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Payments for Ecosystem Services

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Payments for Ecosystem Services (PES)

A Position Paper

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Foreword

Climate change is upon us, it is no longer a distant threat but a clear and present danger. Stresses on humankind and the planet's ecosystem are multiplying: the gap between climate action and financial resources is, unfortunately, increasing. In this scenario, impact investment holds a beacon of hope since along with ensuring socio-ecological gains, it generates profit. It is not just about doing the right thing; it is about making smart investments that pay off socially, environmentally, and economically.

The Friedrich-Ebert-Stiftung (FES), India Office under its social-ecological transformative agenda collaborated with Second Nature Sustainable Solutions to develop knowledge and a coalition-of-the-willing to co-create systems change in impact investing. This coalition brings together enterprises working on-the-ground on integrated and economically sustainable projects for natural ecosystems and local community livelihoods, around 70 enterprises are on board: it aims to create a platform that links social enterprises and impact entrepreneurs with impact investors.

Over centuries, ecosystems have supported people. Today, environment indicators reveal that ecosystem services are at the tipping point – the point of no-recovery. In addition, climate events are increasing, their impacts are more devastating.

The answer may be found in nature-based solutions, at scale. Payments (profits) are guaranteed for environmentally sustainable practices – through cohesive community (social) action with decision-making (governance) embedded at all levels – that result in measured rehabilitation and preservation of ecosystems. The Payment for Ecosystem Services approach can play a catalytic role in attracting private sector capital at scale – a critical need today – for nature-based solutions since risk-return profiles are easily measurable and quite visible in this approach.

But, the efficiency and effectiveness of current expenditure for scalable nature-based solutions has often been questioned. Payment for Ecosystem Services tend to be rather complex since continual environmental service delivery is critical in protecting ecosystems against short-term climate events and change, preserving ecosystems over time, and safeguarding provisioning service delivery, in long-term climate change or ecosystem collapse. The FES India–Second Nature partnership validated models of four agencies working on the ground, across India, and then developed this position paper for Payment for Ecosystem Services delivery that includes disaster risk reduction essentials.

This position paper aims to provide knowledge andsupport to social enterprises that intend to become impact enterprises. It also intends to be a basis for access to private sector climate financing by conservation practitioners, since financial returns accrue to investors, to scale up socio-ecological impact across different ecosystems.

FES would like to thank the authors, Ashish Mehta and Sarbjit Singh Sahota, for their in-depth research, expertise, and value-based assessment of the sector that contributed to the development of this position paper. We hope the paper will advance uptake of Payment for Ecosystem Services as an approach for addressing social-ecological transformation through impact investment as part of climate financing.

Richard Kaniewski and Mandvi Kulshreshtha
Friedrich-Ebert-Stiftung, New Delhi
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Preface

There is a significant gap in connecting socio-ecological enterprises with impact investors and funders by language, by purpose, by objective, and by approach. Under its 'Climate Finance' programme, Friedrich Ebert Stiftung, engaged Second Nature Sustainable Solutions to develop an Impact Investment Primer (IIP) for change-makers who work on, or aspire to create, transformational impact but are not connected to the impact investment ecosystem. Since May 2020, almost 70 change-makers, representing the diversity of socio-ecological sectors ranging from Education and Human Rights to Ecological Services to Sustainable Housing and Architecture, and from Clean Energy to WASH (Water, Sanitation, and Hygiene) and Waste Management, have participated in the programme. Several enterprises also engaged in one-on-one impact advisory. The learnings and experiences of these social enterprises led to the development of the key elements of an Impact Investment Ecosystem (IIE) for Transformative System Change (https://india.fes.de/e/an-impact-investment-ecosystem-for-transformative-systems-change). One of the four pillars of the IIE is Impact for Ecosystem Restoration and Regeneration (https://india.fes.de/fileadmin/user_upload/IIE.pdf).

Four such enterprises, that are deemed to be at different stages of the investment lifecycle for impact enterprises (Sengupta, 2015), are working on integrated and economically sustainable programs for the restoration and regeneration of natural ecosystems, simultaneously with generating community livelihoods.

1. Sustainable livelihoods through conservation and restoration of degraded forest lands: Wayanad, Kerala (Preparation phase)

2. Circular economic model for climate resilience, biodiversity restoration and community livelihoods: forests of Uttarakhand (Validation phase)

3. Mangrove ecosystem restoration and sustainable livelihoods: coastal region of Sundarbans, West Bengal (Blueprint phase)

4. High density income generating plantations for marginal & small farmland owners: Baramati district of Maharashtra (Blueprint phase)

To bring predictability and scale to ecosystem restoration, new-age financial constructs, rooted in the Impact Investment paradigm are needed. Models such as Payments for Ecosystem Services (PES) create a vibrant socio-economic system that incentivises communities as ecosystem stewards. However, it is becoming apparent that financial constructs, rooted in the impact investment paradigm for natural resource management (NRM) and Nature-based Solutions (NbS) remain consigned to small pilots and conferences, while their immense potential remains untapped.

This position paper is the outcome of a conscious decision to both, learn from these four on-the-ground ecosystems-based initiatives, and to outline a multi-stakeholder approach to scale these (and similar) initiatives using PES and other market-based models. In the first part, it brings together the context and current knowledge in this domain. In the second part, it charts out the principles and methods for like-minded entities to collaborate and adopt for establishing a successful PES programme. Additionally, it explores the links between long-term sustainability of natural assets and the reduction in vulnerability of people to climate change and environmental stresses.

We'd like to thank FES-India for supporting this work, specifically Mandvi Kulshreshtha, Program Adviser, for facilitating the efforts and resources to evaluate these initiatives and establish the multi-stakeholder interactions that have led to this paper.

Ashish Mehta
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Acronyms and Abbreviations

DRR	Disaster Risk Reduction
e.g.	for example
Eco-DRR	Ecosystem-based Disaster Risk Reduction
ESG	Environment, Social, and Governance
EWS	Early Warning System
i.e.	that is
MBMA	Meghalaya Basin Management Agency
NbS	Nature-based Solutions
NCFF	Natural Capital Financing Facility
NGO	Non-governmental Organisation
NTFP	Non-timber Forest Produce
PES	Payments for Ecosystem Services
viz.	namely
vs.	versus

Background

In the hills of Meghalaya, climate change and land use conversions are resulting in a significant loss of forest cover. Similar stories are playing out in several forests and other natural ecosystems across the country, and beyond. Globally, populations living within and close to natural ecosystems are realising that nature-based systems no longer support their livelihoods and, as a result, their way of life.

But the story is different in the State of Meghalaya, India. By integrating some of its existing ecological assets such as sacred forests, and with the support of the World Bank, Meghalaya has developed a policy that incentivises communities to protect their own sacred groves or to develop new forests (MBDA, 2020). The Green Meghalaya (PES) scheme provides landowners with expertise and support to renew and regenerate their tracts of land and also payment for that service[1]. Essentially, landowners are paid for maintaining and improving the health of forests. And, the better they do (as measured and tracked by science-based techniques) the more they get paid. This two-pronged benefit is an illustration of PES in practice. As of now, the monitoring support and payments are coming from the Meghalaya Basin Management Agency (MBMA) who in turn are reimbursed by the World Bank. As per Government of Meghalaya policy for PES, communities are expected to maintain the forest for at least a period of 30 years.

And, if you travel to farms of north-eastern France, you will find that the global multinational giant Nestle (who took over the Vittel mineral spring water company in 1992) continues paying local farmers to reduce nitrate contamination of water sources instead of paying much more for the water treatment that ensures the necessary quality of spring water (Perrot-Maître, 2010). Again, this is measured by scientific techniques and Nestle continues to market its spring water based on its high purity and composition. This is facilitated by a locally-based intermediary institution, with payments made to farmers for implementing agreed upon sustainable land management and agricultural practices. Interestingly, the next generation of farmers is now renewing the contracts – and these too are being executed for a period of 30 years.

In one case, an Indian state government backed by the World Bank, and in another, a global multinational corporation, are both in their own way ensuring that natural ecosystems are not only restored but also regenerated. Additionally, by providing local owners/stewards of those ecosystems (fair[2]) compensation for this effort, they are ensuring that the ecosystems are truly sustainable and inter-generational. It is to be appreciated that the long-term health of the ecosystem ensures a critical societal objective of safety and security through Disaster Risk Reduction (DRR).

According to Paul Ferraro, a professor at Johns Hopkins University, whose research focuses on the design and evaluation of environmental programmes: "...compared to alternative voluntary approaches like certification, community forest management, alternative livelihoods, theoretically, it (PES) has a lot of desirable attributes: it's low complexity, easier to target, and you have this ability to tie investments more directly to outcomes" (Ferraro, 2001). It is this "low complexity" of the mechanism that has high appeal. Let's delve deeper to understand the context, background, state-of-the-art, and the future proposition of PES, within the framework of Nature-based Solutions (NbS).

[1] The GREEN Meghalaya (PES) scheme, administered by the MBMA, is meant to support villages, communities, clans or individuals that have a minimum of two hectares of natural forest and commit to conserve and protect these for a minimum period of 30 years.

[2] One of the challenges that PES initiatives face is that fair compensation is not provided. This is eminently solvable, and should be a critical ingredient and not an impediment to a PES initiative.

1.0 Introduction

The earth's natural ecosystems – be it forests, mountains, agricultural lands, grass lands, freshwater bodies, wetlands, and coastal stretches – provide services ranging from, but not limited to, clean air, fresh water, storm protection, irrigation, pollination, soil conservation, and carbon sequestration. Furthermore, these interconnected ecosystem services may be aligned to have unprecedented potential in DRR and resilience of livelihood systems. However, human activity is stressing these crucial planetary lifelines, and impairing biodiversity and land productivity at massive scales. As per the International Union for the Conservation of Nature (IUCN, 2020 A):

- Globally, about 20 per cent of the planet's vegetated surface shows decline in productivity with fertility losses due to erosion and soil depletion;

- Unsustainable food production and exploitation of resources has resulted in a loss of about 100 million hectares of forests since 2000, and also grassland and landscape desertification;

- Seventy per cent of wetlands have been lost over the last century; and

- At the current rate of mangrove destruction (1% every year), they will functionally disappear by 2100.

The cycle of ecosystem destruction is complex and much more severe than what meets the eye. Consider the fact that this human induced ecosystem destruction is co-located with changing climate, and rising frequency and severity of climate disasters, which in turn have more adverse impacts on the health of ecosystems. Underlying all forms of degradation is humanity's continually accelerating demand for more and more resources – primarily food, energy, commodities – and land. For example, in the case of forests – 80 per cent of tropical deforestation is due to agriculture. Forest-dependent communities also cut trees for their needs; in the long run that adversely impacts the communities themselves (Mongabay, 2012).

The United Nations has termed 2021-30 the *Decade on Restoration of Ecosystems*. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, human-induced terrestrial degradation is interfering with "the well-being of at least 3.2 billion people, pushing the planet towards a sixth mass extinction of species" that is costing "about 10 per cent of the annual global gross product in loss of biodiversity and ecosystem services" (IPBES, 2018). Within this period, the Bonn Challenge set out a goal to restore 350 million sq. km. (almost the size of India) of degraded terrestrial ecosystems by 2030 (Waltham and others, 2020).

The *Desertification and Land Degradation Atlas of India*, released in 2016, estimates that about 30 per cent (96.4 million ha.) of land in India is degraded (ISRO, 2016). According to some projections, as a result of climate change, India could potentially lose up to 1,730 billion US dollars by 2050; specifically, land degradation and poor crop productivity by itself is estimated to have reduced India's Gross Domestic Product by 2.5 per cent in 2014-15, or approximately 73 billion US dollars (India Together, 2021).

The crux of the issue is that the benefits of ecosystems are enjoyed by the entire planet, while the benefits of felling the forests, or depleting the watersheds, or mining the mountainsides, are accrued privately, by a few, leading to a vicious cycle of over exploitation and destruction. This is the age-old story of the fight of, and for the commons (Hardin 1968). Undoubtedly, governments and philanthropy work with local Non-governmental Organisations (NGOs) and good Samaritans on the ground – this is essential – but the state of ecosystems demonstrates that current approaches are unable to solve the problem at the scale of devastation that is upon the planet. According to the United Nations Office for Disaster Risk Reduction (UNDRR), the period from 2000 to 2019 saw approximately 2.97 trillion US dollars in direct economic losses due to climate-related events (UNDRR and CRED, 2020).

These losses of resilience and adaptability, inherent in natural systems, have increased the exposure of millions in urban and rural areas to extreme disasters. In 2019, India was ranked as the seventh most affected country due to climate change-led extreme weather events – both in terms of fatalities (2,267 people) as well as economic losses of over 66 million US dollars (Eckstein and others, 2021). Notably, districts particularly vulnerable to extreme hydro-met disasters – floods, droughts and cyclones – are home to over 80 per cent of India's population (Mohanty and others 2021).

Correspondingly, DRR as an outcome of NbS has lately been at the centre of the discussion on disaster risk financing between the G20 countries (G20, 2022). The core issue is that DRR financing remains an aspiration with limited attention and confidence. The problem of defining outcomes of DRR work is still marked by the complexities involved in measuring the effectiveness of such interventions. Uncertain baselines, contextual variations, interconnectedness of interventions make it challenging to attribute specific outcomes solely to DRR efforts. In regions where communities confront regular climate extremes like floods, droughts, cyclones & hurricanes, etc., the prospect of achieving sustainable development appears elusive without a dedicated investment in broad-based DRR strategies. Herein, leveraging NbS, supported by financial mechanisms such as PES, emerges as a pivotal, at-scale strategy for DRR.

To bring predictability and scale to the restoration of ecosystems, new-age financial constructs are needed.

Impact investment is one; it not only brings in capital, but also unleashes entrepreneurial energy to solve socio-ecological problems at scale (Rockefeller Philanthropy Advisors, 2012). This is required for meeting local and national priorities such as food and water security, as well as the commitments to tackle the socio-economic impact of climate change and climate extremes, biodiversity loss, land degradation, and ultimately, to achieve the 2030 Agenda for Sustainable Development.

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2.0 What are PES?

UNDP's Social and Environmental Standards Toolkit groups ecosystem services into four main categories (UNDP, 2023):

(i) Provisioning services: Goods people receive from ecosystems, such as food, water, timber, medicinal plants, etc.;

(ii) Regulating services: Benefits people derive from the regulation of ecosystem processes such as surface water purification, carbon capture and storage, climate moderation, and protection from natural hazards, etc.;

(iii) Cultural services: Non-material benefits for people such as aesthetic stimulus, recreation, cultural belonging and spiritual experience, including sacred sites; and

(iv) Supporting services: Natural processes necessary for other services such as soil formation, nutrient cycling and primary production.

Communities that are strongly dependent on natural ecosystems, be it in a rural or an urban setting, can benefit from financial incentives for their stewardship to protect ecological assets, so that they continue to provide a set of life sustaining and protective services. PES is a step in the direction for creating a socio-economic system that recognises communities as ecosystem managers. Global economic models currently are discussing the value of ecosystem services, but the relevant stakeholders have been unable to come together in their own best interests, yet: to jointly contribute to the achievement of an agenda of commons. PES initiatives mobilise these stakeholders[3] to create a productive system that predictably delivers value for all stakeholders.

The idea behind PES is to pay communities to protect their land and other ecological assets (also considered 'resilience infrastructure') in the interest of ensuring the provision of certain specific 'services' (values) rendered by nature, such as clean water, habitats for wildlife, carbon storage, and protection from disasters. This involves a series of periodic payments (incentives) to landowners (or stewards or managers) of the natural resources in return for a guaranteed flow of ecosystem services and measurable conservation benefits such as carbon sequestration, reforestation, mangrove and wetland conservation, watershed protection, etc. Set up as a voluntary transaction between two parties, the payments may be made privately or indirectly with government participation, as the two actions illustrated in the background to this paper. By incentivising sustainable management of ecosystems, PES also reduces the vulnerability of communities and the exposure of landscapes to hazards such as floods, droughts, heat waves, cyclones, etc.; the critical goals of Eco-DRR.

PES, a relatively new conservation strategy, is an upgraded version of Integrated Conservation and Development Programmes, or eco-development /grassroots conservation, because of its focus on the needs of local people and communities as much as on environmental conservation. The communities that inhabit these ecosystems are generally the poor and vulnerable, and those that most acutely suffer from climate change and *development-by-extractive* methods. This focus on socio-economic outcomes and poverty reduction, also helps PES programmes reduce inherent conflicts that arise between conservation experts and local communities.

At the same time, PES ties funds to activities that benefit the planet. These payments are made by the entities that benefit from the ecosystem services; this could be individuals, businesses, or governments representing communities and societies (Fripp, 2014). Therefore, In contrast to the *'polluter pays principle,'* PES follows a *'beneficiary pays principle'* and is considered a more amenable approach. By providing a periodic and assured flow of payment (income), PES can achieve multiple

[3]Key stakeholders in PES may include landowners/resource managers, government agencies, buyers/civil society, local communities, scientific and technical experts, financial institutions and investors, regulatory and enforcement agencies, etc.

development outcomes – poverty reduction through improved resilience of communities and increased land productivity simultaneously with environmental conservation. In this way, PES can align local-to-global economic incentives with environmental and DRR objectives, fostering a more sustainable and resilient future for both ecosystems and communities.

The critical success factor in PES is a values-and-principles based approach that keeps the people and the ecosystem services in the centre, and the financial benefits in an outer circle. And, to keep it simple and productive. Value-additions, such as forest produce created in the PES process, eventually feed into the local socio-economic system which will have a multiplier effect if market linkages are thought through while developing different components of a programme.

Over a period of time, the socio-economic capital will continue to benefit from the risk-resilience and other ecosystem services that are enabled by PES. It takes time for a virtuous cycle to kick-in.

The practice of PES to achieve inspired outcomes is within the reach of all levels of governance. The current market is dominated by public subsidy programmes that account for most of the funding. Among private sector buyers, the highest amount was recovered from water utilities and food and beverage companies, mostly collected in Europe, South Africa and the United States of America. While a number of PES projects have begun in Africa and Latin America, China and Vietnam generated most of the flows in the Asia Pacific region (IPBES, 2019).

Examples of PES from around the world:

- The City of New York uses PES to protect watersheds in the Catskill mountains (SER, 2012).
- One of the first PES programmes is Costa Rica's environmental services payment programme, financed via gasoline taxes and disbursed by public authorities (GGGI, 2016).
- In India, the Palampur Municipal Council has a 20-year agreement to make annual payments[4] to the Village Forest Development Society for the protection and management of Bheerni Forest (Dash, 2019). In return, the Village Forest Development Society has agreed to protect and conserve the catchment area of the Bohal Spring to ensure sustainable supply of water to the city.
- Syngenta's Operation Pollinator, a collaboration between academia, NGOs and the government assists farmers to enhance biodiversity (FAO, 2013).
- Hyper-local eco-sensitive policies and PES practices formulated by the Ransih Kalan village panchayat in Punjab to pay for environment friendly actions by farmers and citizens are proving to be effective (Kamal, 2021).

[4]Payment at 10,000 Indian rupees annually, is admittedly low, which emphasises the point of designing programmes with fair compensation as a principle.

2.1 Types of PES

The twin objectives of PES can be enumerated as:

1. Protecting and preserving natural ecosystems; and

2. Providing livelihood opportunities for local communities.

The process of structuring, recognition and nature of incentives are some of the key elements of PES. Typically, they are structured as either:

1. Output-based: Payments are computed by measuring actual ecosystem services provided, for example, tonnes of carbon sequestered or an increase in the agreed upon measure for biodiversity; or

2. Input-based: Payments are linked to implementation of agreed upon practices for land, or/and resource management, for example, farmers reducing the amount of chemical pesticides used per hectare.

Additional attributes to qualify a PES are: type of ecosystem (forests, wetlands, mangroves, etc.); geographical scale (local, regional or global); mode of compensation (direct or indirect); and the fund provider (public or private).

Water related services (pollution control, watershed protection and development, etc.) form a large proportion of active PES schemes via both private and public funding. Carbon sequestration and storage, in the form of emission reduction targets, is another prevalent scheme for payments. In fact, due to the implosion of companies signing on to net-zero pledges, the voluntary carbon credit market has, till recently, been growing at a record pace. By 2030, the market is expected to reach between 10 billion US dollars and 40 billion US dollars from a base of 500 million US dollars in 2020 (BCG, 2023). Additionally, PES exists for non-domestic biodiversity protection and forest protection.

2.2 What is Eco-DRR? How does it fit in with PES?

Once the balance between human activity and nature is disrupted, disasters result. According to UNEP, "The degradation of ecosystems – such as forests, wetlands, drylands, and coastal and marine systems – is a major driver of disaster risk and a key component of communities' vulnerability to disasters" (UNEP 2023). The United Nations Office for Disaster Risk Reduction published a comprehensive report on the practices within NbS that deliver DRR and climate change adaptation outcomes (UNDRR, 2020). Eco-DRR, in its essence, should leverage ecosystem services to enhance safety (reduce impact of flood, cyclone, landslides, etc.) and security[5] by preventing and reducing the impact of disasters, at both local and habitat scale. The Partnership for Environment and Disaster Risk Reduction, a clearinghouse for knowledge, training, advocacy and practice on Eco-DRR, defines it as, "the sustainable management, conservation and restoration of ecosystems to reduce disaster risk, with the aim to achieve sustainable and resilient development" (PEDRR 2020).

2.2.1 Reducing Disaster Risk with PES

If applied strategically, NbS can help address all aspects of disaster risk, such as vulnerability, exposure to hazards, while also improving people's lives and preserving ecosystems, the common goal of PES. Moreover, these approaches can help countries meet their global and national commitments towards combating climate change and sustainable development, which are lagging due to the Covid-19 pandemic.

Many studies have found that NbS offer a high return on investment, with a range of benefits for communities, households, and individuals to achieve targets related to safety, security and well-being. These have earned NbS the label of 'no-regret' or 'win-win' solutions. Developing such solutions will require local generative-dialogues between 'four types'[6] of partners.

[5]E.g. Continuum of water, food, nutrition, and livelihood security bringing climate change adaptation benefits.

[6]Grid-group cultural theory, devised by anthropologist Mary Douglas.

For example, whether disaster damages can be reduced and vulnerable communities kept safe, by deploying NbS that respect river dynamics and ecosystem functions. For best results, such a dialogue must remain a continuously evolving process of engagement leading to development of a community of practice. The foundational challenge is that Eco-DRR is not a definitive and an individual strategy, it always responds to local needs, vulnerabilities and aspirations and policies. Many communities of practice have emerged around Eco-DRR and some of them have rightly framed principles to guide the practice of DRR using ecosystem services (CBD, 2018). In essence, Eco-DRR involves assessing ecosystem services, engaging with communities to develop an orientation towards outcomes, and restoring ecosystems like wetlands or forests to reduce disaster risks and benefit from results which include water/food/nutrition/ livelihood security. In due course, stakeholders in Eco-DRR, including communities, learn to integrate monitoring actions, capacity building, and policy advocacy into NbS, thus enhancing resilience with safeguards against climate-related hazards and fostering sustainability in DRR.

2.2.2 Applying PES to DRR

PES schemes such as Reducing Emissions from Deforestation and Forest Degradation (REDD+)[7] have been heralded as a potential avenue for financing conservation. However, PES schemes for mangrove based ecosystems continue to be at a nascent level of implementation (Friess, and Thompson 2016). There is one case study from Vietnam where the United States Agency for International Development funded payouts for mangrove based environmental services. Two conclusions may be seen below (Sommerville, 2016).

- Mangrove based payments compete with aquaculture conversion and clam farming. In spite of mangroves providing ecosystem services such as carbon sequestration, Non-timber Forest Produce (NTFP) collection, and coastal protection, the (output-based) PES are insufficient to offset the productivity losses to local farmers.
- Consequently, the PES scheme has to shift to incentivise behaviours (i.e. input-based) that result in planting, restoring, regenerating and managing mangrove plantations.

Though these are early days in the use of PES to drive DRR outcomes, substantial public finance support for PES is emerging. The Government of Vietnam began implementing a PES policy in 2010 (To and Dressler 2019). Similarly, the State of Meghalaya in India has been implementing a state-wide PES scheme since June 2022 (MBMA, 2022).

Now is an opportune moment to cultivate an outcome-oriented approach among vulnerable communities, frontline workers, and decision-makers to foster mutual support between PES and DRR practices. Disaster risk-resilience is invariably a local issue, hence at-risk communities and various stakeholders can develop unique, locally relevant DRR metrics of success, for example, year on year, a majority of farmers choose to plant drought or flood resilient crops based on short-term and medium-term climate forecasts.

2.2.3 Integration with the Global Agenda

PES enabled Eco-DRR, and its forward integration within the environment, social, and governance agenda, demands new types of cooperation. With large-scale global financial commitment to climate change mitigation and adaptation, there is a need for improved understanding of the operational context and possible collaborations. One way to consider this is that Eco-DRR is not a substitute, rather it needs to be integrated with other solutions. Hence, we are seeing the possibility of blended finance[8] and efforts to create impactful DRR solutions using stakeholders' capabilities. Another way to understand it is that Eco-DRR offers a 'financial economy' as well as a 'physical economy' composed of a range of NbS and benefits that eventually roll up to climate change adaptation and mitigation targets.

[7]REDD+ is a climate change mitigation solution developed by the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).

[8]Blended finance uses catalytic capital from philanthropic partners and risk-capital from impact investors.

Financial economy: Public, as well as private investments, in NbS are growing rapidly, though many efforts are oriented towards making a global market of NbS. To give it a push, the IUCN, in 2020, adopted a Global Standard for Nature-based Solutions (IUCN, 2020 B). In the global financial market construct, local populations (very small numbers) remain at the tail end of the spectrum and at best as beneficiaries. Aligning Eco-DRR with PES and ensuring active local participation has a huge potential for delivering tangible benefits and change at scale.

Physical economy: Eco-DRR incorporates ecological principles into strategies for reducing disaster risks to assets and services of a productive, social sector. Hence, the (physical) practice of conserving and restoring ecosystems, preserving biodiversity, and promoting sustainable land use and water management, can bring about multiple economic benefits which can be further intensified through participatory planning. Participatory Eco-DRR planning, and actions aligned to climate change adaptation and mitigation, in turn, enriched by knowledge building and local policy formulation, can bring long-lasting benefits in safety[9] and security[10] to at-risk communities. In this manner, Eco-DRR manifests a sustainable and holistic approach to DRR that recognises the importance of healthy ecosystems in building climate resilience.

2.3 State-of-the-Art in PES

PES has been around for over a quarter of a century. Along with our appreciation and admiration for natural systems, "the weird thing is that people do value nature, but it hasn't got the political elevation to affect decision-making in a way that would reflect the values that people have for nature," says Sarah Bekessy of Bush Heritage Australia (Oakes, 2021). The best-case scenario of the relationship with natural systems is when the natural ecosystem is treated with respect and not merely as a new 'financial instrument'[11]. This requires a shift, in people's mindsets; mindsets which then are aligned with ecological needs and not with merely economic needs – to establish a more holistic, rather than a transaction-based relationship with the planet. Reflecting on this shift, the Intergovernmental Platform on Biodiversity and Ecosystem Services agreed to use the term 'Mother Earth', alongside the language of ecosystem services in their conceptual framework (IPBES n.d.).

Here's a sampling of some of the best-in-class case studies and content in the public domain:

- *Payments for Ecosystem Services: A Best Practice Guide* is a seminal report by the United Kingdom's Department of Environment, Food, and Rural Affairs that provides a step-by-step outline of creating and implementing a PES scheme, complete with 27 case studies from around the world (Smith, and others, 2013).

- Investing in Nature: Financing Conservation and Nature-Based Solutions is a report by the European Investment Bank's Natural Capital Financing Facility (NCFF) that operates as a PES 'bank'. It outlines different financing models and ecosystem services within Europe that can deploy capital via the NCFF and presents examples of successful PES interventions and PES-like schemes (EIB, n.d.).

- *Prosperous Forests* is a 2019 research report commissioned by the Food and Land Use Coalition that depicts innovative forest business models, and that by using the term "regenerative" emphasises the need for natural systems to renew or regenerate – in essence move beyond traditional sustainability-based approaches (FOLU, 2019).

- *New Nature Economy:* Asia's Next Wave is a 2021 report by the World Economic Forum and Temasek that posits that 2021-2030 will be the Asian decade for a nature-positive economy. According to the analysis, natural climate solutions could create an opportunity worth 23 billion US dollars by 2030 in Asia Pacific – three-quarters of this opportunity will be concentrated in South and Southeast Asia's biodiverse tropical forests, peatlands, and grasslands (Ecosperity, 2021).

[9]Safety of housing, livelihood assets etc.

[10]Water-food-nutrition-livelihood security.

[11]The PES scheme of Meghalaya outlined earlier, strikes a balance by paying communities for preserving their sacred forests (a matter of faith) and associated socio-cultural values. Exploring and invoking socio-cultural values presents groundbreaking opportunities to add value beyond economic benefits.

- WRI's *The Business of Planting Trees report* presents several business-oriented models curated from around the world for tree plantations that leverage the impact and PES financing models for their long term sustainability (WRI, 2018).

- *PES for agriculture in the Himalayas* reveals that agriculture with an ecological footprint using PES serves two purposes in the Indian Himalayan region. It brings down poverty and makes agriculture climate-resistant. This article calls out to the poorer Indian states and their citizens to rightfully claim PES from the rest of the country (Dash, 2019).

- *UN Decade on Ecosystem Restoration 2021-30 – What Chance for Success in Restoring Coastal Ecosystems* is a 2020 article in Frontiers of Marine Science on 'blue' ecosystems that explicitly calls out for new financing approaches, including PES-based, that are essential for any chance of success (Waltham, and others, 2020).

- A 2016 report on PES based scheme for mangrove protection in the crucial Mekong Delta ecosystem highlights the inter-play between PES and DRR. PES payments for mangrove protection also have the potential to aid DRR, a significant win-win in the climate change regime and in a crucial regional ecosystem (Friess and Thompson, 2016).

- As part of their Conservation Effectiveness Series in 2017, Mongabay, conducted one of the most comprehensive reviews of the results of PES. An analysis of 38 PES schemes that have been implemented globally demonstrated that while PES schemes have done reasonably well on ecological and environmental outcomes – there is limited change in socio-economic outcomes, primarily due to poor systems for payments and lower pay-outs to the local communities (Gaworecki, 2017).

- The Meloy Fund for Sustainable Community Fisheries, deploys blended finance for development and adoption of sustainable fisheries in Indonesia and the Philippines (Yow, Veronica, 2022).

- *IPBES' Global Assessment Report on Biodiversity and Ecosystem Services* includes an overview of PES in different world regions and ecosystems with a helpful table on the underlying governance structure and stakeholders involved for each of the PES programmes. This document also provides an indication of impact effectiveness, including for critical socio-ecological markers such as equity and biodiversity (IPBES, 2019).

2.4 PES pay-out models

The most common PES-based schemes cover the following:

1. Water: Watershed protection, water rights, water quality/pollution.

2. Land: Vegetation and ecologically sensitive land use/management.

3. Floods: Protection and risk reduction.

4. Carbon sequestration and offsets: Reducing Emissions from Deforestation and Forest Degradation (REDD) and REDD+ schemes are a part of this.

5. Organic farming: Reduction in the use of chemicals, such as nitrates.

6. Sustainable harvesting: From both land and water bodies.

7. Eco-tourism: Aesthetics, recreation.

8. Biodiversity: Habitats for wildlife, biodiversity offsetting.

9. NTFP: Nuts, oils, etc. from standing forests.

When considering a PES scheme for any of the services outlined above, the opportunity to experiment, and the need to provide usable information about successes and failures, has to be established amongst the stakeholders. Johns Hopkins' Paul Ferraro says, "My prescription is, every time there's a new PES programme, or a scaling up of an existing programme, it should be done in a way that allows us to draw conclusions about the overall impact or some element of it, like targeting versus not targeting; more frequent payments versus less frequent; longer contract, shorter; tying the payments to actions

versus tying it to environmental outcomes. These are questions that have been in the literature since the 90s, since I started working on this, and they don't have good answers. We're not going to be able to make these programs effective if we don't have answers to what mechanisms and moderators are important in making PES impactful for both the environment and people. Every time we start a new PES programme that's not implemented with some experimental variation, it's an opportunity lost" (Ferraro, 2017).

2.5 Funding Cycle for a PES

Nature-based business models can generate a diverse set of revenue streams, across timescales. For example, Forest Land Restoration can be a combination of grant/Corporate Social Responsibility (CSR) funding for PES in the initial 1-3 years, move on to NTFP revenues, and as the trees mature over 7-10 years, take advantage of the carbon credit markets to realise healthy double-bottom line impact returns.

This provides built-in risk diversification and an opportunity for short-term and long-term investments into natural climate solutions. Unfortunately, insurance, trading, and traditional finance houses are not yet active in this space. The onus, therefore, falls on philanthropical and development finance (WEF, 2015) participating with ecopreneurs (Hanes, 2020) and local/state government agencies (Caggiano and Male, 2017).

The way to think about structuring this would be akin to setting up runners of a team in a relay race, wherein the different types of financial stakeholders take up key implementation roles at different stages of a PES initiative (like laps run by different members of a relay race team). Each stage (lap) maps a different phase of socio-ecological-economic evolution in the programme and with a corresponding funding partner. This is illustrated in the PES programme proposed for the Sundarbans region of India (Figure 1).

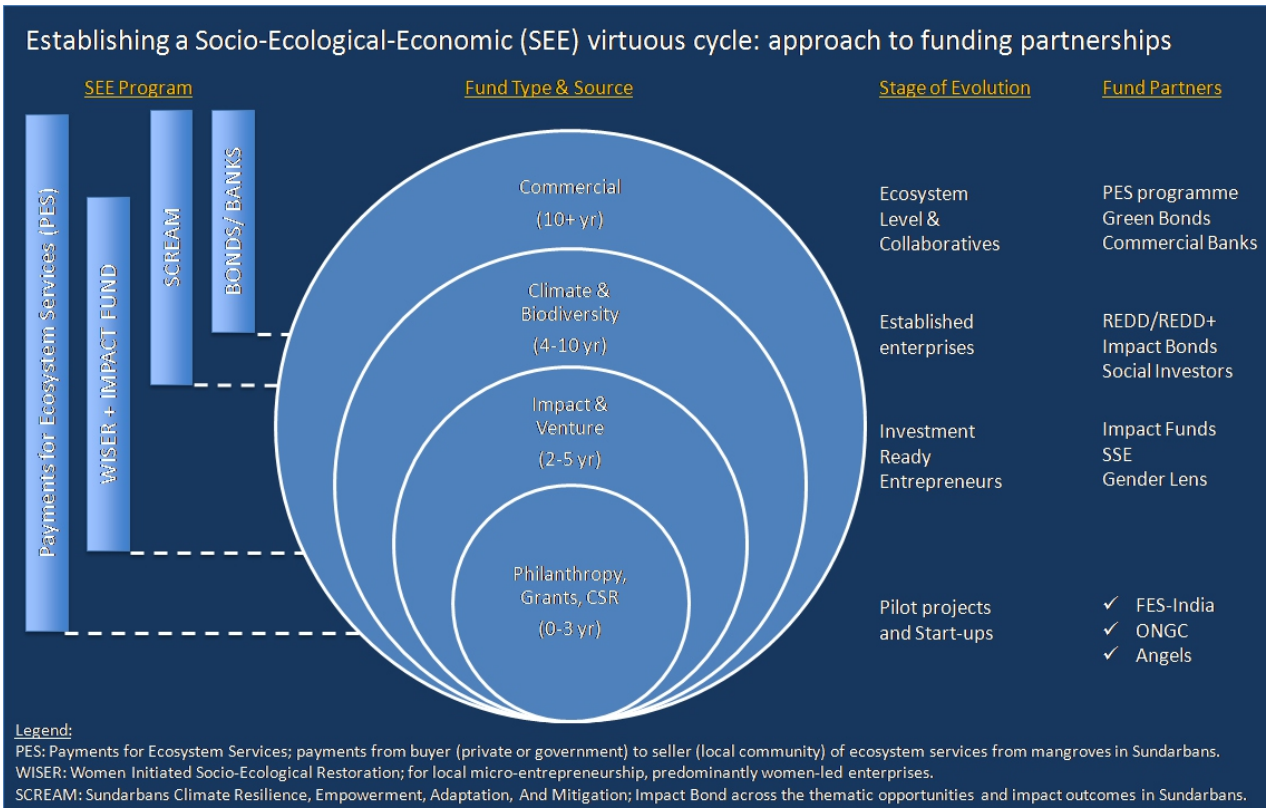

Figure 1: Establishing a socio-ecological-economic virtuous cycle: An approach to funding partnerships

2.6 PES to Achieve Eco-DRR results

As discussed, in addition to a range of socio-ecological outcomes, implementing PES interventions offers significant potential for DRR. By incentivising conservation, regeneration, and sustainable management of ecosystems, PES can contribute to reducing the vulnerability of communities and the exposure of landscapes to various hazards such as floods, droughts, heat waves, cyclones, etc. In order to achieve this, the first step is to conduct locally-led disaster risk analysis and mapping of ecological assets. The next step is to establish a PES framework for action that targets outcomes tied to key disaster risks identified in step one.

According to the Open Government Partnership's Practice Group on Dialogue and Deliberation, "Individual behavioural intentions and commitment to engage in DRR have to be supported by various locally defined policies. The fuel for such local policies is a set of right narratives. A shared narrative is, created together, from the bottom up, through a deliberative process" (OGP, 2023). The Eco-DRR programming process has to create spaces/platforms for stakeholders to make a deliberate effort to stand back and see the bigger picture. Some of the pertinent themes to develop local narratives in line with global narratives[12] may be seen below.

1. System literacy and stewardship: Farmers and other trade groups develop deep insights about biodiversity and its value to eventually emerge as ecosystem managers. In due course, communities adopt certain principled behaviours that heighten Eco-DRR yields. Socialising these pro-planet behaviours develops into default behaviours (culture) that help at-risk communities effortlessly use NbS to solve wide ranging problems of safety (disaster/climate-extremes) and security (food/water/nutrition/livelihoods).

2. Flood/drought regulation and erosion control: At a fundamental level, floods or droughts are essentially a water management issue. Healthy ecosystems, such as wetlands, forests, and natural barriers, play a crucial role in regulating water flow and preventing erosion. A PES programme can be used to encourage landowners and communities to preserve these ecosystems, which, in turn, helps reduce the frequency and impact of floods/droughts and landslides.

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3. Climate regulation and mitigation: Ecosystems like forests act as carbon sinks, helping to mitigate climate change by absorbing greenhouse gases. A PES initiative can be set up to specifically encourage forest conservation, afforestation, and reforestation efforts. This would contribute to building climate resilience and reducing the risk of climate-induced disasters. Over time, the forest would produce NTFP such as medicinal herbs, nuts, and oils.

4. Water resource management: Sustainable management of watersheds and aquifers is essential for ensuring stable and reliable water security. A PES programme can be designed to incentivise farmers and landowners to adopt practices that enhance water quality and quantity, thus reducing the risk of water scarcity and associated conflicts.

5. Biodiversity conservation: Preserving biodiversity-rich ecosystems is vital for maintaining ecosystem resilience. PES programmes can motivate conservation efforts, protect vulnerable species and maintain ecosystem services that are critical for DRR.

[12]Linking local and global narratives helps leverage a range of resources including funds.

6. Community resilience: PES initiatives often involve the active participation of local communities. Communities have a keen interest in advancing climate and disaster resilience in the context of local livelihoods and other elements in human settlements. By engaging communities in conservation efforts and sustainable practices, PES initiatives can enhance community resilience to disasters with anticipatory actions that foster knowledge sharing, social cohesion, and preparedness.

7. Early Warning Systems (EWS): One approach to PES is to allocate funds for the development and maintenance of local, integrated early warning systems that can be integrated with wider EWS systems provided by government agencies to improve disaster preparedness and responsiveness of the community and trade-groups. This could include setting up weather monitoring stations, alert systems, and communication networks. Some of the features of the EWS of 'Save The Hills,[13] a community-based operation established to provide timely and accurate information on impending landslides to vulnerable communities in the Kalimpong district in West Bengal, India may be seen below.

a. The system includes a number of automated weather stations supported by a network of trained volunteers who monitor local conditions for signs of landslides, such as changes in rainfall patterns, ground movement, and cracks in buildings.

b. The EWS is complemented by a system of community-based mitigation measures, such as the construction of drainage channels and retaining walls. These measures are designed to reduce the risk of landslides and to help communities cope with the impacts of landslides that do occur.

c. The EWS has been successful in reducing the number of deaths and injuries from landslides in Kalimpong and surrounding areas.

d. Arguably, the system helped the population living on the banks of River Teesta in North Bengal, India, during the recent (October 2023) Sikkim glacial lake outburst flood event.

[13]Save The Hills is a group of concerned citizens who are raising awareness about landslides in Darjeeling-Sikkim Himalayas in India.

8. Green infrastructure and NbS: PES funds allocated to NbS, such as green infrastructure and ecosystem restoration, can be cost-effective and sustainable approaches to DRR.

9. Stakeholder collaboration and risk governance: PES interventions requires collaboration between various stakeholders, including government agencies, NGOs, communities, and private sector actors. This collaborative network can also establish a disaster risk governance mechanism that promotes coordination and drives efficient use of resources to reduce risk.

10. Livelihood diversification: Since PES creates economic opportunities through eco-friendly livelihood options like ecotourism or sustainable agriculture, it is a viable mechanism to diversify livelihoods. By reducing dependence of vulnerable sectors in the local economy, the community's vulnerability to disasters is also reduced.

11. Insurance and risk financing: PES schemes can be linked to insurance and risk financing mechanisms to bring a range of values to at-risk communities. For instance, payments may be contingent on maintaining specific risk reduction measures, providing an added layer of financial protection against disasters.

By embracing Eco-DRR, stakeholders foster a holistic and sustainable approach that enhances the intrinsic value of ecosystems and their critical role in building resilience to natural hazards while offering multiple pathways to economic benefits.

2.7 Data readiness for PES plus Eco-DRR

One of the significant challenges that often deters administrators to venture into PES is to do with data readiness and implementing the process of tracking results. In fact, in a recent article by the CFA Institute, the author calls out the lack of investor-ready data as the key missing ingredient for institutional finance to vest into NbS (CFA Institute 2022). In many ways, 'data readiness' is a misnomer, the work done by MBMA and the World Bank on PES clearly highlights that information and information management systems must be built ground-up. Data readiness to support a functional and vibrant NbS market to advance the common good usually includes two fundamental enablers.

1. Assimilation of data, evidence and local wisdom to develop deep insights in partnership with people of concern (at-risk communities and others). This will help develop system literacy and a system for validation of results.

a. **System Literacy:** Men, women, and children from the community; frontline workers; and urban local bodies will be able to make the right assumptions in the context of climate change and ever escalating disaster risks to undertake climate change adaptation, and DRR actions.

b. **System for validation of results:** Sustainability of ecosystem services and related value-chains (outcomes) are expressed in terms of key numbers (outputs) that lead to the flow of the PES to the participating community. In the long run, this strengthens the right beliefs within communities, leading to creation of various social norms that support Eco-DRR and other goals.

2. At-scale mobilisation and organisation of vulnerable population groups to develop system literacy and make local sense.

a. **System literacy:** As stated above, various positive outcomes help the majority in the community to make sense of ecosystems and their role in advancing safety, security, and prosperity of their habitation.

b. **Make sense for people locally:** All community engagement and social behaviour change processes in due course should transition from 'theory' to 'practice' to 'culture' by building local leadership for transformative, nature positive change.

3.0 Challenges, Risks and Critiques of PES

As mentioned earlier, despite the promise and potential of PES, and the availability of successful implementations across multiple ecosystems, its adoption has been slow and insubstantial. With regard to the operational risks and project uncertainties – these are well understood across domains and there is significant expertise to solve them effectively – those cannot be the reasons to not adopt a PES-based programme. This chapter outlines the key challenges, risks, and critiques that prevent mainstreaming and a more widespread uptake of PES.

3.1 Challenges

Three broad challenges exist, the first being capital. Not only is there insufficient access to upfront and working capital, but long-time horizons are also not conducive to capital markets' flow.

When it comes to stakeholders, governments and philanthropy continue to play the major role and there is limited involvement of impact investors – this leads to less innovation on-the-ground.

Finally, for any financial scheme, returns are key. When it comes to PES, the risk-return profiles are not well understood by the investment community, at the same time, measurement practices and approaches are non-standard and often rudimentary.

3.2 Risks

For PES to succeed, the enforcement of property rights and the risk of changes in land management rules and regulations have a significant impact on ecosystem service delivery and design of the PES intervention. Secondly, leakages can occur when the provision of ecosystem services in one location increases pressure for conversion in another, even if it is inappropriate for the PES intervention. For example, there is already a worrying trend towards monoculture plantations during afforestation/reforestation, since this is known to adversely impact biodiversity and the long-term sustainability of the forest.

Finally, like any scheme, the risks of corruption and abuse are ever present- especially when it comes to the benefits reaching the impoverished and vulnerable.The World Wildlife Fund, along with partners, has set up the Targeting Natural Resource Corruption consortium that outlines corruption risks and anti-corruption responses in sustainable livelihood interventions, including mapping out a PES results chain (known as Miradi Share) to integrate anti-corruption responses in a PES chain (Whitt, 2022). Transparent monitoring and measurement of impact helps ensure that there isn't 'impact-washing' with PES implementation.

Biophysical risks are typically viewed as an intrinsic component of any PES programme. However, it's important to recognise that, in specific cases, natural disasters, pests, and diseases can disrupt landowners' capacity to deliver ecosystem services, potentially resulting in service interruptions and payment disputes.

The adversities, depending on the specific design and context of a PES programme will always remain, and yet, they can often be mitigated through careful programme design and sustained stakeholder engagement.

3.3 Critiques

The main critique is philosophical: is it appropriate to value natural systems, and if we do, can we ascribe a real monetary value to them. Sir John Lawton says it effectively: "Arguing that the natural world is priceless is deeply mistaken. Recognising the economic value of the natural world for society provides a framework for the voluntary, public and private sectors to work together" (Lawton, and others, 2010). The cultural and ethical concerns surrounding the commercialisation of nature and the monetisation of ecosystem services still divert the necessary focus needed to drive momentum in PES implementation.

The other critique is behavioural: the unintended effects on human behaviour, such as the use of PES for ecosystems that the owner was anyway planning to protect and preserve; or leakage, wherein one area is preserved at the expense of another.

The critique of the design and complexity of PES interventions and the potential for wasted financial resources is also common. Admittedly, setting up PES programmes are not trivial, and by their very nature, they may not be replicable due to the imperative to incorporate local context. There are also not enough studies that show the rigour needed for research, such as the use of randomised control trials to compare and contrast PES vs. non-PES interventions (Gaworecki, 2017)

While valid, we do not feel these criticisms detract from the benefit of PES-based systems. PES, by design, is inherently fair; and the payments can be and should be made such that they are appropriate for the work required. Bringing in impact and blended finance will, in fact, mitigate some of the underlying issues, as the frameworks, methods, and measurement metrics become established. The long-term impact of ascribing a tangible value to our ecosystems; creating regenerative ecosystems that are in harmony with the humans who inhabit them; and an approach with stakeholder collaboration that is preceded by a fundamental realignment of mindsets and narratives, has the potential to realise benefits that are multi-fold and intergenerational.

One of the oft quoted objections to the Eco-DRR practice is that such a practice cannot provide complete protection from disasters and the projected ecosystem takes too long to mature and provide predictable services. Eco-DRR is not a standalone or individual strategy and should be combined with other solutions for DRR, including hybrid green-grey-blue solutions, early warning systems, and other measures for prevention and emergency preparedness. Eco-DRR as a practice requires, daily, weekly, monthly, and annual routines of engagement to derive the requisite and long-lasting results, which are invariably cost effective and nature positive.

4.0 Principles for Natural-ecosystem Restoration and Sustainable Regeneration

A considered review of risks and challenges in literature is illuminating; they are manifest in short-term behaviour, distrust, subterfuge, and abuse of the system. A values-based approach, with upfront alignment amongst the stakeholders – and a viable horizon that allows success to occur – comes across as simple yet powerful mitigation. This, then, is about establishing intent and building trust amongst PES intervention actors. An evaluation of the Vittel PES scheme in France concluded that "trust building through the creation of an intermediary institution that was locally based and led by a champion sympathetic to the farmers' cause" was the fundamental condition of its success (Perrot-Maître 2001).

4.1 Values-based principles

Different PES actors should adhere to principles that form the guiding framework for PES intervention amongst partners and collaborators. These principles should be the basis for the intervention which are then built upon, prior to delineating the activities of that specific intervention. This will, more often than not, meet and even surpass objectives of PES and Eco-DRR outlined earlier.

1. The ecosystem subsumes the financial economics of the system and not vice-versa. Monetary valuation of natural ecosystems should not be the starting point of a PES project, instead a 'Responsible Capitalism' approach is to be adopted (FIRST Responsible Capitalism, 2023).

2. The stakeholders – local communities, domain experts, investors and funders, government and civic authorities, and social enterprises – should collectively develop a set of goals and vision for the outcomes of the PES project, with a fundamental realignment of mindsets and narratives.

3. The grassroots community will be central to, and an equal participant in the intervention.

4. DRR as an outcome is incorporated at the design stage and followed through by an empowering process of community engagement for social behaviour change.

5. Collaboration with both 'Community' and 'Communities of Practice' is essential to jointly address obstacles to normative and social transformations. This concerted effort is key to instilling predictability in PES practice and should be an integral part of the investment strategy. Raising awareness about a wide-ranging array of benefits beyond just PES can significantly contribute to social buy-in.

6. Technical expertise does not take over. Local knowledge and learned wisdom should not be ignored.

7. Skilling, knowledge transfer, and systems management are to be conducted via an equal, non-hierarchical, two-way interaction between local communities and domain experts.

8. Copy/paste approaches should not be adopted; local context needs to be incorporated in scheme design.

9. The learnings and methods are to be placed in an open-source domain.

10. PES actors should not wait for government and policy interventions or support, but maintaining full compliance with the laws of the land is essential. The government and its agencies will remain informed of the programme on an ongoing basis, and the on-the-ground PES team, will continually encourage government agencies to participate, both financially and non-financially, with an aim to leverage policies.

11. Measurement, Verification, Reporting, and Improvement – M/V/R/I – of impact metrics: effective and reliable measurement of service provisioning should be adopted with continual and periodic assessment, reporting, and improvement.

5.0 Methods to Transition an Ecosystem Project into a PES Programme

Setting up a PES programme isn't trivial since it has multiple dimensions, actors, and stakeholders. Following detailed Interactions with the enterprises whose ecosystem case studies are described in the appendix, and based on the Principles outlined in the previous Chapter, this paper proposes the following set of methods to successfully convert a natural ecosystem project into a PES. These are not in any chronological order; they set out the various aspects that a programme designer needs to embed in the PES to deliver long-term sustainability for the natural ecosystem as well as the local community inhabiting it.

1. Grant-based capital

Funding from multiple sources for PES pilots over the initial (1-3) years will enable the following actions to be completed.

a. It will enable work on the ground across multiple socio-ecological streams; mobilise and build community participation; and develop a pool of stakeholders.

b. It will help build frameworks, partnerships, and share learnings that will lead to replication and scale.

c. It will obviate the need to start with a financial investor-ready valuation of the services provided by the natural ecosystem.

d. It will pilot long-term financially sustainable market-driven models by identifying successful ones as well as the ones that may not be oriented to markets.

2. Financial models

PES programme models need to be designed to include diversity of local economics and livelihoods, and to minimise vulnerability to disaster risks.

3. PES objectives

The objectives of the initiative are to be designed so that they are aligned to key disaster risks to enable DRR.

4. Establish baselines

The initiative will need to analyse disaster risks and map local ecological assets. Intermediaries and knowledge providers should undertake demand-side mapping of ecosystem services.

5. Stakeholder alignment

Each PES initiative needs to conduct common and joint activities for the systemic transformation of mindsets and narratives.

6. Knowledge creation

The initiative needs to create system literacy and awareness amongst the community as part of stakeholder alignment, engagement and governance.

7. Payment process

The initiative should, generally start with input-based payments and move to output-based based payments, incorporating the learnings from successful pilots. Outcome-based payments are more popular when initiatives are resourced through blended finance. DRR and poverty reduction are outcomes that require much deeper and complex engagement.

8. Measurement

a. Establishing a baseline.

b. Conducting periodic milestone assessments from the baseline.

c. Deploying best-in-class methods for analysis and evaluation.

i. Examples of some measures that are being considered by the enterprises in the appendix are: Shannon diversity index, canopy density, IUCN red list, incidences of human-animal conflicts, carbon sequestered, soil quality, water quality, sea-level regulation.

9. Monitoring and evaluation

Measurement, reporting and verification with regulatory oversight. Provisioning needs to be made for additional costs on enforcement, legal, communication and compliance; these transaction costs can often exceed design estimates (UNDP, 2015).

10. Metrics

These need to be established on DRR and should include EWS measures.

11. Qualitative analytics

In addition to quantitative metrics, qualitative analytics are to be considered for these complex human-nature ecosystem interactions.

12. Hybrid approach

Financing options should consider blended finance with multiple participating entities in a co-operative structure.

13. Replicability

The design of PES criteria for replicability and scale should keep the local context in mind.

6.0 The Way Forward

Driving results during various phases of a PES with Eco-DRR programme involves a combination of strategic actions, community[14] engagement, incentives, and adaptive management. Here's how results can be achieved in each phase of such a programme.

1. Participatory Assessment and Planning:

Action: Conduct a thorough participatory[15] assessment of ecosystem vulnerabilities, risks, and potential of regenerating ecosystem services to reduce disaster risk and other outcomes.

Drivers:

- Ecological assets and associated socio-cultural values (including faith) are mapped and their significance recognised and linked to identity, wellbeing, livelihoods and for reducing hazard exposure of social, economic, and environmental assets.

- Recognising the role of women as key actors in disaster resilience, particularly through NbS [engaging SHGs as last mile (paid for) extension agents for agriculture, allied activities, including natural resource management] achieving DRR and water/food/nutrition/livelihood security goals.

- Develop a risk-resilience perspective[16] and outcome orientation amongst the at-risk communities, frontline workers, and decision makers before proposed assessment.

- Comprehensive/holistic plan that clearly outlines specific ecosystem-based interventions tailored to the local context and aspirations.

- Constituency of community leaders, frontline workers and decision makers committed to *bivalent results** that are deeper and broad-based.

2. Stakeholder Engagement:

Action: Foster, continued collaboration among communities, government agencies, NGOs, and other stakeholders.

Drivers:

- Establish a network/platform of committed partners, ensuring diverse perspectives and resources are brought to the programme to practice certain principled behaviours (agreed locally).

- The increased agency of locals who rely on natural assets for survival and livelihood.

- Openness to negotiation between the needs of the community and environmental concerns is one of the preconditions for the success of the PES programme.

3. Ecosystem Restoration and Conservation, and beyond:

Action: Implement measures to restore and conserve ecosystems.

Drivers:

- Document and communicate tangible improvements in ecosystem health and resilience, such as increased biodiversity, improved water retention, etc. to unlock incentives.

- Ecosystem health defined as standards, benchmarks and practices within the local context.

- Market access created for sustainably harvested outputs from various elements of the ecosystem.

[14]Including at-risk communities and communities of practice.

[15]Since this an interdisciplinary and multi-sectoral development agenda, aim for broad-based participation (domains/sectors/trade-groups/institutions/population-groups).

[16]A more holistic, rather than transaction-based relationship with the planet.

*Bivalent results emerge from human-nature centred design and planning. The characteristics of the human element include: accountable, responsive (gender, age,....), and transparent systems; inclusive economic development, reduction of inequality and poverty, accommodation of social diversity and dignity and freedom of women, men, children, disabled, elderly, etc. Eco-DRR restores biodiversity; improves ecosystem services, habitat connectivity, soil and water quality and; increases carbon sequestration and adaptation of indigenous species, restores floodplains, wetlands, vegetation resilience; controls erosion control. Outcomes of these interactions reveal the success of an Eco-DRR programme.

4. Capacity Development:

Action: Provide learning opportunities for a range of stakeholders on ecosystem services and DRR.

Establish a continuum of planning, learning, action and tracking of results along locally relevant PES and DRR metrics for various sectors/trade groups/ institutions/population-groups.

Drivers:

- Empower communities to actively participate in programme activities and make informed decisions regarding ecosystem management.

- System shifts: What needs to change through capacity development?

5. Early Warning Systems:

Action: Integrate ecosystem-based information into early warning systems.

Drivers:

- Improve the accuracy and effectiveness of early warnings, leading to enhanced community preparedness and reduced vulnerability.

6. Policy Integration:

Action: Advocate for the inclusion of the established principles and methods in policies, processes, and institution development.

Drivers:

- Influence policy changes that support sustainable ecosystem management and DRR at local, regional, and national levels.

- Develop multi-sectoral institutional support system to implement PES and track multi-dimensional results such as water-livelihood-food-nutrition security.

- System shifts: alter status (institutions and skills), processes, policies, standard operating procedures, and standards.

7. Monitoring and Evaluation:

Action: Establish monitoring and evaluation mechanisms with strong commitment to participatory tracking of results, use of digital workflows and localisation of data.

Drivers:

- Use data to measure various commitments to enable PES and track the success of Eco-DRR interventions allowing for continuous improvement and evidence-based decision-making.

- Reinforcing and balancing feedback loops: Front-line workers and community leaders use local data and evidence for planning and design of interventions and adaptation of ongoing programme.

8. Knowledge Sharing and Education:

Action: Engagement with the community and 'Communities of Practice' to overcome barriers to normative and social change for practicing PES and Eco-DRR.

Drivers:

- Foster a culture of environmental stewardship and resilience within communities, frontline-workers and decision-makers through education and knowledge exchange.

- Improved awareness and understanding of the ecosystem and adopted practices that follow principles of accountability to at-risk populations to drive deeper results.

- Enable interaction between social and scientific assumptions[17]:

– How the social environment shapes vulnerability, cultural and scientific assumptions about disasters damage and losses and other issues.

– How scientific assumptions shape social structures, culture, and interactions and performance of ecosystems.

[17]Regarding complexities such as Disasters, Ecosystems, Ecosystem services, health, and wellbeing, etc.

9. Incentive Mechanisms (structured):

Action: Implement incentive mechanisms, such as PES payments, awards, and rewards (recognition).

Drivers:

- Encourage sustainable practices by demonstrating the tangible benefits of ecosystem preservation and restoration.
- Local leadership for results is mobilised and organised and individuals are recognised through an institutionalised system.

10. Adaptive Programme Management:

Action: Embrace an adaptive management approach, that is structured, yet with a high level of spontaneity.

Drivers:

- Respond effectively to changing environmental conditions and community needs/vulnerabilities, ensuring the ongoing relevance and success of initiatives.

- Constituency of community leaders, frontline workers and decision makers is recognised and rewarded for contributing to learning and action platforms for achieving bivalent results.

- Intersection between social and formal governance is recognised and supported.

- Possible damage of natural asset and loss of ecosystems services is assessed and managed on the go.

By aligning specific actions from each programming domain emphasising community and scientific involvement, the PES plus Eco-DRR programme can drive positive and sustainable results in reducing disaster risks and fortifying ecological resilience.

6.1 Aligning the actors in a PES programme

The PES-Best practice guide mentions the following four groups of PES actors (Smith, and others, 2013):

1. Prospective **buyers** of ecosystem services;

2. Prospective **sellers** of ecosystem services;

3. Prospective **intermediaries** of agreements linking buyers and sellers; and

4. Prospective **knowledge providers**, who support the development of PES schemes.

A crucial role to ensure a successful PES scheme is established is played by intermediaries, in partnership with other like-minded entities. This role would entail critical tasks, such as:

- Help sellers understand the ecosystem service 'product' they are providing;

- Help prospective buyers assess the value of the ecosystem service;

- Introduce and help establish relationships between buyers and sellers, and alignment towards common goals for all the stakeholders;

- Establish baselines for the ecosystem service;

- Identify interventions and resource requirements;

- Aggregate multiple service providers (such as landowners);

- Assist in structuring contractual elements and fair price determination;

- Assist in implementation and monitoring and verification activities; and

- Assisting in the administration of the scheme, wherever needed.

It needs calling out, that there is a need for facilitators and ecosystem intermediaries to work across the multiplicity of stakeholders involved, in order to create a thriving PES ecosystem for social enterprises that are working on the ground with local communities. Additionally, there is a presupposition that beneficiaries are aware of their dependency on particular ecosystem services. However, for the success of market-driven

[18]Interdisciplinary, multi-sectoral action.

models, it is essential that beneficiaries themselves recognise the value of the services they receive. Hence, capacity building and outreach interventions (by intermediaries, knowledge providers, government agencies, and facilitators) are often a critical precursor to scheme development.

Systems-change ecosystem players cannot achieve their vision in isolation. Achieving desired PES outcomes will require strong collaborations amongst the community of organisations – philanthropies, impact investors, corporates, government, and bilateral and multilateral agencies.

A call to action is necessary to build partnerships and to co-create a 'coalition of the willing' for the restoration and sustainable regeneration of natural ecosystems. Considering what is state-of-the-art in this domain, it also creates a leadership opportunity for India to engage with thought leaders and other PES actors across the globe. For those entities that believe in a value-based framework, this will be a game-changing approach to achieve multiple Sustainable Development Goal objectives.

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Notes

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Friedrich-Ebert-Stiftung (FES) is the oldest foundation in Germany. The foundation was named after Friedrich Ebert, the first democratically elected president of Germany. FES is committed to the advancement of both socio-political and economic in the spirit of social democracy, through civic education, research, and international cooperation.

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Ashish Mehta, an Impact and climate finance advisor, entrepreneur, and evangelist, is focused on accelerating the deployment of capital and resources by investors, organizations, and social enterprises towards transformative and measurable People, Planet, and Profit (3P) Impact. Academically trained as an engineer, and following over two decades of multi-domain corporate experience, Ashish's current work is in the capacity of an entrepreneur-as the founder of Second Nature Sustainable Solutions - and the co-founder of Minus CO2.

Sarbjit Singh Sahota, a Disaster Risk Management professional with extensive experience in public policy as well as grassroots level action in the field of Disaster Risk Reduction, Risk-informed development planning and humanitarian action. Formally trained as an Architect and Urban Designer, Sarbjit currently works with UNICEF India as an Emergency Specialist.

Forest Land Restoration

Wayanad district with an area of 2132 sq kms, has approximately 1/3rd of the land under forest cover. The forest cover since 1950 has reduced by a shocking 62%. During the same time plantations have increased by 1800%.

Tribals of Wayanad form 17% of the district's population, who were largely dependent on the forest and its produce. The invasion of alien species like *Lantana camara* and *Senna spectabilis* are suppressing native biodiversity and in turn threatening the livelihoods of these tribal communities.

About 35% of Wayanad Wildlife Sanctuary is threatened by these invasive species. Proliferation of invasives has caused depletion of wildlife fodder. The impact is threatening the survival of umbrella species like Tiger and Elephant, giving rise to increasing instances of human-animal conflicts in the region.

Wayanad's forests are also home to more than 13 rivers, including Kabini the primary tributary of river Kaveri. Loss of forests is threatening with loss of access to water.

The goal of Forest First Samithi is to restore degraded forest lands in the Western Ghats by effective removal of invasive species and securing native biodiversity with direct participatory support of local tribal communities.

40 ft long uprooted Senna lateral root

Tholpetty on India Map

Blueprint for forest land restoration - 12 months cycle

Solution and approach

1.5 Year old saplings of 80 native species are planted

Monsoon

Planting, Pitting (Jun – Sep)

Planting RET/ native saplings

Saplings being loaded for planting along riparian buffer and hill side

Invasive Senna removal (Jun – Nov)

Invasives *Senna spectabilis* and *Lantana camara* are uprooted along with the root stock to prevent secondary growth

Summer

Invasive Lantana removal (Jan – Mar)

Assisted Natural Regeneration : aiding natural regeneration

ANR Lantana removal

Maintenance/ Mulching (Dec – Mar)

Mulching

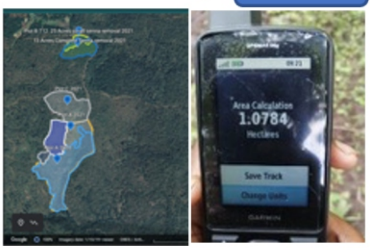
April - May

Check dams
Seed collection
Nursery management
Fire monitoring

RET/ Native floral species nursery

Wild edible fruits | Rare, Endangered and Threatened tree species (RET) | Pollinator attracting species | Riverine species | Medicinal plants

GPS based tracking GPS Link



Forest First : Land Restoration and Habitat Conservation - Going beyond tree planting

Types of Land Restored

Restoring degraded lands in Western Ghats ravaged by invasive species like *Lantana camara*

Forest Land
Planting diversity in forest lands invaded by Lantana and improving biodiversity habitats.

Sacred Groves
Forest patches that are worshipped by local village communities.

Riparian Buffer
Riparian (or riverine) buffers are ecologically vital strips of forests alongside streams and rivers.

Coffee Estate
We work with estate owners to plant more diversity which has a high dominance of exotic Silver Oak.

Landslide Eco restoration
Working with small farmers to restore landslide prone areas

What kind of flora do we plant and conserve ?

Biologically important species (which attracts pollinators) → Wild edible fruits → Riverine species → Rare, Endangered and Threatened Tree Species (As per IUCN) → Medicinal species

Outcomes of Restoration and Conservation

Forest Land
Eradication of invasive species and improve diversity of species by planting at least 70 species and establish native species using assisted natural regeneration.

Sacred Groves
Conserving a diversity of over 100 native species of trees that belong to the above categories. These sites will perform the function of provider of seed bank and gene pool.

Riparian Buffer
Reduce soil erosion, provide habitat for local species like Otters by adding 25 riparian species

Coffee Estate
Improve the pollination in coffee estates by encouraging planting of biologically important species. Improve species diversity to 30 species in large estates.

Landslide Eco Restoration
Using native grass like Vetiver and Bamboo to restore lands affected by landslides on soil stabilization.

500 Acres	Total area under restoration	400 Acres	Forest Land Restoration	70 Acres	Private land	30 Acres	Sacred groves

FOREST LAND RESTORATION

SEP 2020 - FEB 2024

400 ACRES RESTORED	28300 PERSON DAYS	04 INDIGENOUS TRIBES	40K SAPLINGS PLANTED	23K SAPLINGS FREED FROM LANTANA	247 ACRES INVASIVE SENNA REMOVED
11 SMALL CHECKDAMS CONSTRUCTED	04 NURSERIES CONSERVING 80 SPECIES	68 RESTORERS SUPPORTED	118 FUEL EFFICIENT SMOKELESS CHULHAS	200 SOLAR HOME INSTALLATIONS	10 BEE BOX INSTALLATIONS

TECHINCAL - Anand A, Engineering Solutions Expert
ADVISORY - Salim Pichan, Plant taxonomist
Mr. MB Naik Nursery (Sirsi)
Dr. Ganesh Babu Plant Biologist (Trans Disciplinary University)
Mr. Ramesh V Director, Society for Ecological Restoration

FINANCIAL/INVESTMENT: Centre for Wildlife Studies, Give Foundation - HDFC Parivarthan Grants, Living my Promise, Sustainable Green Initiative Foundation, Tata Industries Limited, Tata AIG Insurance, Tata Group Company, UST Technologies International Private Limited, Vincular Testing Labs India Private Limited

Abundance of the Commons

A circular economic model for climate resilience, biodiversity restoration and community livelihoods

Wildfire ravaging an Uttarakhand forest

Home to 12 out of the 18 river basins in India, the Indian Himalayan Region also houses four of 36 global biodiversity hotspots. The project is based in the State of Uttarakhand, a Himalayan state. Since 2000, wildfires fueled by the annual accumulation of 16.73 million dry pine needles have led to the loss of 54,801 hectares of forest cover in Uttarakhand. As a result, nearly 50% of the state faces excessive soil loss, mainly due to sheet erosion and landslides, impacting agricultural productivity. Between 2018 and 2021, Uttarakhand recorded 253 landslides causing 127 fatalities, as reported by the State Emergency Operation Centre. This has significantly contributed to climate and economic vulnerability in the region. Approximately 60% of rural hill farming communities in Uttarakhand face food insecurity. Uttarakhand also registers one of India's highest rates of outmigration. Between 2018 and 2022, approximately 330,000 individuals migrated from various regions of Uttarakhand, primarily from its hilly areas.

Destructive forest fires pose a major threat to farmlands bordered by pine forests. Loss of wildlife is a tragic consequence

Pine Needle Accumulation

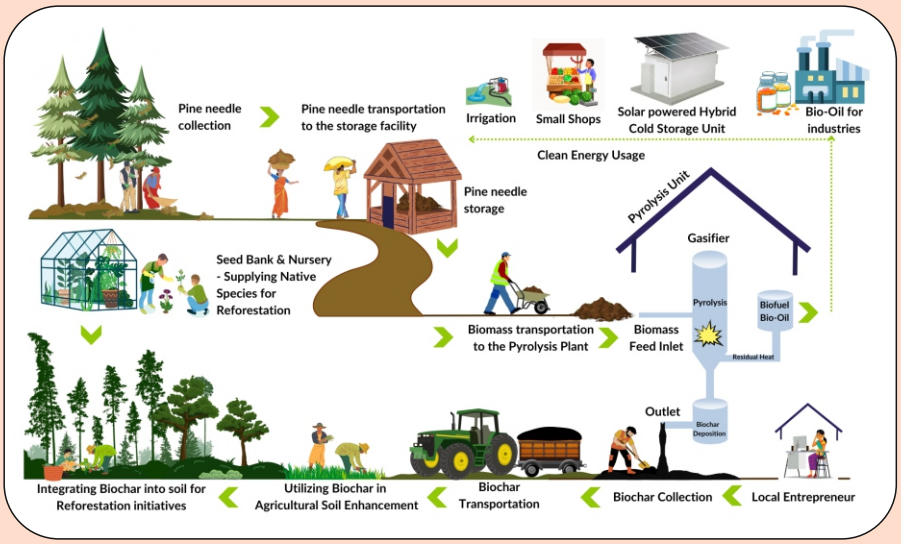
A key factor in destructive wildfires and biodiversity loss.

This solution targets Uttarakhand's extensive pine needle accumulation, a key factor in destructive wildfires and biodiversity loss. Processing these needles into biochar can contribute to soil enhancement and carbon sequestration, along with clean electricity generation from syngas. Biochar is applied to the forest soils that are cleared of pine needles, after which native species are planted. This closed loop mitigates forest fires, accelerates revival of native oak forests, creates alternative sources of clean energy and employment opportunities, all leading to climate and economic resilience of local communities.

Pine needle pyrolysis plant in Uttarakhand, installed by Avani Bio Energy Private Limited

Hasten's solution addresses the serious issue of pine needle accumulation, amounting to a staggering 16.73 million tonnes annually in Uttarakhand. These highly inflammable needles contribute to devastating forest fires, deforestation, and loss of biodiversity, increasing climate and economic vulnerability of local populations. The project approach takes a systemic view that addresses the core causes of climate and economic vulnerability by building a two-stage integrated value chain model. Initially, research and human-centric solutions were prioritized. This was followed by integrating solutions through prototyping with community collaboration.

Pine needles are gathered and processed using decentralized pyrolysis plants that produce biochar, syngas, and bio-oil. Biochar improves soil quality for afforestation, reforestation, agroforestry and agriculture, and contributes to carbon removal. Syngas generates clean electricity, while bio-oil is used by pharmaceutical industries. This holistic model not only addresses ecological challenges but also empowers local communities through alternative livelihood opportunities.



Community reforesting with native species

Avani Bioenergy Private Limited's biochar production unit

Mapping the Locations of Projects Across Uttarakhand

> "The project's vision is to create multiple opportunities for regional economic development of Himalayan communities through regeneration of their natural assets. The project goal is to transform 5000 ha of degraded forests into lush biodiverse areas with thriving flora and fauna in five years."

Potential Impact

SOCIAL

- Payment for Ecosystem Services (benefit sharing with local communities)
- Women focused financial inclusion

ECONOMIC

- 200 micro entrepreneurs with a focus on women and youth
- Over 10,000 local jobs
- Securing farming livelihoods

ECOLOGICAL

- Mitigation of forest fires and soil erosion
- 5 million new native trees grown in the region
- Over 30 native species
- Monoculture forests to multi-species forests
- 5,000 ha of community forests will be restored
- Enhancing climate resilience, carbon sequestration, and reviving local biodiversity
- Groundwater recharge

Hasten Regeneration, a non-profit organization, employs a systemic approach to restoring degraded ecosystems. It addresses the challenges of climate change, biodiversity decline and economic vuknerability through integrated projects. Hasten collaborates with local communities, governments, non-profits, and corporations in projects that focuses on regional-scale regeneration of farmlands and forests, and fostering resilient livelihoods. Utilizing innovative climate technologies in clean energy, waste management, and water conservation alongside restoration efforts, Hasten facilitates stakeholder gatherings, workshops, curriculum development, training sessions, and consulting services for nature-based climate projects, ensuring effective project scoping, design, and execution.

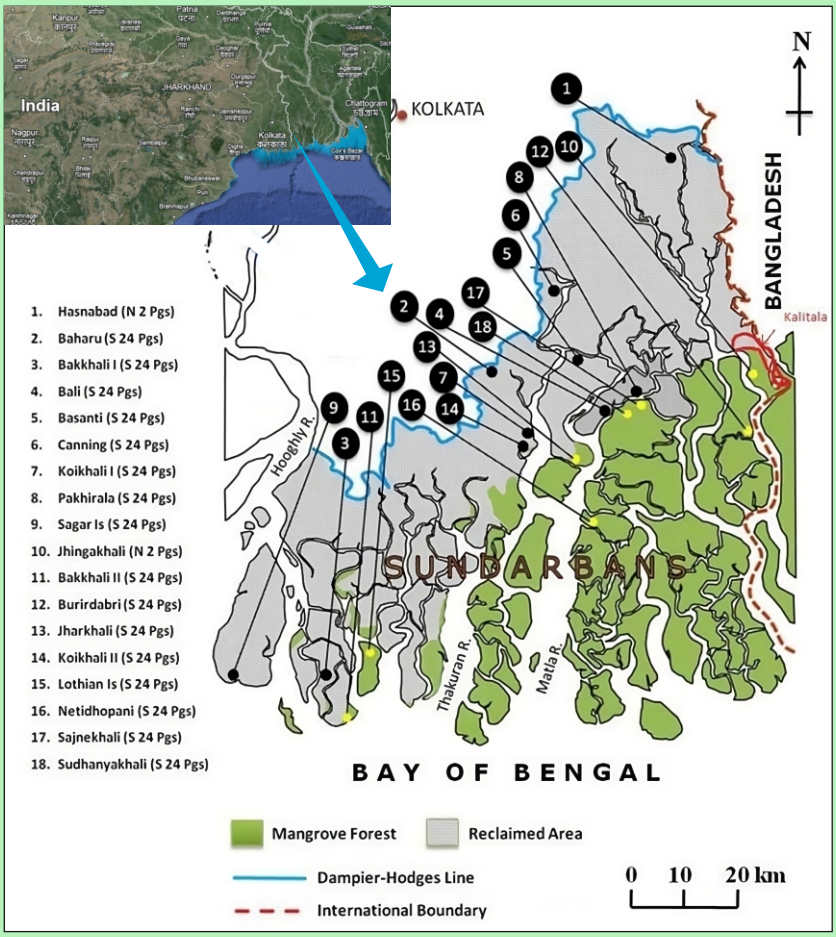
Partners:
Avani Bio Energy Private Limited
Aarohi
Arpan Seva Sansthan
Swiss Himalayan Amity
Afforestt
Climes
Sugi
American Forests

Harmonizing Sundarban's Economy & The Mangrove Ecosystem

Preparing an agriculture field (photo credit - Ankita Mondal)

Tending to a mangrove nursery (photo credit - Shruti Kulkarni)

Mangrove plantation in a river bank (photo credit - Ankita Mondal)



Sundarbans are the largest mangrove forest in the world. The Indian side has 102 islands, 54 of which are inhabited by more than 4.5 million people. The inhabited islands are spread across ~5400 sq. km covering 181 panchayats in two districts of West Bengal . The region has been hit by 4 cyclones in the last 5 years Fani & Bulbul (2019), Amphan (2020), Yaas (2021)

Thriving mangrove ecology & local economy are both possible.

The Sundarbans mangrove forests were cleared and settled on, in the 1850s, to increase revenue for the colonial government. The local economy is completely dependent on rainfed agriculture with paddy being the primary crop. It has an agrarian economy that has been imposed upon a mangrove ecosystem. The poorest of the poor, are extracting fish, crabs, honey, etc. from the forests at unsustainable rates.

Over the years, farmers in the area developed many local varieties of rice, some of which were saline tolerant. However, in the 1990s, the government and market forces pushed in High Yielding Varieties (HYV) of rice which is not saline tolerant. Their advent, with a promise of higher yields, gradually sucked these farmers into the industrial farming value chain, where they lost control over seeds and had to buy HYV seeds, as well as other inputs like chemical pesticides and fertilizers, from the market. This gradually raised the social, ecological, economic costs of farming in the region. People are now faced with rising climate uncertainties like erratic localised weather patterns and cyclones.

Unless the local economy is aligned with the mangrove ecology, local livelihoods will collapse in the near future. The first step towards this will be to make local agriculture disaster risk resilient. In the long term, it will require restoration/regeneration of the mangrove ecosystem in the inhabited islands and creation of harmonious livelihood relationship between people and the mangrove ecosystem.

> “ The first step towards this will be to make local agriculture disaster risk resilient. In the long term, it will require restoration/regeneration of the mangrove ecosystem in the inhabited islands and creation of harmonious livelihood relationship between people and the mangrove ecosystem. „

For agriculture in the Sundarbans to become climate risk resilient, interventions need to focus on at least eight systemic focus points in the value chain.

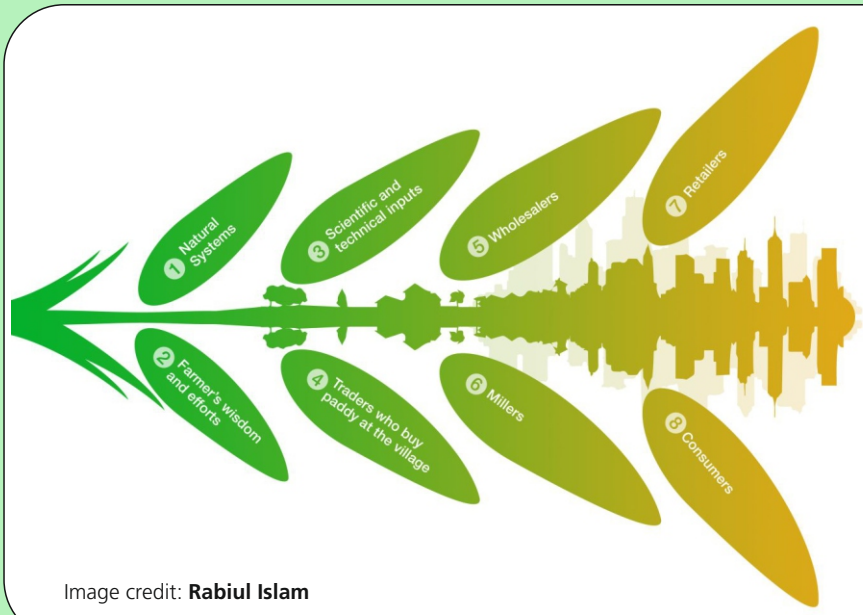


Image credit: **Rabiul Islam**

Potential Impact: Transforming the local economy in the Sundarbans from what has developed through destruction and exploitation of the mangrove ecosystem to an economy that is harmonious and regenerative for the ecosystem and people.

SOCIAL

As per 2015 data, Kalitala has 6,434 households with a population of 24,462 persons (male: 12,694, female: 11,758). Schedule caste persons form 80.88 % of the population, 3.74 % belong to Schedule Tribes, 11.96 % are Other Backward Class people and 3.42 % belong to Muslim and general caste persons).

ECOLOGICAL

Kalitala Panchayat's total land area: 2,575 ha,

Water bodies: 803 ha,

Cultivated area: 1,204 ha,

River bank embankment: 48 km

ECONOMIC

28 local rice varieties reintroduced

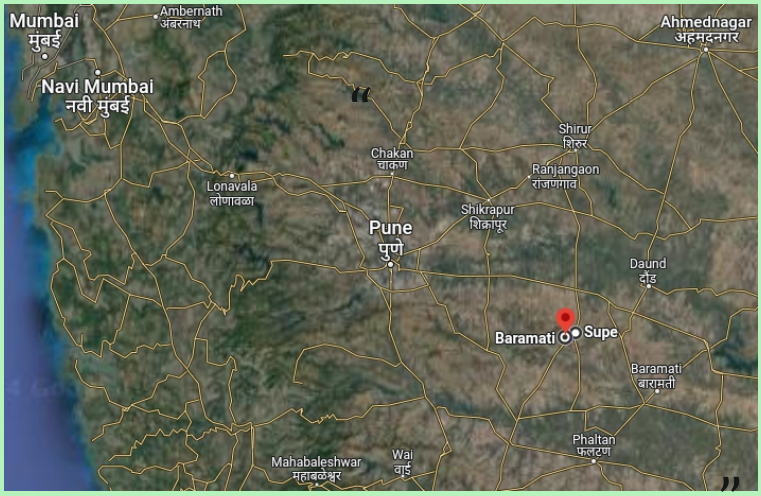
Resilience | Innovations | Culture | Empowerment or RICE was a pilot initiative co-created by Sundarban Unnayan Bhawan of Kalitala and Eco Logical Foundation of Delhi with a small Corporate Social Responsibility grant of 0.45 million by Oil and Natural Gas Corporation Limited in 2021. Please visit www.ricesub.in or see https://www.youtube.com/watch?v=h3opO2NxtvA for more details. Based on learnings from the pilot, efforts have been initiated on creating a multi-stakeholder platform of organisations and enterprises aligned through shared universal values and committed to finding nature based solutions to social, ecological and economic challenges faced in the Sundarbans ecosystem.

High density plantation of Native Plants with Small Farmland Owners

This is a water scarce region. Despite that, sugarcane is among the major crop here. Canals supply water after rains. There is good irrigation, but they are largely used to cater to Sugarcane cultivation. Ogale, Nagarale, 2014 estimate about 30% of the region's land is under Sugarcane cultivation. A good fraction of them around river Karha where the soil is not very conducive for Sugarcane. Baramati anyway receives about 550mm of rainfall. To grow a crop which requires about 2500mm of water seems like waste of water resources.

The region or taluka has several sugar factories and bagasse based cogen power plants in the vicinity. As a cash crop, several farmers prefer to plant sugarcane. With the growing impact of climate change, it may be helpful to conserve the excellent service offered by the canal network within the region.

Our endeavour is to explore the use of Payment for Ecosystem Services (PES) as an alternative to income from water-intensive crops like sugarcane. We started operating in Kalkhairewadi Gram Panchayat, where we have some support from the locals.



Plantation on day 1

Plantation growth after 60 days

Plantation after nearly 800 days

Payment for Ecosystem Services through Improved Native Biodiversity on Small farmlands

Most reforestation solutions are in existing forest lands or urban spaces.

The objective is:

- To increase the population of trees and plants
- To improve native bio-diversity
- To provide steady income source for marginal farmers

We think rural private "mini-forests" may solve part of the challenge.
An Acre of Sugarcane can consume about 1 crore litres of water during its cultivation. By engaging marginal and small farmers, we use a fraction of their farmland for high-density, hypernative species. We pay them a lease for the farmland and a monthly stipend for maintaining the plantation for 3 years. This leads to lesser land for sugarcane, increased tree cover, higher population of native species, improved biodiversity and a regular payment for ecosystem services an dmore water for other livelihood and economic activities.

We planted Lemon, Avla, Sitaphal, Audumbar, Drumsticks, Bel, Neem, Palash, Bor, Peepal, Jambul, Tamarind, Castor among other few more. In all we planted over 15 species we found during the survey of the region. We were also guided by forest officials and taxonomists / botanists from the academia.

With this pilot, the Gram Panchayat has evinced interest to replicate similar projects on Panchayat lands.

With a greater area, additional projects such as: 'Nutrition Garden' for better health; and 'Native Cattle Breed', will support, more consistent employment, agri-insurance, adaptation to climate changes

Increase Tree & Plant Population of Hyper-native Species and Improve Local Floral and Faunal Biodiversity

If we work on the grampanchayat lands, we think we can improve local biodiversity, "poshan-vatika" or "Nutrition Garden" can improve health of children and women (by partnering with Anaemia Free India Foundation).	18 hyper-native species 1000 saplings Over 90% Survival Rate
With greater number of small-farmland owners opting to use a fraction of their land for plantation, we can set up a pilot Payment-for-Ecosystem-Services mechanism.	1 Small farmland Farmer 3.25 acres Native plantation on 0.25 acres
We aim to avoid sugarcane plantation and therefore increase water availability in the region for other native and local crops and for livelihood.	Avoided Sugarcane cultivation Avoided 17.5 lakh litres of water

Earthyantra implemented the project. Shri Prashant Khaire and family were the volunteer farmer. The project is in Bhondwewadi, Supa, about 10km west of Morgaon Ganpathy Temple, Baramati Taluka, Pune District, Maharashtra State