster Risk Reduction (Eco-DRR) through mangrove restoration.	• Biodiversity wall by the sea, Grassroute • Ashtamudi Lake Mangrove restoration • Marine Life of Mumbai(MLOF)
Eco-tourism & restoration	Developing a sustainable model by interlinking traditional/historical environmental practices, restoration efforts, and tourism.	• Pokkali cultivation and eco-tourism. • International student exchange program.
Environmental Education Curriculum	Environmental education in schools centered around conservation through hands-on activities by providing non-monetary incentives.	• The Bhoomithra Sena clubs • Ente Maram Paddhati Scheme • The Re(ef)Generate, Andaman Islands • Habitat Learning by ATREE-CERC
Traditional Ecosystem restoration Practices	Co-creating a democratic model with community partners at the panchayat level to protect abandoned sacred groves, and supporting indigenous peoples' forest tenure.	• Wayanad Ramayana Trail • Planning and Protecting RET trees through sacred groves of the state

Incentive-based Ecosystem Restoration

Model	Description	Examples
Carbon credits and Corporate Social Responsibility	Eco-restoration efforts at the community level can access finance from the carbon credit mechanism and corporate social responsibility.	• Carbon credit funds are utilized in the restoration of mangroves. • Corporate Social Responsibility funds are being utilized in the revival of watersheds.
Model based on Local self-governments as the facilitator	Developing a working model for collaborations between Local Self-Government Institutions(LSGIs) and community partners by utilizing existing programs to encourage, replicate and scale up ecosystem restoration efforts to integrate administrative goals better.	• Canal restoration efforts in Muhamma. • Panchayat talk series.
Mahatma Gandhi National Rural Employment Guarantee Scheme(MGNREGA)	Implementing ecosystem restoration activities at the local level through the MGNREGS can ensure rapid scaling-up.	• Pachaturuthu project by LSGIs.
Finance model based on the Meenangadi example	Developing a finance model where individuals can leverage growing trees and other land restoration efforts to acquire loans in addition to other benefits.	• Meenangadi Tree banking scheme

Generating income by interlinking tourism activities with conservation agriculture and agro-forestry.

Flood-related soil erosion in Kerala According to Project Drawdown, the increased by 80% during the Kerala floods of 2018. High erosion rates due to land use changes and reduced land cover have increased degraded land in the state. (Chinnasamy et al.,2020) Conservation agriculture is a system that can prevent the loss of arable land and restore degraded lands. Agro-forestry combines tree-planting with another agricultural enterprise and is evidenced as one of the most effective measures for restoring degraded lands. Additionally, agro-forestry can provide numerous economic and environmental co-benefits. Innovative agro-forestry models well-suited to the context need to be identified quickly to restore degraded lands. A study has found that agroforestry efforts with the local crops, fruit, and tree species effectively restore ecosystem services in degraded lands. (Biswas, 2022).

practice, if implemented, can reduce carbon dioxide emissions equivalent to 12.81–8.08 gigatons based on average carbon sequestration rates of 0.25–0.78 metric tons of carbon per hectare per year, depending on the region.

Kerala Forests & Wildlife Department Ecorestoration Policy 2021 mentions:

Planting trees in private land will be promoted so as to increase the tree cover outside forest areas which inturn would increase the carbon sequestration and reduce dependency on forests. (page 17)

Agro-forestry with bamboo cultivation has been identified as a feasible restoration effort in Kerala due to its economic and ecological benefits. It emits 35 percent more oxygen into the atmosphere than other species and has a short life span of 6-12 years. While bamboo can reduce the impact of water and wind, thereby preventing soil erosion. Thus, agroforestry using bamboo can lead to inclusive development, economic growth, and disaster mitigation.

Example 1: Agro-forestry with bamboo

National and state-level agencies are already working on increasing its cultivation in the country. The National Bamboo Mission under the ministry of agriculture and farmers welfare aims at increasing the area under bamboo plantations in non-forest lands. This is to supplement the income of the farms, contribute towards resilience to climate change, and meet the raw material requirements of the industry sector. The state scheme Kerala bamboo mission under the department of industries and commerce similarly focuses on revitalizing the bamboo sector by creating more opportunities for value addition, enhancing income generation, and poverty alleviation. Uravu, an NGO based in Wayanad, has been pioneering several initiatives in supporting indigenous communities to create additional income by bamboo cultivation.

Biju Kakkayam, an experienced practitioner and environmental activist, has planted bamboo across river banks. The project is being implemented in collaboration with the social forestry wing in Kakkayam.

Example 2: Model wetland village Muhamma

The Ashoka Trust for Research in Ecology and the Environment and the Muhamma grama panchayat in Alappuzha jointly distributed Papaya and Moringa saplings to households. The objective was to enhance food security, improve tree cover, and promote agroforestry at the household level.

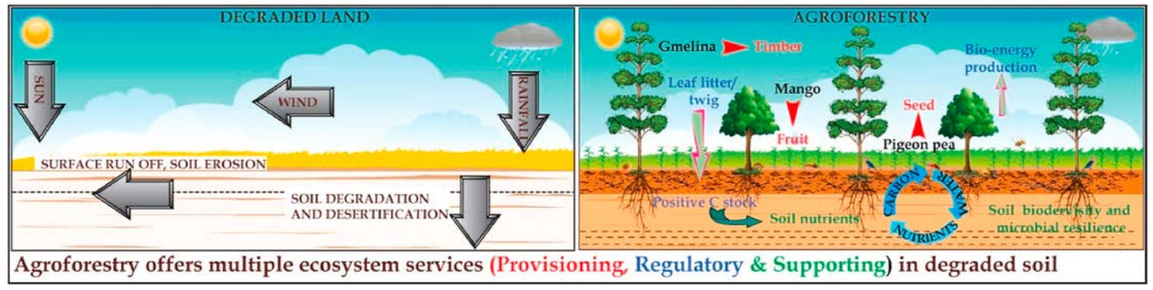
Example 3: Subhiksham Surakshitham Project

The 'Subhiksham Surakshitham Project ' was introduced in 2021 (Kerala Agro-Ecology Based Biodiversity Conservation)' in Kerala with the joint assistance of the Central and State Governments to promote natural agriculture in lands as small as 5 cents. The project aims to ensure certification and encourage the adaptation of organic farming, improve the resilience of soil structure to climate change, enhance immunity through safe food, and promote eco-friendly farming at a low cost utilizing traditional agricultural knowledge.

As part of the project, the product will be given PGS (Participatory Guarantee System) Green certification in the first year. After three years of natural farming, PGS Organic certification will be given to the produce. This could incentivize farmers to switch to regenerative agricultural practices and provide small-scale landholders to utilize unused land for regenerative agriculture towards restoration.

Recommendations

1. Incentivizing private property owners and small farm holders through regenerative agriculture and agroforestry for additional income generation.
2. Encouraging research to build public interest and citizen science.
3. Developing outreach strategies to communicate the benefits of agroforestry and conservation agriculture.
4. Develop schemes to incentivize or provide tax incentives for scaling up conservation agriculture.



Agroforestry offers multiple ecosystem services (Provisioning, Regulatory & Supporting) in degraded soil

Source: Biswas et al. "Agroforestry Offers Multiple Ecosystem Services in Degraded Lateritic Soils." Journal of Cleaner Production 365 (September 10, 2022): 132768.

Generating employment opportunities and enhancing Ecosystem-based Disaster Risk Reduction (Eco-DRR) through mangrove restoration.

The role of mangroves in mitigating disasters has been extensively researched. By breaking the velocity of water and wind, they act as a shield and reduce the impact of disasters. An example is the Pichavaram mangrove forests that significantly reduced the impact of a tsunami in the Cuddalore district in 2004.

Mangroves act as blue carbon storage in the coastal ecosystem. They absorb carbon dioxide from the atmosphere, storing it in their roots, branches, and the sediment that surrounds them. Mangroves can store up to 5 times more carbon than upland forests. Additionally, several aquatic species use mangrove forests as their breeding grounds making Mangrove restoration an important part of building resilience in the state.

Kerala Forests & Wildlife Department Ecorestoration Policy 2021 mentions:

To protect the ecologically important mangroves, steps will be taken to acquire privately owned mangroves based on their consent after paying eligible compensation.(page 23)

Mangrove restoration can tap into several co-benefits like increased fish wealth, opportunities to scale up the area's tourism sector, livelihood generation in terms of planting and maintenance of saplings, and flood mitigation, to name a few.

Restoration of mangroves can aid in income generation for community members involved in it by:

- Combining it with funds from corporate organizations as part of CSR initiatives.
- Combining curated experiential tourism programs.
- Accessing carbon credits market.
- Encouraging fishing societies to invest in mangrove planting as it has the added benefit of acting as a nursery habitat for several marine species.

Manoj Kumar, A renowned practitioner from Vypin, Edavanakad, and his team run an organization called **'Grassroute'** working on coastal conservation. Grassroute is part of a project for building a biodiversity wall by the sea, using indigenous plant species and mangroves on a 25km stretch.

Sasthra Sahithya Parishath conducted a state-level study in association with Kerala Sasthra Sahithya Parishath (KSSP) to identify the potential sites for the restoration of mangroves. The outcomes were submitted to the forest department project proposal under the Rebuild Kerala project to take over private property for the afforestation of mangroves.

Another example is the restoration of mangroves in Ashtamudi Lake, led by 305 groups of women from 12 panchayats. The women were trained in planting and raising the mangroves and received Rs 11 per sapling. 1 lakh saplings were planted, and 10,000 such saplings survived, amounting to the restoration of more than 50 hectares of land. The area has emerged as a popular tourist location, and there has been a drastic improvement in the fish wealth in this area.

Marine life of Mumbai (MLOF) is a volunteer-driven project run by the coastal conservation foundation (CCF), presenting a fascinating experience for city dwellers to experience the biodiversity in the seashore. (Mehta, 2019) Through curated experiences driven by education and citizen science, the project aims to build interest in coastal biodiversity, habitats, and the need for conservation among the public "c*ome see a side of the city that has remained hidden in plain sight!*" Accounting for the lack of studies on Marine life on the Mumbai coast, Shore walks during low tide were one of the initiatives of MLOM, which is attended by many students and researchers. The public interest that arose brought to attention the rich marine biodiversity in the city and the need for further studies to bridge the knowledge gap for conservation.

The incentive for the public is in learning about their city in addition to encouraging students and researchers to build more knowledge through research. Similarly, Kerala can incentivize similar citizen-science-driven shore walks along mangrove forests by collaborating with researchers to encourage research and applying the research for restoration activities.

Incentive-based Ecosystem Restoration

RECOMMENDATIONS

1. Building capacities among the private property owners in conserving and restoring the mangroves on their land will create ownership and employment. Converting the afforested patches of land as tourist attractions can further boost income generation.

2. Conduct scientific studies on the Kerala coast through collaborations with community experts to build public interest in restoration issues.

3. Identifying communities that can lead mangrove restoration efforts and providing the capacity with tools to raise finance for the restoration efforts.


Manoj Kumar from Garssroute

ECO-TOURISM AND RESTORATION

Munroe Island l Photo by Sanju Soman

Developing a sustainable model by interlinking traditional/historical environmental practices, restoration efforts, and tourism.

Eco-tourism, Green tourism, Resilient destinations, etc., are some of the urban nomenclatures for sustainable tourism.
The livelihood opportunities and economic value that eco-destinations create through tourism activities incentivize restoration.

A global approach towards curating unique experiences, supporting local businesses, and implementing disaster warning systems to ensure the safety of potential sites can be key for destinations to transition towards sustainability. Interlinking the impetus for tourism with restoration efforts of varied ecosystems, like restoring mangroves, wetlands, etc., will create more potential sites for tourism with a self-sufficient model in the long run.

Kerala Forests & Wildlife Department Ecorestoration Policy 2021 mentions:

For Eco restoration, planting of local indigenous species based on specificity of each location shall be promoted. (page 24)

These positives make ecotourism a significant developmental tool for incentive-based ecosystem restoration, biodiversity conservation, and planning.

Example 1: Pokkali Cultivation promotion by the Blue Yonder

The Blue Yonder, a travel company, has been promoting the Pokkali variety of rice and its cultivation through tourism. Pokkali is a highly saline-tolerant rice cultivated in water-logged coastal regions through labor-intensive practices. It fetches a high market value of Rs 80 to 90 per kilogram. The Blue Yonder collaborated with an agrarian community historically engaged in cultivating Pokkali near Fort Kochi to develop a sustainable model of preserving the crop through tourism. In their Pokkali and Organic farm visits, through curated activities, they involve tourists with the community as well as in the harvesting of the crop.

"Pokkali and Organic Farm Visits are designed to bring the story of Pokkali to travelers! Its unique qualities, cultivation, its deep-rooted connection with the community, and their struggle to sustain it presents a wonderful case of how various stakeholders from society collaborated to preserve the delicate cycle of nature!"

- The Blue Yonder

Example 2: Kumarakom Model

Responsible Tourism (RT) Mission in Kerala focuses on the destination's economic, social, and environmental aspects to implement a tourism model. The Responsible Tourism (RT) model is mainly conceived with three kinds of responsibilities which are termed as the 'triple-bottom-line economic responsibility, social responsibility, and environmental responsibility. The Responsible Tourism(RT) project made the local communities central to the tourism sector by offering their services and products as tourist attractions. To carry out the project, a destination-level Responsible Tourism Committee consisting of representatives from the panchayat, the tourism industry, local non-governmental organizations(NGOs), and community partners were created. This bottom-up approach is in contrast to the previous top-down model that considers the interests of the local stakeholders, local self-governments, and the local communities. The outcome was that resource use, employment opportunities, and benefits sharing through tourism development were better channeled to the communities on the ground.

Example 3:Non-Governmental Organization

The Community Environment Resource Centre of the ATREE jointly collaborated with International universities to promote learning experiences for students pursuing courses on environment and natural sciences. As part of the program, the students visited community members in Alappuzha to study and understand the various conservation efforts. These visits helped community members earn an additional income. The students also invested funds in setting up fish sanctuaries in the lake, which acted as breeding spaces for marine life.

RECOMMENDATIONS

1. Encouraging agricultural tourism in collaboration with community partners to develop sustainable models of preserving native crops, and showcasing services and products by the communities to the visitors.
2. Formulating an institutional mechanism with a bottom-up approach by creating committees with representatives from the local bodies and communities to distribute benefits sharing and improve resource-use.
3. Provide capacity building for farming communities to develop experiential tour programs.

Lake cleanup drive by Climate leaders of SUSTERA Foundation in Vellayani Lake, Trivandrum

ENVIRONMENTAL EDUCATION CURRICULUM

Environmental education in schools centered around conservation through hands-on activities by providing non-monetary incentives.

Increased engagement of environmental education in the academic curriculum has been identified as imperative for capacity building for ecosystem restoration. It can be done by enabling interactions with nature through organic farming and ecosystem restoration.

"Inducing curiosity by adding deep ecology to the academic curriculum will be beneficial and as students learn science subjects, they must be encouraged to develop an interest in the larger questions and a greater good rather than studying for the exams."
- Research scholar Salman Farissi, The Central University of Kerala.

Kerala Forests & Wildlife Department Ecorestoration Policy 2021 mentions:

Projects for setting up small forest patches in schools and cities and planting trees on private properties will be promoted, which will be expanded in association with the State Education and Local Self-Government Departments. (page 26)

Young learners from schools can be a great force in restoration efforts. The local community can benefit from the enthusiasm of young learners for restoration activities. At the same time, the students will benefit from skilling up to explore different career pathways and learning about their own ecosystems. This also translates to experiential learning for students.

Such an academic curriculum can be designed around incentives such as additional points or certificates for being part of restoration efforts.

Example 1: The Bhoo Mithra Sena clubs

The Bhoomitra Sena clubs (BMCs) scheme was launched by the Directorate of Environment and Climate Change to strengthen environmental commitment among college students. It is now being extended to higher secondary schools in the state. The Bhoo Mithra Sena is supported in all state government colleges and higher secondary schools. (Bhoomithra Sena Clubs - Guidelines, 2021)

The exemplary activities of the Bhoo Mithra Sena were discussed by college students and professors. Bhoo Mithra Sena, along with the biodiversity clubs and NSS in colleges, has contributed substantially to environmental education and has developed a keen interest among students in ecology and conservation.

The biodiversity club has a project named Santi Sthal initiated in the year 2013 to grow rare, endangered, and threatened species of trees on campus. It has developed into a thick forest in 7 years. It started at 15 cents and now it is around 27 cents of land that is transformed, Biji Abraham, Professor at the Christian College Chengannur, recounted.

Example 2:Ente Maram Paddhati Scheme

The social forestry wing under the Kerala Forest Department engages in afforestation projects outside the forest area to increase green cover. ‘Ente Maram Paddhati’ was a venture initiated in collaboration with the education department of Kerala. Under the scheme, each student in classes 5th to 9th was given saplings to plant in their homes or in their neighborhood. The students were to nurture and report the progress of the plant growth at the end of the academic year. 2.35 lakh saplings were planted by school children across the state in 2007 on World Environment Day, thereby setting a record in planting. The initiative created awareness and community-led action among the youth and children in the state. This and similar initiatives under Kerala social forestry Haritha Keralam have received global recognition. (The Hindu, 2010). Vidyavanam’ is another social forestry project undertaken where rupees one Lac investment is made into five cents of land in schools and the students are made the custodians of the Vidhyavanam.

Example 3: The Re(ef)Generate, Andaman Islands

Cherish Expeditions is a travel-based impact initiative that offers immersive, sustainable, and transformational experiences. They hosted a series of restoration activities in Andaman. The Re(ef)Generate is an initiation into active coral restoration techniques to conserve and replenish coral reef cover in the Andamans.

The program selected 15 aspiring changemakers who came together to co-create impact through a curated learning module, virtual training, and hands-on experience, which will enable them to be future Marine Biologists, Climate change advocates, Conservation writers, Environmentalists, and Wildlife/Underwater Filmmakers.

The Project also certifies the selected participants with an international Advanced Open Water PADI certification, which will help them continue their efforts globally in any part of the world on reef restoration. This model could be replicated in the state to expand the environmental education curriculum, build skills, and for students to explore pathways to climate careers.

‘**Example 4: Habitat Learning**

The Ashoka Trust for Research in Ecology and the Environment have been leading participatory conservation efforts in Alappuzha through its Habitat Learning project. Under the program, young learners can learn about their surroundings and ecosystems by conducting field visits with scientists and ecologists from the region. Similarly, they were also motivated to understand their ecosystem by converging science education with practical experience. The learners were engaged in water quality monitoring and rainfall monitoring exercises that helped them learn about interpreting data. The learners were also provided indirect incentives through books, certificates, and free, paid nature-based tour programs.

RECOMMENDATIONS

1. The release of the best Bhoomitra Sena Clubs (BMC) awards can be restructured to directly reach the students involved in the activities by including a robust certification of appreciation valuable for their future career trajectory. A panchayat-level platform can be formed where the members of BMCs can be directly inducted into local-level ecosystem restoration activities.
2. The school and college curriculums must include climate change impacts to create awareness among the students. An emphasis on exploring pathways in climate careers, opportunities in ecosystem restoration, and how they can support livelihoods need to be included in the curriculum.
3. Equipping young learners with relevant skills and boosting innovation culture in schools and colleges to understand value addition for restoration activities.
4. Creating environmental clubs in schools and colleges to engage students with local ecological concerns and develop ideas for protecting diverse ecosystems.
5. Introducing modules for students that mandate them to involve in participatory projects like environmental monitoring, where they actively engage with experts and local communities alike to collect much-needed data on ecosystems.

The Digital University Kerala started MSc. in Ecology with a specialization in Ecological Informatics in 2021, allowing students to learn in new-age courses sorely lacking in traditional environmental programs. The Master's program has gained significance with the launch of the U.N. Decade for Ecosystem Restoration. Various courses in this program expose students to advanced topics such as ecological engineering, bio-inspired design, ecological modeling, ESG, geospatial analytics, programming (Python and R), and other quantitative techniques. The combination of these relevant subjects is unique in the country and equips students with the skill set necessary to address ecosystem restoration challenges in Kerala.

-Abigith Baby, Student at the Digital University Kerala

TRADITIONAL ECOSYSTEM RESTORATION PRACTICES

Co-creating a democratic model with community partners at the panchayat level to protect abandoned sacred groves, and supporting indigenous peoples' forest tenure.

Integrating all forms of knowledge, including scientific knowledge, indigenous knowledge, and local knowledge, has been identified as one of the critical principles of Ecosystem restoration.

The Man and Biosphere program by UNESCO aims to improve livelihoods and equitable benefits-sharing. This can be achieved in India by integrating indigenous environmental knowledge of indigenous communities towards building sustainable ecosystems.
- Salman Farissi, a research scholar at the Central University of Kerala.

Kerala is home to several historic sacred groves, many of which remain abandoned and undocumented. A well-conserved sacred grove can serve as an ecosystem service provider while simultaneously ensuring the conservation of our natural and cultural heritage.

Kerala Forests & Wildlife Department Ecorestoration Policy 2021 mentions:

Historical role of tribal communities in forest protection should be further strengthened. They should also be provided with basic amenities, which are ecofriendly. Involving tribal communities as equal partners in forest conservation should be done with proper planning and accorded due importance.(page 9)

This cultural practice of worshiping nature in its organic form can evidently contribute towards replenishing these abandoned patches of land and their conservation. In our pre-roundtable discussion with college students, Ms. Arunima, a college student from Sree Ayyappa College, proposed the conservation of sacred groves to address the concern of the ‘mini forests’ being destroyed due to urbanization. Co-creating a model to protect the abandoned sacred groves of cultural significance at the panchayat level can effectively maintain these carbon sponges. Additionally, the scope of ecotourism in these sites can be explored without burdening them.

Similarly, recognizing and securing land tenure to traditionally held forested lands for indigenous communities will ensure indigenous sovereignty and the co-benefits of productive forest management. Indigenous peoples' forest tenure is suggested as one of the Top 100 solutions for climate change by Project Drawdown. A simulated scenario showed that conservatively adopting the land tenure rights model around the world can significantly reduce emissions equivalent to about 8.69 to 12.51 GtC CO2 in the next 30 years.

A systematic study of typical ecosystems and attaining in-depth knowledge from the communities belonging to these ecosystems is key in strongly engaging them in the restoration efforts undertaken by various organizations and institutions. There is a large amount of evidence pointing to the criticality of traditional knowledge on effective forest management and conservation.

Recognizing the major roles of the community in management and enforcement works better than the top-down approach of organizations and institutions. 28% of the world's land surface and 37% of the remaining natural land are managed by indigenous communities (Garnett et al. 2018)

Example 1: Wayanad Ramayana Trail

A circuit of locations significant to the regional tellings of Ramayana in the Wayanad district was identified as sites of cultural and environmental interest for tourism. These were then curated as a tourist circuit known as the Ramayana trail.

The initiative hopes to conserve the key areas in this circuit and maintain the green cover to attract tourists while connecting it to historical life and culture.

Example 2: Planting and protecting RET trees through sacred groves of the state

In 2020, a Species recovery program, Grow Our Dying(GOD) campaign, was implemented by the M S Swaminathan Research Foundation and M S Swaminathan Botanical Gardens (MSSRF & MSSBG). The program aimed to plant and protect 100 species of trees in sacred groves identified across Kerala. The 100 species belong to Rare, Endangered, and Threatened Species (RET), endemic to the Western Ghats. In the first phase, the project was implemented in five districts of the Malabar region. Under the program, individuals and organizations can also sponsor trees to be planted. This program utilizes the eco-social value of sacred groves recognized by groups to encourage biodiversity protection.

RECOMMENDATIONS

1. Co-creating a democratic model utilizing the social and cultural values recognized by groups to protect the abandoned sacred groves at the panchayat level.
2. Recognizing indigenous environmental knowledge and practices to secure land rights to communities and encouraging collaborations with other experts.
3. Securing tenure of traditionally held land for indigenous forest communities and building capacity for restoring degraded forest land.
4. Providing incentivized leadership training in collaboration with environmental organizations.

Sacred groves, Iringole, Ernakulam Photos by Kavya Jeevan

CARBON CREDITS AND CORPORATE SOCIAL RESPONSIBILITY

Eco-restoration efforts at the community level can access finance from the carbon credit mechanism and corporate social responsibility.

Carbon credits are tradable permits equivalent to one metric tonne of Carbon dioxide. The Carbon Credit mechanism was developed to reduce greenhouse gas emissions by creating a market where companies can trade emissions permits. E.g., A firm can pay a broker to take carbon dioxide out of the atmosphere. The broker will then use the money to fund projects that reduce carbon emissions. The firm receives proof that they've purchased a carbon offset which can then use as proof they've demonstrated compliance.

Carbon credits are issued by agencies that certify such credits based on efforts by individuals or groups in any part of the world involved in emission reduction/ sequestration activities such as installing fuel-efficient cooking stoves in rural India, installing solar panels, large-scale afforestation, etc.

The drawback of the Carbon credit model is that more than carbon offsetting would be required and commensurable to environmental degradation. Moreover, the model does not guarantee active investment in reducing emissions.

Kerala Forests & Wildlife Department Ecorestoration Policy 2021 mentions:

For the Panchayats of Kerala to become "Carbon-Neutral", planting of trees is an inevitable step. The services of the Local Self Government Department, Kudumbasree, Vana Samrakshana Samithies, Eco Development Committees, and Self-Help Groups will be utilized for this purpose.(page 23)

However, at the initial stages, it can be an incentive mechanism for institutions to encourage investment in ecosystem restoration projects.

Another way to encourage investment in restoration efforts is to tap into the Corporate Social Responsibility of business organizations. It's mandatory for every business organization covered under section 135(1) of the Companies Act, 2013 in India to spend 2% of its net profit on Corporate Social Responsibility. These funds can be channeled toward restoration activities, especially in urban centers.

Example 1: Net Sink Credit for Climate Equity by Equator Geo

In 2021, Equator Geo, a startup based in Kerala, suggested giving carbon credit to farmers, individuals, households, institutions, and communities called the Net sink credit for climate equity. Small-scale farmers and individuals already contribute to conservation agriculture and restoration efforts. If their contribution is recognized and a system of carbon credits is introduced to incentivize this work, it can become a source of additional income. In this way, making carbon credit trading accessible to groups outside the current trading network will expand the scope of sustainable practices at all scales ensuring restoration efforts and accountability for the same at a multi-scalar level. The idea was presented at the COP26 conference in Glasgow.

Example 2: Carbon Credits for mangrove restoration.

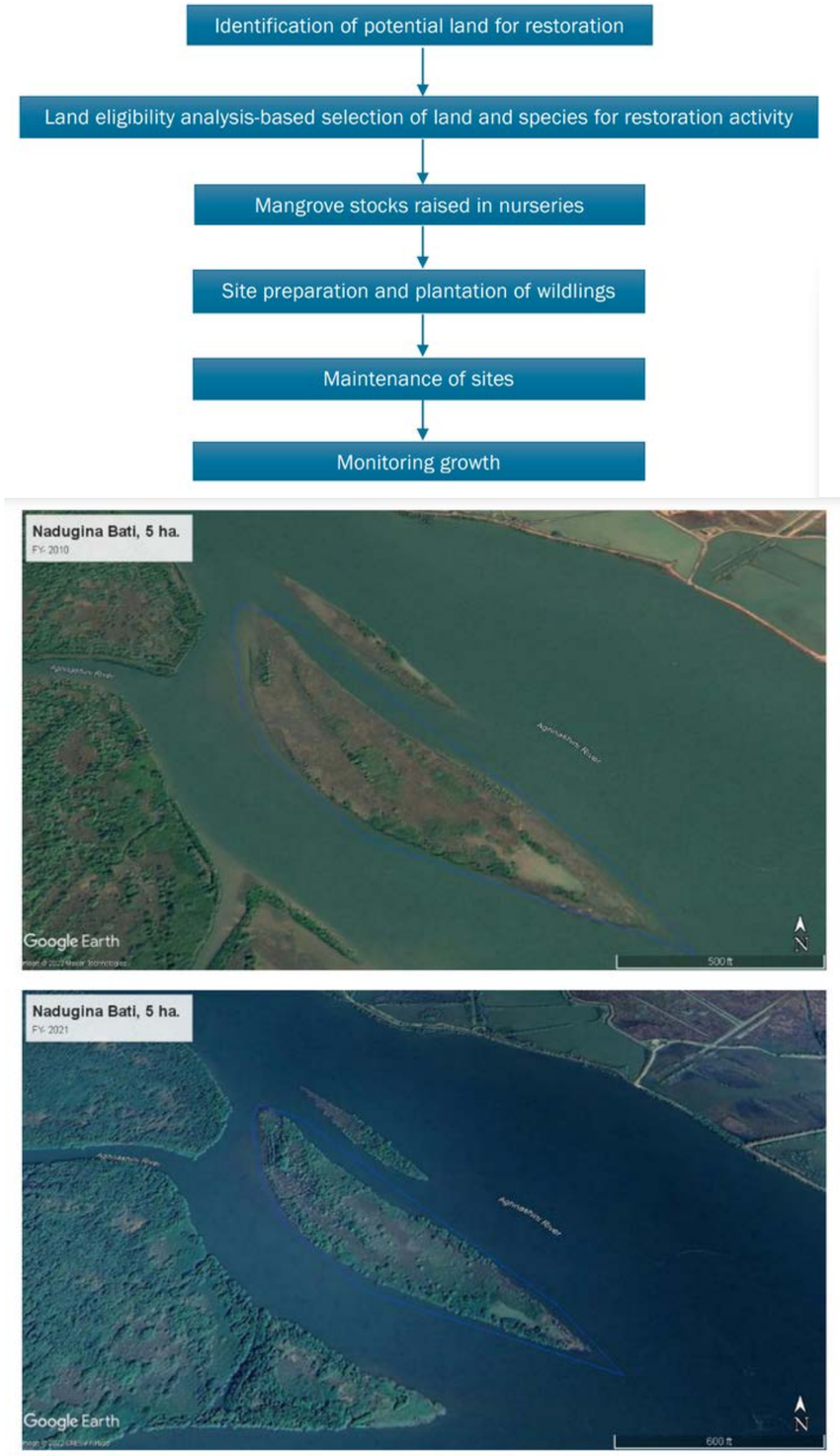
The Verified Carbon Standard (VCS) Program is a widely used greenhouse gas (GHG) crediting program. The program channels finance toward efforts "*that reduce and remove emissions, improve livelihoods, and protect nature*."(VCS) Under their category of Afforestation, Reforestation, and Revegetation (ARR), a participatory project of restoring degraded mangrove ecosystems was carried out in the estuarine islands in coastal Karnataka.

Privately owned land belonging to fishing communities in these regions was replanted with mangrove saplings in approximately 175 ha of land. The project contributes directly to an increase in carbon sequestration and is thus quantified in terms of carbon credits. Furthermore, the project's incentives are based on Mangroves' role as nurseries for several fish species and other commercial aquatic life. The project claims to, directly and indirectly, assist in the improvement of the livelihood of local communities and generate income in addition to the financial benefits from the sale of carbon credits. Revenue from the project will be used to develop sustainable livelihoods through IGAs and the development of alternative livelihoods, which will improve the local community's socio-economic conditions and diversify their income streams. The project is considered to have an annual average CO_2 cut of approx 14.097 tCO_2.

RECOMMENDATIONS

1. Formulating an incentive system like a carbon credit system for individuals and institutions to encourage long-term investments and impact at multiple scales, taking into consideration the challenges of the system.
2. Devising long-term plans by identifying a thematic target for restoration for 2 or 3 years and coordinating the efforts through the project cycle will ensure the channeling of funds and human power retention for an extended period.
3. Local self-government institutions can be provided training to develop project proposals to access corporate social responsibility funds. Alternatively, LSGI's can collaborate with registered Civil Society Organizations or youth groups to formulate restoration projects.

Incentive-based Ecosystem Restoration



[Top] Activities involved in the restoration. [Bottom] Transformation of the land from 2010-2021, Source: Verified Carbon Standard, Report on the *Participatory Mangrove Afforestation & Restoration in the West Coast of India,2021*

MODEL BASED ON LOCAL SELF GOVERNMENT INSTITUTIONS AS FACILITATORS

Canal rejuvenation in Vannappuram GP | By Agnus MA

Developing a working model for collaborations between Local Self-Government Institutions(LSGIs) and community partners by utilizing existing programs to encourage, replicate and scale up ecosystem restoration efforts to integrate administrative goals better.

Local communities and their knowledge have already been identified in this report as central to ecosystem restoration efforts. Involving community experts in administrative processes of restoration activities initiated by the government can benefit from better integration of administrative goals through synergistic efforts and community participation in governance.

Kerala has very strong and efficient local self-government bodies. Kerala was one of the first states in the nation to have successfully set up panchayat-level biodiversity management committees in all panchayats complying with the Biological Diversity Act.

Kerala Forests & Wildlife Department
Ecorestoration Policy 2021 mentions:

To ensure sustainable development by ensuring the protection of the environment and livelihoods, the State Forest Department, Local Self Government Institutions, other Government Departments, Non-Government Organizations, commercial establishments, students, and public and voluntary organizations should come together in a mutually-complementing manner. In furtherance of this, it is envisioned to come up with a plan, in association with partners concerned, for sustainable development based on eco-restoration.(page 30)

A recent survey by a Delhi-based agency, Legal initiative for forest and environment, reported that the Biodiversity Management Committees in most local bodies were inactive. The biodiversity management committees were not aware of the third-party biodiversity projects that were ongoing in the region. (Sreemol, 2022) Therefore, engaging local bodies and implementing restoration projects through local self-governments is essential to ensure their success with the participatory approach.

Example 1: Panchayat talk series

'Panchayat talk series' is an exciting attempt at bridging the communication gap between public interest and the administrative goals of the local bodies. A YouTube channel launched by a young member of Wayanad District Panchayat, Junaid Kaippani, the 'Panchayat Talk series' conducts comprehensive awareness sessions on the local government by responding to queries from the public. (Yousaf, 2021) The series created a platform for engagement for the general public to learn about the three-tier system and the Haritha Kerala Mission, Kerala's development goals, and understand their significance at the LSG level. Such initiatives in actively encouraging participation and interest among the general public in activities of the LSGI's have greatly benefited in sustaining the success of efforts like the panchayat level biodiversity management committees.

As custodians of community resources, the LSGIs possess two important tools: the annual plan of LSGIs and the Mahatma Gandhi National Rural Employment Guarantee Act, 2005 (MGNREGA) scheme. Understanding the full potential of these two schemes and their implementation in restoration efforts will lead to income and employment generation and also help sustainable natural asset and resource management.

To utilize this potential, it is equally important to ensure LSGI's have access to scientific and community expertise on ecosystem restoration projects specific to the ecosystems they are implemented in. A lack of this can inhibit success and reverse the positive impact of such efforts.

For example, projects of afforestation under the Thozhilurappu scheme have reported scenarios of accidental planting of invasive or alien species which adversely impact the environment. Ensuring access to technical expertise to design and oversee these projects can overcome these issues. A step has already been taken in this direction.

The Kerala Institute of Local Administration(KILA), Kerala State Disaster Management Authority, the Irrigation department, land use board are collaborating to train people who are already engaged in ecosystem restoration works taken up through the Thozhilurappu scheme to help them execute activities in a more sustainable and site-specific manner.

Example 2: Muhamma Model Wetland Village

The Community Environment Resource Center of ATREE collaborated with panchayats in Alappuzha to scale up restoration efforts as part of the ambitious project to make Muhamma a model wetland village through community-led conservation efforts.

In Muhamma ATREE worked closely with the panchayat in

- Restoring mangrove patches
- Creating fish sanctuaries and no fishing zones.
- Enhancing conservation of clam species which play an essential role in water purification.
- Restoration of canals.
- Increasing the green cover of the village
- and restoration of degraded lands.

RECOMMENDATIONS

1. Fostering collaborations between Local self-government Institutions (LSGIs) and communities to channel funds and incentivize ecosystem restoration activities through existing government employment schemes.
2. Equipping implementing agencies with relevant technical expertise and training to ensure the success of area-specific restoration efforts.
3. Identifying the best practices at the LSGI level and replicating them in other regions with context-specific modifications and scaling up to improve impact is key to sustaining the benefits long-term.

Using coir geotextile and vetiver planting to fortify canal walls as a nature based solution in Vamanapuram panchayat l Photo by Agnus M

Creating pachaturuthu in Kanjikuzhi, Idukki l Photo By Agnus MA

MGNREGA, in India, spends about **65 %** of its resources on natural resource management activities.

MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE ACT SCHEME(MGNREGA)

Implementing ecosystem restoration activities at the local level through the MGNREGS can ensure rapid scaling-up.

The Mahatma Gandhi National Rural Employment Guarantee Scheme(MGNREGA) guarantees 100 days of work annually for individuals from rural regions. This scheme has mainly helped women by providing a guaranteed income and benefited the locality through the asset creation of public works.

The MGNREGA scheme has been effectively used by several panchayats across India to create positive environmental outcomes. Some of the scheme's most effective projects include installing rainwater harvesting pits, implementing soil protection measures, river rejuvenation, mitigating land degradation, and supporting public farming efforts and restoration. 127 million families are registered as beneficiaries under the MGNREGA, and on average, 70 million households receive paid employment each year.

Kerala Forests & Wildlife Department
Ecorestoration Policy 2021

Uncontrolled forest-fire causes degradation of forests, thereby leading to loss of biodiversity, water scarcity and soil erosion. Forest fire prevention measures will be taken up through participatory forest management initiatives and by exploring the possibilities of Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).(page 22)

In Kerala, the Haritha Kerala Mission under the Govt of Kerala has been actively involved with Local self-government institutions in implementing restoration-based projects through the scheme. Utilizing human resources for restoration-specific efforts can benefit the community as a whole as it ensures livelihood security for workers and other co-benefits.

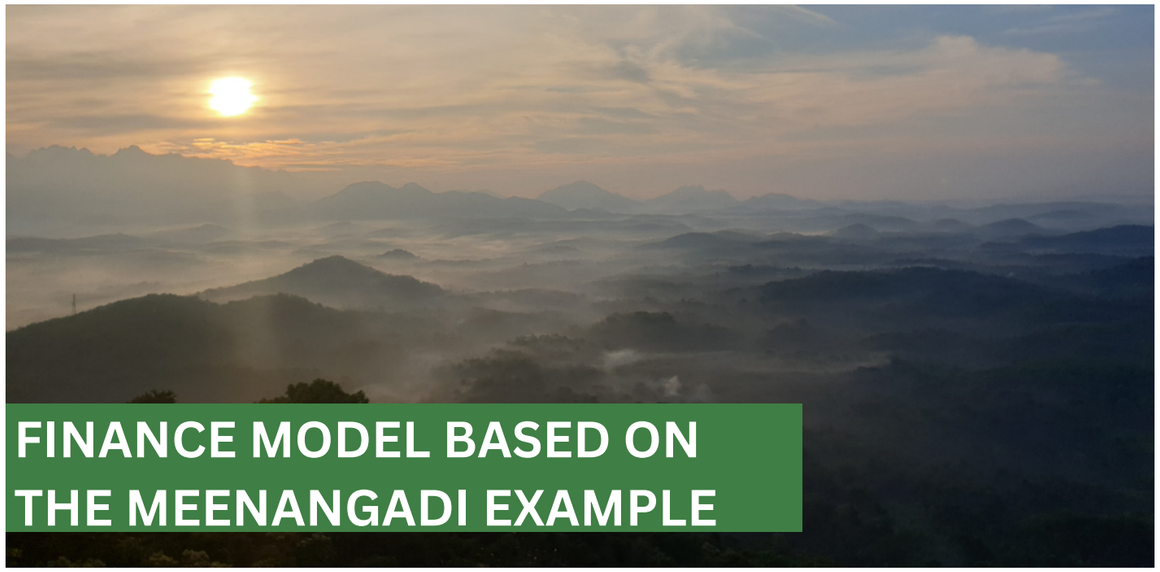
Example 1: Pachaturuthu Program in panchayats

The Haritha Kerala mission of Kerala launched the “pachaturuthu” program in 2020 that aimed at creating small forests (pachaturuthus) in unused, poramboke or surplus lands with government bodies.

Despite the pandemic, the scheme successfully created more than 1250 mini forests in the state. As part of the project, MGNREGS workers have been employed for a period of three years for the maintenance of these plots. After which, these plants can survive on their own. They developed a sapling nursery, prepared the land, planted saplings, and maintained these pachaturuths. Additionally, local committees with representatives of residents and youth club members were formed to ensure the upkeep and monitoring of these plots. The project also envisages achieving self-sufficiency in the production of vegetables and other basic agro products.

RECOMMENDATIONS

1. Utilizing MGNREGA state-specific schemes like Subhiksha Keralam, Kerala Tribal Plus, Jala Subhiksha, and One crore saplings to integrate ecosystem restoration efforts and employment generation through existing schemes.
2. Utilizing the two categories of works under MGNREGA category A: Public Works Relating to Natural Resources Management and category B: Community Assets or individual assets to directly link ecosystem restoration activities at the state level.



FINANCE MODEL BASED ON THE MEENANGADI EXAMPLE

Developing a finance model where individuals can leverage growing trees and other land restoration efforts to acquire loans in addition to other benefits.

Meenangadi panchayat in Wayanad is a district aspiring to be the first carbon-neutral panchayat in the country. The panchayat introduced a 'Tree-banking scheme' as a part of low-carbon development efforts in Creating a Carbon Neutral Meenangadi Grama Panchayat. The scheme incentivizes farmers to plant and protect trees. Farmers can mortgage trees on their land for interest-free loans. Rather than cutting and selling trees for timber from their lands to overcome financial obstacles, farmers can mortgage trees to secure a loan from the Meenangadi Service Cooperative bank annually. The interest-free loan needs to be repaid only if the tree is felled. The scheme aims to increase the income of the farmers in Wayanad, who have the lowest per capita income in the state.

Kerala Forests & Wildlife Department
Ecorestoration Policy 2021

*Raw materials from clear-felled commercial plantations will be given to small-scale forest-based industries in Kerala for a fair price and 50 percent of this revenue will be used for eco-restoration activities while the remaining 50 percent will be used for improved management of the Teak plantations which are retained and for the upliftment of forest-dependent communities, in addition to modernizing forest management activities. This will be operated through a Revolving Fund.(*page 21)

They get Rs.50 for every tree that is planted under this program. After three years, residents can mortgage each sapling for an interest-free loan that can be renewed annually for ten years. The tree banking scheme took shape three years before the scheme was rolled out in 2020 when a tree sapling nursery was set up, and around 300,000 saplings were planted in 250 houses through MGNREGS. The nursery had 33 types of tree saplings. After rolling out the banking scheme, around 200 applications were received.

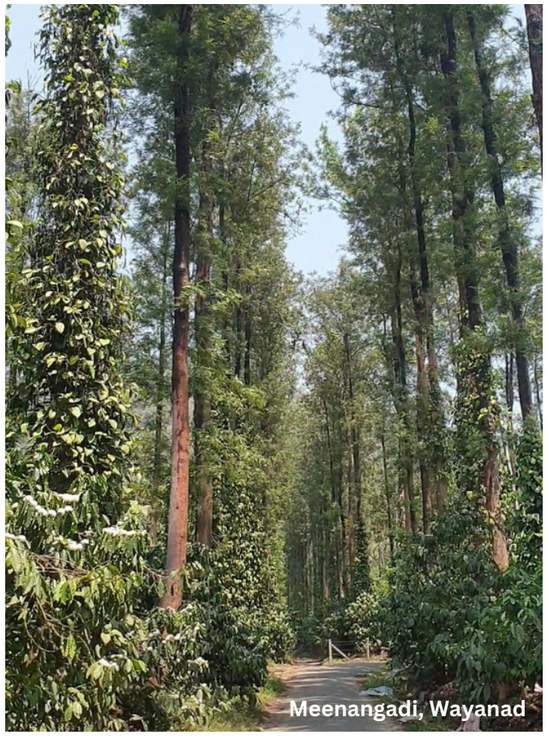
The panchayat collaborated with several organizations, including the environmental organization, Thanal, to implement the project on the ground. Matured trees are surveyed and mapped, which can then be monitored with an app. (The Guardian, 2020)

The state government has allocated Rs 10 crores to the cooperative bank for providing loans for this project. Between 2017 and 2019, 1.57 lakh trees were planted as a part of this program.

This program can be replicated in other panchayats to incentivize different land-holding groups to plant more trees while benefitting from the credit they receive. The monetary incentive received through afforestation and land restoration can be used to support businesses and enterprises. The program's success comes from incentivizing the mass planting of trees, effectively utilizing the MGNREGS to initiate the project, and collaborating with environmental agencies to implement and monitor the project on the ground.

RECOMMENDATIONS

1. Identify the demand and challenges related to ecosystem restoration and financing to develop banking schemes where growing and conserving live trees and other environmental resources can be used to secure a loan.
2. Utilizing human resources and funds through state schemes like the MGNREGS.
3. Collaborating with local environmental agencies with the technical capacity to implement and monitor the project on the ground.



Meenangadi, Wayanad

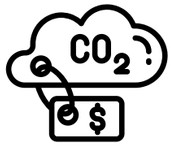
Incentive-based Ecosystem Restoration

OTHER INDIRECT MEASURES FOR INCENTIVIZING ECOSYSTEM RESTORATION

- Tax incentives for households by the local government institution for implementing restoration efforts.
- Tax incentives for businesses that take up restoration efforts within or around their building infrastructure.

- Interest-free loan by a cooperative bank or Local self-government institutions for startups or youth groups involved in ecosystem restoration or that provides services or tools to scale up ecosystem restoration.

- Conservation easements of land owned by NRIs where the owner is happy to conserve the land. A conservation easement is a voluntary, legal agreement that limits the uses of the property to protect its conservation values.



- Payment for ecosystem services (PES) considerations is being implemented in Municipal corporation regions to conserve important ecosystems in urban regions. E.g., PES collection by Kochin Municipal corporation can help provide jobs to individuals involved in conserving large wetlands in Ernakulam.

- Gifting programs by the state government encourage individuals to gift small pockets of land to be restored. The state continues to own the land, but the individual gets a certificate of ownership. This can help raise money for restoration activities.

Incentive-based Ecosystem Restoration

Using coir geotextile and vetiver planting to fortify canal walls as a nature based solution in Vamanapuram panchayat l Photo by Agnus M

METHODOLOGY ROUNDTABLE DISCUSSIONS

Kerala has a high population density of 819 people per sq. km. (Census India, n.d.) The state also has 28 percent of land under forest cover. Increasing the forest cover considering the population density is difficult as the habitable land is already thickly populated. The Western Ghats Ecology Expert Panel (WGEEP) reported that the various human interventions in the ecologically-sensitive areas of Kerala and the resulting change in land use patterns have given rise to flow fluctuations, water quality, and table changes.

Other major changes are alterations in river courses due to dam construction and increasing urbanization trends converting wetlands. The changes in Land use/land cover between 1995 and 2018 with the transformation of different classes of lands like croplands, grasslands, wetlands, mangroves, paddy fields, coastal regions, and the state's varied landscapes have exacerbated the severity of the floods of 2018. The efforts from the state government to restore lands and mark them as reserve forests have been successful so far.

To deliberate on strengthening these initiatives by the State government, the SUSTERA foundation, in collaboration with Purpose Climate Lab (PCL) India, hosted a roundtable discussion that brought together experts, stakeholders, and decision-makers in the field of eco-restoration on 14th January 2022.

The central question of the discussion examined how to enhance Kerala's resilience and how eco-restoration is a potential area for the same.

The roundtable discussed the possibilities of scaling incentive-based models of eco-restoration in Kerala. Besides this, CareLa Contest, an idea-fetching competition on eco-restoration (Kerala), was also organized. The competition aimed to make young people ponder the possibilities of eco-restoration and cultivate awareness by utilizing the competition format to spark discussion. More than 30 teams from across the state applied to contribute their ideas to the contest.

The format of the deliberations was in the form of a roundtable conducted in two parts and an ideas-fetching competition:
The pre-roundtable series of panels on incentivizing ecosystem restoration aimed at creating a platform for multiple stakeholders to share their ideas towards strengthening the state's green economy.

Each panel discussed the possibilities and challenges of implementing a resource-efficient, socially inclusive, and low-carbon model of restoration and the potential co-benefits of engaging in restoration activities. The roundtables also focused on identifying the various stakeholders that can work together to achieve this objective.

The practitioners' roundtable generated substantial ideas for incentive-based models of ecosystem restoration. The practitioners, having dedicated years of expertise in understanding the possibilities of engaging more communities and scaling up their projects to their best potential, contributed immensely to the discussion. The outcome of these deliberations is presented above.

The incentive mechanisms have been analyzed through their feasibility, economic efficiency, and ecological effectiveness. In the discussions, we explored incentives specific to the geography of Kerala, in the form of

- Monetary payments
- Market opportunities,
- Livelihood generation or risk reduction
- Using existing monetary schemes for restoration activities like MGNREGA

These incentives rely on the co-benefits approach which is aimed at capturing both development and climate benefits in a single policy or measure. (ACP,2010)

PARTICIPANTS

- Divya Soman, Researcher, Kerala Forest Research Institute(KFRI)
- Neha Kurian, Kerala Institute for Local Administration(KILA)
- Manoj Kumar, Practitioner, Grassroute
- Ravi Ramalingam, Ashoka Trust for Research in Ecology and the Environment(ATREE)
- Kerala Sasthra Sahithya Parishath (KSSP)
- Renjen Mathew, State Director, World Wide Fund for Nature India(WWF)
- Henna, URAVU
- V.K. Sreedharan, Independent practitioner
- Hari, an Independent practitioner
- Rajan, an Independent practitioner
- Biju Kakayam, Independent practitioner
- Madhoosadharan, Independent practitioner

Incentive-based Ecosystem Restoration

PARTICIPANTS - College Professors' Roundatable

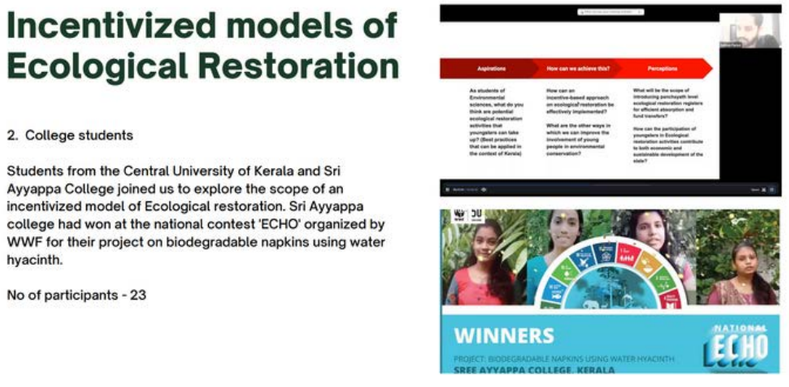
1. Biji Abraham - Christian College Chenganur
2. Dr. Jean Jose - St. Gregorios College Kottarakkara
3. Dr. Nisha FMN College Kollam
4. Dr.Abhilash Christian College Chengannur
5. Aneyamol - St. Xavier's College Aluva
6. Dr. Bindhu RIT, Pampady, Ktm

PARTICIPANTS - Researchers (CUK) Roundatable

1. Muthukumar Muthuchamy - Dean - School of Earth Science Systems Professor and Head - Department Of Environmental Science
2. Nadirsha PS Nawab
3. Salman Farissi
4. Preeti
5. Kavya Jeevan - Phd Scholar
6. Dr. Alagu Manickavelu - Faculty at Genomic Science
7. Dr. Anbazahgi
8. Dr. Karthika M
9. Mukesh - Environmental science department PHD Scholar
10. Dr. Sakthivel

PARTICIPANTS - Students (Sree Ayyapa College)

1. Pooja - Student green protection force
2. Sheetal KM- Microbiology and biochemistry department
3. Abhirami sandya.
4. Ambili
5. Amritha Sri.
6. Amjad - Bsc Electronics.
7. Arunima



IDEAS-FETCHING COMPETITION: THE CARE-LA CONTEST

The Care-la Contest was conducted as an ideas-fetching competition for students from different sectors in Kerala to support innovative projects proposed by Student Innovators. The competition format allowed them to present their ideas on incentivized models for eco-restoration, which would lead to practical, real-world solutions. The projects were presented in front of an expert panel, and winning entries won a small grant for further research on the idea and extensive mentorship.

The two winning entries were:

Greenscape: Ecological conservation by afforestation in the Chaliyar River Basin

Team: Khadeeja Parvin CM

Proposal to restore and conserve the river basin area through a sustainable landscape project and planting trees through local community participation.

Benefits: Meeting the major ecosystem services of the community

Co-benefits: Educational awareness, Creating livelihood opportunities, Youth training, Empower local people, Green recreation, carbon sequestration, Water buffering, Prevention of heat islands, Improvement of water, soil, and air quality, Prevent soil erosion, Food security

Eco-restoration of Ponthenpuzha Reserve Forest

Team: Annie Biju,Anagha K H, Aparna A R

Proposal to conserve the existing forest in the region impacted by an exotic invasive species through incentivized participatory forest management.

Benefits: Forestland restoration, the livelihood of the community is enhanced through fodder collection and Non-Timber Forest Products(NTFPs), Eco-tourism perspectives, reduction in human-wildlife conflict, Creation of a medicinal plants database for conservation

Co-benefits: Educational awareness, Addressing UN goals, Creating additional livelihood opportunities, Youth training, Partnering with local governance bodies, Empower local people, Improving ecosystem productivity, Green recreation, Science and education, carbon sequestration, Mediation of noise, wind and visual impact, Increase soil fertility, Prevent soil erosion

Incentive-based Ecosystem Restoration

CareLa Contest - Incentive-based Ecological restoration models by the 16 teams.

1. Eco-conscious architectural practices - An E- platform, an economically incentivized dedicated portal for promoting eco-sensible hospitality buildings. **by Liss Annie Tom & Team**
2. Ecological conservation by afforestation in the Chaliyar River Basin. **By Khadeeja Parvin CM**
3. Pettimada Quarry - Ecological restoration **By Kukku Joseph Jose & team**
4. Sustainable upliftment of local communities in Kerala through Community participation in synthesizing biogas from Eichhornia crassipes. **By Dr. S. ANBAZHAGI &team**
5. Commercially valuable products from agricultural waste. **By Paul Joshi & Team.**
6. Project Punarjani - Increase the tree cover (trees outside forests) in Kerala by planting 3 lakh trees through an incentivized and self-sustaining program. **By: Karthik Roy & team**
7. Eco-restoration of Pamba River. **By Dr. S. ANBAZHAGI &team**
8. Autonomous water hyacinth collector. **By Ansel Sebastian & Team**
9. Eco-Rehab - Revival of public land through the Miyawaki method. **By Dr. S. ANBAZHAGI &team**
10. Cultivation of mangrove plants for ecological restoration. **Dr.Arun Aravind & Team**
11. Landslide mitigation through the Miyawaki method in Munnar. **By Maria Prince & Team**
12. Eco-restoration of Poomala using Kulavetti Tree. **B Devanand M D & Team**
13. Perinthod-Valiyathod Eco-restoration project **By Annie Biju & team.**
14. Grassroots restoration - Vattamkulam and Tavanur panchayat in Malappuram **District By Shameela.M & team**
15. Eco restoration of abandoned quarries in Kaviyoor Panchayath of Pathanamthitta. **By Dr. S. ANBAZHAGI &team**
16. Urban park restoration **By Mathew Tom & team**

CONCLUSION

The degradation of our ecosystem can have severe consequences for the various services that the ecosystem provides us, such as raw materials, water, and food. Ecosystem restoration and conservation of natural assets are of utmost importance for our survival than ever. The IPCC's sixth assessment report (WG3) found that natural ecosystems are crucial for absorbing more carbon dioxide and reducing the effects of climate change. Ecosystem restoration is a resource-intensive strategy, but it can lead to high impact if done through incentivized systems in Kerala. Incentive-based ecosystem restoration strategies overcome the major challenges of restoration efforts, namely, funding and coordination, along with building physical and material infrastructure.

Kerala has robust state-level environmental and job creation programs that can be adapted to scale up ecosystem restoration activities and the upcoming infrastructure to upscale these efforts. With the help of active grassroots organizations, practitioners, and the education system in the state, the local self-governments can facilitate the development of efficient and effective incentive-based models for ecosystem restoration, as outlined in the document.

Further work needs to be done to understand more about:

- Ways to build partnerships.
- Linking nature-based solutions with engineering solutions in regions highly vulnerable to climate change.
- Ways to transform institutions to speed up the process.
- Finance and market infrastructure.
- Documentation of innovative practices

The main intention of the document is to provide a simplified understanding of how the ecosystem can be restored and more jobs can be created in Kerala. The SUSTERA team will now focus on creating outreach about the solutions amongst young practitioners, c government, decision-makers, NGOs, and community stakeholders. We'd like to invite you to join our efforts in the same.

"Making peace with nature is the defining task of the 21st century. It must be the top, top priority for everyone, everywhere."
– António Guterres, UN Secretary-General, 2021

Incentive-based Ecosystem Restoration

RECOMMENDATIONS

1. **Building capacities among the private property owners in conservation and restoration.**
2. **Encouraging research on the different ecosystems of Kerala to build public interest and citizen science.**
3. **Identifying best practices at the LSGI level and replicating them in other regions with modifications or scaling up to improve the impact is key to sustaining the benefits of such efforts.**
4. **Encouraging tourism with an emphasis on nature as natural and cultural heritage and encouraging agricultural tourism in collaboration with community partners to develop sustainable models of preserving crops, bringing services and products by the communities for the visitors.**
5. **Instituting an institutional mechanism with a bottom-up approach by creating committees with representatives from the local bodies and communities to distribute benefits sharing and resource use better.**
6. **Including Climate change impact in education with an emphasis on opportunities for ecosystem restoration in the curriculum. Additionally, equipping Bhoomitra Sena Clubs with certification and integration into the local government efforts on eco-restoration.**
7. **Formulating an incentive system like a carbon credit system for individuals and institutions to encourage long-term investments and impact.**
8. **Expanding the scope of Economic valuation of ecosystem services under government institutions to encourage restoration efforts.**
9. **Utilizing MGNREGA and state-specific schemes like Subhiksha Keralam, Kerala Tribal Plus, Jala Subhiksha, and One crore saplings to integrate eco-restoration efforts and employment generation through existing schemes.**
10. **Identify the demand and challenges related to eco-restoration and financing to develop banking schemes where live trees can be used as security to secure a loan.**

Incentive-based Ecosystem Restoration

Achieving the recommendations requires all stakeholders to work together. Specifically, we call on:

KERALA INSTITUTE OF LOCAL ADMINISTRATION

- Provide training on incentive-based eco-restoration methods for LSGIs.
- Provide training on raising finance for restoration activities.
- Support LSGIs in creating project proposals and valuation of benefits of ecorestoration.
- Create awareness of the various benefits for the LSGIs in regard to climate adaptation.

KERALA STATE BIODIVERSITY BOARD

- Research and identify regions that have immense restoration potential.
- Identify species that can be planted in restoration efforts.

KERALA FOREST DEPARTMENT

- Engage with tribal communities in the conservation of land and restoration of degraded forest land.
- Develop innovative schemes to scale up restoration efforts.

KERALA STARTUP MISSION

- Provide support for startups working on restoration efforts.
- Support IoT-based tech that can be incorporated into scaling restoration efforts.

HARITHA KERALA MISSION

- Educate LSGIs on the benefits of the Carbon credit model.
- Help scale successful incentive-based eco-restoration efforts.
- Identify and monitor restoration efforts with negative impacts.

DIRECTORATRE OF ENVIRONMENT AND CLIMATE CHANGE

- Emphasize the need for Disaster risk reduction through eco-restoration.
- Provide financial support for scoping and research on eco-restoration.

DEPARTMENT OF AGRICULTURE

- Develop farm tourism schemes for farmers.
- Provide training to farmers on integrating restoration with sustainable farming practices.
- Provide incentives to farmers engaged in restoration activities.

KERALA STATE COUNCIL FOR SCIENCE, TECHNOLOGY & ENVIRONMENT

- Provide incentives to educational institutions for restoration efforts.
- Conduct research on income generation for restoration efforts.

KERALAUNIVERSITY OF FISHERIES AND OCEAN STUDIES

- Conduct studies that prove a local benefit for fisheries activities by restoration of mangroves.
- Research on potential restoration of Coral reefs across the coastal belt of Kerala.

KERALA STATE PLANNING BOARD

- Improve coordination between government agencies to scale up restoration.
- Include restoration as a major priority for Kerala and analyze the economic benefit of the same.

KERALA STATE COASTAL AREA DEVELOPMENT CORPORATION

- Organize scientific studies to identify coastal stretches where bio walls can be built via restoration.
- Coordinate with LSGIs, corporate organizations, CSOs and research organizations in implementing soft solutions.

MULTILATERAL AND BILATERAL AGENCIES

- Support efforts to improve coordination between departments in the effective implementation of projects.
- Invest in research and advocacy related to restoration.
- Identify lacunas in scaling up restoration efforts.

NON GOVERNMENTAL AGENCIES

- Identify regions with potential for restoration activities.
- Raise finances for restoration activities.
- Organize training for LSGIs, schools, colleges, etc., on the need and potential of restoration activities.
- Engage with corporations to scale restoration efforts in urban areas.
- Engage in capacity-building communities.
- Research on specific restoration practices and their benefits.
- Identify traditional restoration efforts and help scale the efforts.

EDUCATIONAL INSTITUTIONS

- Motivate students to document indigenous species and the history of the region's landscape.
- Develop long-term restoration plans for the region.
- Engage in science education through such efforts.
- Collaborate with LSGIs to take up restoration efforts.

CORPORATE ORGANIZATIONS

- Channelize CSR funds towards the restoration of natural landscapes.
- Supporting communities engaged in the natural conservation of landscapes.
- Educate staff about the need for restoration efforts.

Incentive-based Ecosystem Restoration

About SUSTERA

Sustera Foundation was established in 2017 with a vision premised on addressing the climate urgency in Inda. Sustera drives collective action through capacity-building training, campaigns, and policy dialogues to equip communities to adapt better to climate change and build resilience.

We collaborate with governments, civil society organizations, and the private sector to envision solutions for climate challenges that have the potential to be scaled up and replicated.

In the last five years, we have extensively worked towards handholding stakeholders in co-creating Climate Resilient & Climate Responsible Communities and scaling up climate solutions.

This is our first publication with the ambition of scaling future action research work.

Incentive-based Ecosystem Restoration

Related video content!

- 15 solutions for Climate Change in Kerala
- Ecological restoration through mangrove conservation and wetland reclamation.
- Eco-restoration for a Climate-Resilient Kerala
- Ecosystem Services- malayalam explanatory video
- The role of Bioremediation in the wake of Climate Change

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