Catalysing Nature-based Solutions

PERSPECTIVES AND PRACTICES FOR DEVELOPING HIGH-QUALITY PROJECTS

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Foreword

The twin crises of climate change and biodiversity loss pose a real and immediate danger to humanity, not least those in the most vulnerable sectors of society – the young, the poor, the least advantaged. This also presents significant risks to the global economy. However, where there are risks there are opportunities, and climate and nature is no exception.

Taking the Asia Pacific region for example, using huge natural resources sustainably can combat the growing climate and biodiversity crises while supporting widespread equitable economic and social development. Where an estimated US$19 trillion (63%) of GDP is at risk from biodiversity and nature loss, sustainable nature-positive business enterprise is estimated to be worth approximately $4.3 trillion annually by 2030 (14% of GDP). Getting the balance right could not only prevent further harm but also deliver huge benefits.

At UBS Optimus Foundation, we recognize the interdependence of climate, biodiversity and human societies. Therefore, our efforts in addressing the crises are focused on Nature-based Solutions (NbS) as this approach benefits local communities and biodiversity while ensuring long lasting and effective mitigation solutions. By design, NbS interventions implement actions to protect, sustainably manage, and restore natural and modified ecosystems and address societal challenges effectively and adaptively.

But in order to attract more philanthropic and investment capital into NbS projects, and importantly ensure this capital is being effectively deployed, it is crucial we all understand what a high quality NbS project looks like. Specifically, what are the key areas to consider when looking to support or invest in a NbS project? What are the key outcomes and metrics at a minimum we should expect the project to deliver? What are the leading practices and frameworks for measuring, reporting and verifying (MRV) the impact of these projects across all dimensions, not just mitigation? How can technology and communities play a role with MRV?

This report brings the practical insights of Mana Impact and EnviroStrat together with over 30 global experts to help address these questions and provide recommendations on how to catalyse more high quality NbS projects. In particular, we hope by focusing across the full spectrum of natural capital assets, from forests to mangroves, it will give the reader a sense of the vast potential we have to harness nature to benefit both our people and planet at the same time.

We believe by learning from each other, and working together, we have a chance to address the urgent climate and biodiversity challenge and support the necessary transition for all of humanity and our planet.

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We are grateful to all the interviewees and individuals who provided their time and invaluable insights to this report.

Contents

EXECUTIVE SUMMARY 05

1 INTRODUCTION TO NATURE-BASED SOLUTIONS (NBS) 09

1.1 Definition and Potential of Nature-based Solutions 10

1.2 Nature-based Solutions in the Asia-Pacific Region 12

1.3 The State of Measurement, Reporting and Verification 13

2 ASSESSMENT OF NBS PROJECTS 15

2.1 Project Design 17

2.2 Projection Implementation 22

2.3 Measurement, Reporting and Verification 24

3 IMPACT INDICATORS, METRICS AND DATA COLLECTION 39

4 NATURE-BASED SOLUTIONS IN PRACTICE: PROJECT REVIEW AND BEST PRACTICES 51

4.1 Review of NbS Projects 52

4.2 Illustrating Best Practices - Case Studies 57

4.3 Challenges on the Ground 62

4.4 The Case for Integrated Projects across Ecosystem Types 65

5 KEY FINDINGS & OPPORTUNITIES 66

REFERENCES 70

APPENDIX A: DATABASES AND SOURCES 76

APPENDIX B: EXPERTS INTERVIEWED 77

APPENDIX C: SUMMARY OF LAND TENURE AND RIGHTS 79

APPENDIX D: MRV STANDARDS, FRAMEWORKS AND TOOLS 80

APPENDIX E: INDICATORS FOR DIFFERENT ECOSYSTEMS 87

APPENDIX F: CASE STUDIES 94

Executive Summary

Asia Pacific is well known for its biodiversity hotspots and exceptional diversity of fauna and flora, yet it is also the region that faces some of the greatest biodiversity losses. Nature-based Solutions (NbS) provide a great opportunity to protect and restore a wide array of natural assets in the region, including those with the highest climate mitigation potential such as forests, peatlands, and mangroves, which are of particular abundance in this region.

This report provides an overview of the current global standards, frameworks and tools being used to support the measurement, reporting and verification (MRV) of NbS projects, highlights best practices for high quality NbS projects, and features case studies for the following natural asset types:

01. Forests

02. Savannah Grasslands & Rangelands

03. Freshwater wetlands

04. Peatlands

05. Mangroves

06. Seagrass beds

07. Coral reefs

The report also identifies the most comprehensive list of indicators to measure, report and verify for the following outcomes:

Social / Livelihoods

Biodiversity

Climate Mitigation

Climate Adaptation

Ecosystem Health

Lastly, the report analyses some of the findings and opportunities to catalyse high quality NbS projects in the region based on extensive desktop research, insights obtained from interviews with over 30 experts from a variety of fields, ranging from academia to project developers, and our internal experience and knowledge. Some of the main opportunities include:

- Developing **marine protection projects** and **blue carbon standards** that will enable the protection of our oceans. Particular ecosystems that require more focus include seagrasses and freshwater wetlands.
- **Growing beyond carbon mitigation**, to include climate adaptation, biodiversity and social outcomes in NbS projects. High quality NbS projects need to ensure that biodiversity integrity is also a key outcome, and that communities benefit in an equitable and sustainable manner.
- **Developing biodiversity standards, frameworks and credit markets** to elevate the importance of biodiversity outcomes. Support the development of standards, measurements and technologies to protect and restore marine ecosystems.
- Fostering the development and **deployment of greater usage of data analytics technologies in Asia, particularly related to marine ecosystems**. There is currently a large gap in the market and the development of such technologies will enable the proper valuation and monetization of marine ecosystem services.
- **Growing the capacity of project developers and implementation organizations** given the limited number of organizations that have the necessary capabilities including a proper understanding of carbon markets; possess strong scientific and ecological background; hold strong connections and trust in the communities; can exert strong execution capabilities with the capacity to execute on the ground in local communities.
- **Allocating funds for long term monitoring and evaluation after project completion to establish success in the long run.** There is usually a time-lag between the intervention and ecosystem restoration outcomes, and thus more focus is needed on ex post evaluations.
- Developing **integrated ecosystem projects rather than single natural asset NbS projects**; these are more holistic and explicitly designed for interconnectivity and flows between different ecosystem types with greater resilience.

Methodology

A desktop review was conducted to analyse existing frameworks, standards and tools, with a focus on those pertaining to project MRV. Given the large number of existing projects, the project review scope has been narrowed down to projects that had obtained financing beyond philanthropic or government funding and were able to also access revenue from carbon markets. The list of NbS projects (with a focus on Asia-based projects) was sourced from existing databases and literature, as well as recommendations from interviewees, using high level screening (eligibility) criteria. This included project registries managed by certifiers (e.g. Verra and Plan Vivo), and project databases such as the Joint Nature Conservation Committee's **Database of NbS Case Studies**. In total, 560 projects were identified as relevant NbS projects from several databases and sources (**Appendix A**). These projects were further reviewed in regards to project design, implementation, and MRV practices. Some that present elements of 'best practice' are further highlighted as case studies in Section 4.

Primary research involved semi-structured interviews with subject matter experts, practitioners and other stakeholders involved in NbS projects. Interviewees included science and technical experts, representatives of global environmental NGOs, independent verifiers, project developers, and fund providers. The interviews provided insights to complement the literature review with a view to evaluating best practices, challenges and opportunities in the adoption of NbS. The list of interviewees is included in **Appendix B**.

Through reviewing existing projects in consideration of industry standards and frameworks, as well as recommendations by the interviewed experts, this research attempted to elucidate some of the impact indicators most commonly applied in NbS design and implementation.

Finally, in writing this Report, the Mana Impact and EnviroStrat team drew from our own background knowledge and insights regarding NbS project design, implementation, measuring, reporting and verification.

Glossary of Terms and Abbreviations

Additionality	The project benefits, such as biodiversity conservation or avoidance of greenhouse gas emissions, would not have occurred without the project and intervention
APEC	Asia-Pacific Economic Cooperation (forum of countries)
Baseline	The existing conditions prior to project starting
Biodiversity credits	A biodiversity credit represents a specified quantity of benefit to biodiversity as a result of interventions to conserve, manage or restore biodiversity
Blue Carbon	Carbon captured by the world's ocean and coastal ecosystems
Co-Benefits	Refers to nature's provision of services and benefits in addition to climate change mitigation
FSC	Forest Stewardship Council
IPCC	Intergovernmental Panel on Climate Change
IRIS+	Impact measurement and reporting framework
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicator
MPA	Marine Protected Area
MRV	Measurement, Reporting and Verification
NbS	Nature-based solutions involve actions to protect, sustainably manage, and restore natural and modified ecosystems that simultaneously provide social and environmental benefits
NGO	Nongovernmental Organisation
PES	Payment for Ecosystem Services
Plan Vivo	Plan Vivo Foundation – for Nature, Climate and Communities
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SDG	Sustainable Development Goal
SEA	Southeast Asia
UNEP	United Nations Environment Programme
VCS	Verified Carbon Standard (Verra)
WPU	Wildlife (and Forest) Protection Units

PART ONE

Introduction to Nature-based Solutions

1.1 Definition and Potential of Nature-based Solutions

Nature-based solutions (NbS) involve a wide range of ecosystem-related approaches for addressing urgent societal challenges such as climate change, disaster prevention, and water and food security. NbS involves actions to protect, restore and manage ecosystems and their functions; either as stand-alone interventions or in conjunction with engineered solutions, that result in increased human well-being as well as environmental benefits (**Figure 1**).[1]

Adoption of NbS, through the focus on protecting nature, provides opportunities for expanding the markets for ecosystem services beyond carbon sequestration, and attracting investments in underlying natural assets.

The categories of ecosystem services and goods that humans receive from well-functioning ecosystems include:

01. Regulating services
(E.g. Climate and flood regulation)

02. Provisioning services
(E.g. Food and water)

03. Cultural services
(E.g. Tourism & recreational values)

04. Supporting services
(e.g. Habitat and soil)

The International Union for Conservation of Nature (IUCN) proposes a broad typology for NbS to increase understanding and guide the operationalisation of projects following an ecosystem-based approach (**Table 1**).

Figure 1: Definition of nature-based solutions (Source: IUCN)

Historically, most NbS projects have focused on forests and have typically been funded by government and/or philanthropy. While forestry projects continue to deliver some of the highest climate mitigation opportunities, the increasing demand for high quality NbS projects and its underlining carbon credits are providing additional sources of capital to restore and protect natural landscapes and ecosystems beyond forests.[2]

Table 1: NbS categories and examples of approaches / intervention types (Source: IUCN) [3]

NbS Category	Intervention Type
Ecosystem protection	Area-based conservation approaches, including protected area management (e.g. MPAs)
Ecosystem restoration	Ecological restoration Ecological engineering Landscape-level restoration (e.g. forests, coastal)
Ecosystem-based management	Integrated watershed management Integrated coastal zone management
Issue-specific ecosystem-related	Ecosystem-based adaptation Ecosystem-based mitigation, (e.g. carbon sequestration in vegetation and sediment) Climate adaptation Ecosystem-based disaster risk reduction, (e.g. flooding)
Infrastructure-based	Green and natural infrastructure, (e.g. water storage and purification by freshwater wetlands)

A 2017 study estimated that NbS could provide over one-third of the cost-effective climate mitigation needed before 2030 to stabilise warming to below 2°C while also maintaining and improving biodiversity, providing for water and air purification, and improving soil health and productivity.[4] Given the potential for various natural asset types to deliver ecosystem services, catalyzing the growth of high quality NbS projects requires:

- Valuing the ecosystem services provided by natural asset types beyond carbon mitigation and accounting for climate adaptation and biodiversity benefits;
- Improving the ecosystem services measurement standards provided by the natural asset types, particularly those that have been given less attention (such as mangroves and seagrasses); and
- Aggregating various natural asset types together into larger NbS projects to create economies of scale, as well as deliver greater ecosystem service benefits than any of these assets would be able to do in isolation.

1.2 Nature-based Solutions in the Asia-Pacific Region

The Asia-Pacific region has rich biodiversity and hosts many of the ecosystems that have the potential to be developed as NbS for climate adaptation, climate mitigation and socio-economic development purposes. For example, Asia houses 34.4% of the world's coral reefs,[5] and 38.4% of the world's peatlands.[6] Despite this, our analysis reveals a limited number of projects having been developed in Asian countries in comparison to other regions of the world; most involve forests and peatlands.

While protecting, managing, and restoring forest and peatland ecosystems provides the greatest benefits for climate mitigation in tropical Asia (**Figure 2**), other natural assets should be considered for high quality NbS projects as well given their potential to deliver climate adaptation, social and biodiversity benefits. Mangroves, for example, are a natural asset type that have a larger carbon sequestration capacity than terrestrial forests, are critical for preventing flooding, improving water quality, and are vital juvenile fishery habitats. Asia has 42% of the world's mangroves and it is estimated that the ASEAN Region lost up to 33% of its mangrove forests between 1980 and 2020; reinforcing why mangroves should be a focus for future NbS projects.[7]

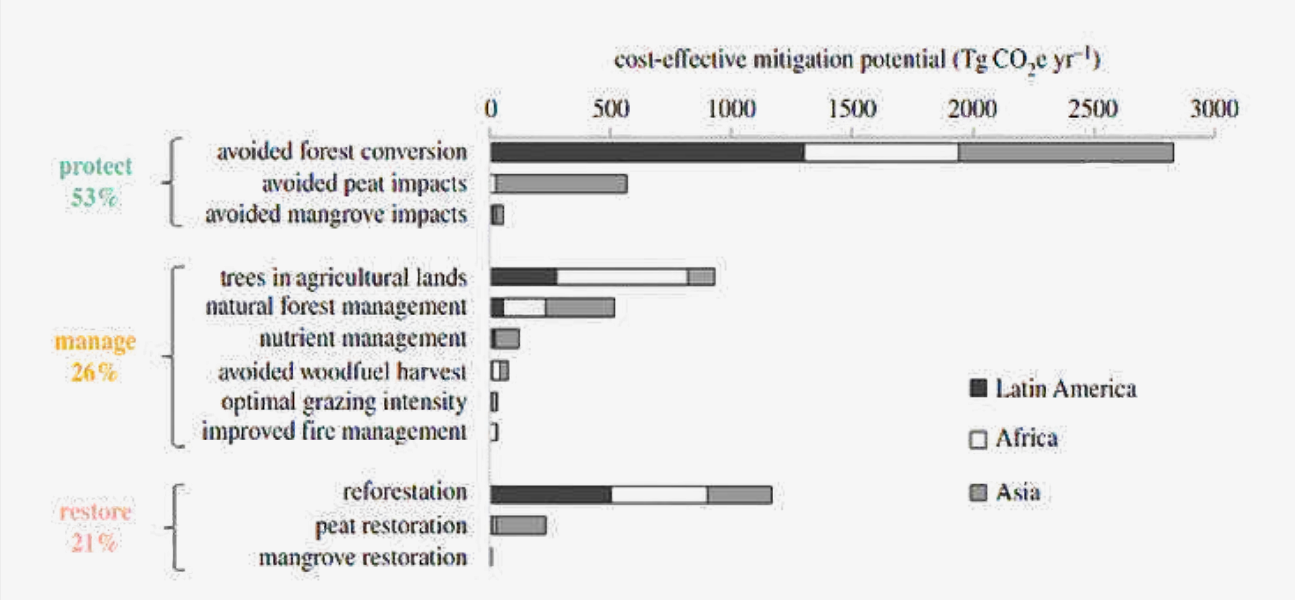


Figure 2: Cost effective (less than US$100 per Mg CO_2e) mitigation potential of NbS in tropical regions. Asia is light grey (source: Griscom BW et al. 2020[8])

1.3 The State of Measurement, Reporting and Verification

Measuring and Monitoring

Manual data collection methodologies are predominant for project MRV. These include on-the-ground measurement of variables like tree diameter at breast height (DBH) for calculating carbon stocks, species count along transect lines, or interviews with local stakeholders to understand the status of socioeconomic indicators. However, there is also increasing usage of technology such as remote sensing (e.g. satellite imagery) measurements to complement ground measurements and scale up the monitoring capacity for a larger area. Such technologies can help to increase efficiency, accuracy and frequency of data collection. Some of these technologies are further explored in Part 4.

Reporting

Impact reporting varies from project to project, depending on whether the projects are subjected to any disclosure requirements (e.g. for aligning with particular KPIs requested by funders, or for progress reports submitted to registries). Some of the more developed, large-scale projects reviewed disclose their impact information on dedicated websites, for example the Rimba Raya Biodiversity Reserve Project in Indonesia.

Other than climate mitigation (which uses carbon dioxide equivalent as a core metric), there is generally no industry consensus on the key metrics to report for biodiversity conservation, climate adaptation and social impact outcomes.

Verification

Verra's Verified Carbon Standard (VCS) and Climate, Community and Biodiversity Standard (CCB), the Gold Standard for the Global Goals, and Plan Vivo are some of the most well-known certifications for the voluntary market. Verra has one of the largest registries in the world with more than 1,800 projects registered,[9] while the Gold Standard has more than 1,700 projects.[10] However, a small proportion of the credits issued come from Nature-based Solutions (approximately 32% for Verra, and 3% for The Gold Standard).[11] Plan Vivo has 26 certified projects (all of which involve NbS) listed on its website.[12]

Currently, verification and certification systems are largely developed for carbon and climate mitigation for terrestrial ecosystems (particularly forests). There is a lack of verification or certification standards for NbS projects specific to coastal and marine ecosystems such as mangroves, coral reefs or seagrass beds, especially in relation to biodiversity outcomes. However, there is emerging development in 'blue carbon' standards and methodologies associated with interventions across marine ecosystems (e.g. seagrasses and seaweed).

Interviewee Perspectives

Some ecosystems (e.g. grasslands and forests) have plenty of monitoring frameworks and norms in the industry while others (e.g. coral reefs and marine ecosystems) have less developed industry standards. Blue carbon verification is still in its nascent stage. Standards are largely carbon related and not all ecosystems are covered, for example verifications specifically for coral reefs do not exist. Additionally, the market standards for biodiversity are generally less developed (this is newer compared to carbon).

PART TWO

Assessment of Nature-based Solutions Projects

Although the IUCN Global Standard for Nature-based Solutions defines the NbS concept, there is no agreed international framework or standard that defines a high quality NbS project.

The criteria in **Table 2**, which were drawn from interviews with subject matters experts, and literature review and analysis have been used to evaluate NbS projects and identify best practices for this Report.

Table 2: Criteria for Assessing Nature-based Solutions Projects

Project stage	Criteria
Project Design	• Potential for environmental conservation or restoration, and additionality compared to baseline conditions • Level of community engagement • Alternative economic opportunities • Enabling environment • Assessment of additionality
Project Implementation	• Relevant expertise of project developers and funders • Knowledge and technical capabilities of the local community organisations and cooperatives
Project Measurement, Reporting and Verification	• Alignment with global and industry methodologies and standards for MRV • Monitoring plan undertaken at regular intervals, along with a management plan that adapts the design based on the results • Impact reporting • Independent verification or audit • Outcome permanence and long-term sustainability, and ensure that leakage (which refers to the movement of activities that degrade or destroy ecosystems outside of the project area) does not occur

2.1 Project Design

Robust design helps to define the appropriate partnerships, strategies for finance, processes, and tools to achieve desired NbS goals and outcomes. The project design stage also addresses core issues of implementation capability and capacity for NbS, pathways for investment and the level of due diligence required. NbS practitioners, project developers and certifiers interviewed emphasised the importance of effective project design informed by a deep understanding of community interests and local context, and the economic and social 'levers' that can be used. Specific aspects of importance in project design are described below.

Potential for ecological conservation or restoration

Criterion 3 of the IUCN's Global Standard for NbS highlights the importance of preserving or improving ecosystem health: *"NbS result in a net gain to biodiversity and ecosystem integrity"*. Project design should aim to conserve or restore ecosystem health and prevent further degradation. For example, projects should avoid single species restoration, which can lead to monoculture and simplification of ecosystem structure, or the introduction of non-native (and potentially invasive) species.[13] Project design should always benefit the ecosystem structure, its underlying functions, and biological diversity.

Best Practice 1:
ESTABLISHING BASELINE CONDITIONS AND SETTING CLEAR MEASURABLE TARGETS

Prior to designing an intervention, there is a need to measure and understand the baseline ecological conditions of the target area. The baseline assessment should encompass the ecosystem structure and functions, habitat connectivity, biodiversity status and trends, external drivers for ecosystem loss or degradation, and other local factors. This informs response options, which in turn should also seek to generate net improvements and make use of traditional, local and scientific knowledge. The need to access and apply robust science was emphasised by all project developers interviewed.

An effective project design requires setting clear and measurable goals. The potential to achieve net biodiversity gain and ecosystem integrity needs to be articulated and adequately established in relation to indicators and targets.

Various frameworks have recommended the incorporation of SMART criteria when setting goals, objectives and metrics (**Table 3**).[14]

Table 3: SMART metrics (Conservation Measures Partnership)

Specific	Clearly define goals so that all stakeholders have a common understanding of the objectives.
Measurable	Can be defined or measured such as in numbers, percentages or binary responses.
Achievable	Practical in terms of the ability to meet the goal specified, and in light of the political/social/financial considerations.
Results-Oriented	The action results in necessary changes in target conditions, threat reduction or other results.
Time-Limited	To be achieved in a specific time frame (i.e. number of years).

Community Engagement

A key enabler for NbS lies in engaging and partnering with local community and project stakeholders. Meaningful involvement of communities provide three broad categories of benefits:

1. Local perspectives and knowledge;
2. Support in implementation; and
3. Increased perceptions of legitimacy of the NbS project.[15]

Transdisciplinary planning processes enable the application of collaborative planning and community engagement, which promotes citizen empowerment. The level of community empowerment, legitimacy and ownership in turn ensures that the conservation and restoration practices of the project have continuity and thereby increases likelihood of successful implementation and sustainability of project outcomes.

Best Practice 2:
ENGAGEMENT AND EMPOWERMENT OF LOCAL COMMUNITIES

Local communities and stakeholders should be involved from the outset of the project's conceptualization to its design, governance and management. Stakeholder mapping is crucial to identify and include all the parties who will be impacted by the project. Activities such as focus groups, as seen in the case of the Gunung Niut Nature Reserve Conservation Cooperative (Case study 1), help identify challenges and issues that need to be addressed. It also illustrates how broad engagement of local communities enables forests and indigenous wildlife protection while at the same time improves the livelihoods of local communities by delivering initiatives that respond to their needs.

Project documentation should provide evidence of regular consultation with the local community, and provide details on how women participate and contribute to decision-making, for example through noting who contributes to the final decisions in meeting minutes. It is also pivotal for projects to uphold the rights of Indigenous Peoples and local communities to Free Prior and Informed Consent (FPIC).

Alternative economic opportunities

A well-designed project examines alternative revenue streams and economic opportunities that provide communities with a diversified range of economic and livelihood options. Projects with a benefit-sharing mechanism are more likely to incentivise local communities to participate, contributing to its sustainability and likelihood of success.

Carbon credits are the most common form of project revenue observed in NbS projects reviewed for this Report. The growth of voluntary carbon markets provides income which can be used to incentivize communities to protect and restore natural ecosystems. However, projects cannot solely depend on a single revenue stream to be financially sustainable. Carbon revenue is often 'stacked' with other revenue streams to ensure the viability of the project. In the agriculture and forestry sectors, additional revenue streams include intercropping opportunities in the forest, employment as rangers, or afforestation to decrease sedimentation of downstream water bodies (this includes nursery enterprises and jobs).

Best Practice 3:
PROVIDE ALTERNATIVE ECONOMIC OPPORTUNITIES AND EQUITABLE BENEFIT-SHARING MECHANISMS

When communities are able to benefit from project activities e.g. receiving income from planting seedlings or protecting ecosystems, the project has the ability to induce long-term behavioural change which in turn offers higher chances of successful implementation. Benefit-sharing mechanisms such as payments for ecosystem services should be equitable in terms of recognizing customary rights holders and local communities who have historically and presently contributed to maintaining or protecting the area and ecosystem.

Enabling environment: policy support and land tenure rights

While NbS projects can be fully funded via private investment, they are nonetheless affected by national and local government policies and regulations. This includes policies with regards to selling carbon credits internationally, clarity and transparency of land tenure rights, ownership of the carbon credits, as well as alignment of project outcomes to the socio-economic goals and objectives of government agencies. Government (at central and local levels) plays a range of roles in supporting the adoption of NbS, such as:

1. Acting as a catalyst by supporting project identification and feasibility studies, facilitating collaborations and coordination;
2. Supporting data provision and measurement;
3. Establishing supportive policies such as explicitly targeting NbS in procurement rules or considering marine ecosystems and blue carbon in nationally determined contributions; and
4. Providing investment within blended finance arrangements or credit guarantees for large-scale NbS projects.

Barriers in Asia include the lack of clear national policies regarding the ownership of carbon credits generated from NbS projects and a lack of clarity on land tenure rights. These challenges impact the ability of communities involved in the restoration and protection activities to benefit from their involvement. A summary of the status of land rights and policies of some countries in Southeast Asia can be found in **Appendix C**. The following general trends were observed across Southeast Asia:

- While there have been efforts to strengthen land rights through mapping and registering customary land areas, the process is resource intensive and time consuming, and only a small proportion of communities have received recognition of their land tenure and rights thus far.

- There have been conflicts between environmental policies and indigenous land rights. This issue is compounded by overlaps in land ownership in different maps, which lead to contested land title and tenure claims. Some national park agencies have demarcated and implemented conservation areas where indigenous people reside, and the dwellers are subsequently prosecuted or evicted by the authorities.

- While some countries do have basic legal frameworks and policies that recognize the customary land rights of local communities, their effectiveness depends on local enforcement. Corruption, as well as illegal encroachment often lead to violations of human and land rights. Accountability and reparation mechanisms, as well as enhanced security measures are pivotal for implementing land rights policies.

- Laos PDR and Vietnam are the only countries in Southeast Asia with legal provisions (albeit ambiguous) for rights to carbon credits to be transferred to indigenous peoples and local communities.[16]

Best Practice 4:
CLEAR DEFINITION OF LAND TENURE AND ACCESS RIGHTS

Projects should uphold the rights and access to land and resources, especially of vulnerable and marginalised groups including indigenous peoples.[17] *NbS projects should provide evidence of land rights or tenure e.g. agreements and certificates of customary ownership by locals, and clarity on the sharing and ownership of any carbon credits (if applicable).*[18]

2.2 Project Implementation

Project implementation is essential to the success of NbS projects. This requires scientific, traditional and local knowledge regarding ecosystems and the application of appropriate interventions to protect, manage and restore them. Equally important, NbS requires business, planning and execution expertise to ensure that projects are viable and investible, and solutions can be scaled up efficiently.[19]

Capacity of Project Developers

Implementation success is hugely dependent on the project implementers and partners, especially local communities. The skills and experience of project developers are also important, as such organizations play a role in 'orchestrating' and coordinating with the right stakeholders to be involved. Given the role that project developers have in the design and implementation of NbS projects, they need to demonstrate a variety of different skills including:

- Expertise in conservation and finance;
- Experience in project design and implementation informed by theory of change and the investment thesis;
- Understanding of business and investment models, including investment instruments like green or climate bonds, and payment for performance models;
- Strong understanding of project context, and relationships to NbS beneficiaries;
- Knowledge of policy context and the levers for NbS in project jurisdictions, including aspects such as land or resource tenure.

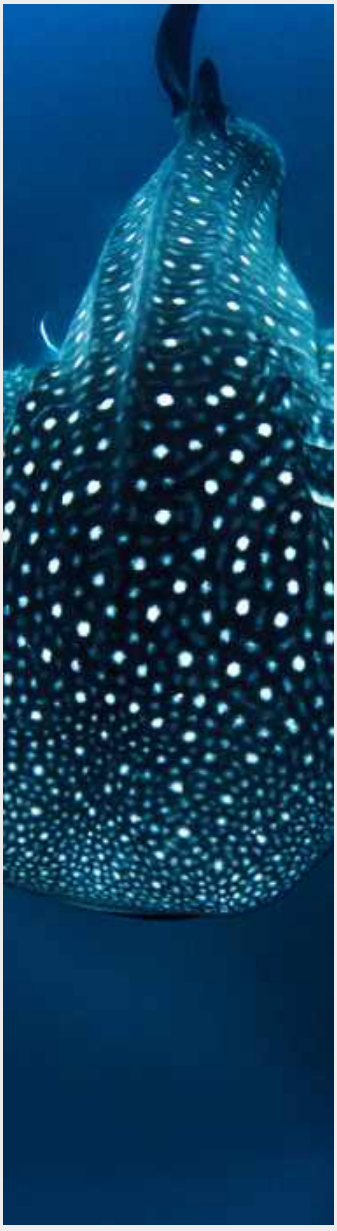
Best Practice 5:

PARTNER WITH EXPERIENCED AND WELL-ROUNDED PROJECT DEVELOPERS

NbS projects are complex given that they involve multiple stakeholders and also entail managing natural ecosystems, which can be unpredictable. Therefore, working with project developers with experience developing projects, strong science background, carbon market experience and the strong intention to benefit communities will increase the likelihood of success. Having said that, the number of project developers with all of these experiences is limited.

Local community organisations and cooperatives

Having the relevant skills and an enabling environment are pivotal to allow local communities and organisations to support project implementation. Local organisations may be interested to engage in restoration and conservation activities, but in order to ensure that projects can be implemented well on the ground, it is also crucial to assess the capacity and capability of these local organisations and stakeholders. Ideally, local organisations involved in projects already have existing capacity in project-related areas and only need some additional support such as technical knowledge and training, support in developing business models for small enterprises that can create alternative livelihood opportunities, access to markets for the products, etc. On the other hand, local communities are able to offer contextual insights and considerations that project developers are not aware of, and hence also provide a learning opportunity. All of these elements need to be considered and included in the project design and implementation planning.



Interviewee Perspectives

If the capacity and knowledge of the local community and partners is properly developed, the potential of success and the generation of co-benefits to carry on without a project developer's input is much higher.

Best Practice 6:
CAPACITY BUILDING

While projects seek to involve the local community in environmental conservation or restoration efforts, there is a need to understand and address the requirements or challenges that the local community faces. Some of such challenges may be resolved through training and education (e.g. training for wildlife monitoring, climate-resilient and sustainable agriculture etc). Capacity building should ensure that while locals receive training on protecting, sustainably managing or restoring an ecosystem, they should also be empowered through improved livelihoods, access to sanitation and education, understanding their land tenure rights, etc.

2.3 Measurement, Reporting and Verification

While the design and implementation of a NbS project are pivotal to its success, understanding how to measure, report, and verify outcomes and impact is key to evaluating whether projects are achieving the intended outcomes in practice, assessing implementation, and unlocking further financing opportunities.

MRV systems for NbS projects must be aligned with the project goals and bespoke MRV frameworks may need to be used in recognition of the complexity of NbS interventions. For example, ecosystem-based adaptation to climate change (a strategy that fits under the category of NbS) entails harnessing ecosystem services for the protection of communities (e.g. mangrove forests protecting coastlines against storm surges), provision of alternative goods for communities (e.g. agroforestry products in regions experiencing rainfall oscillations) and regulation of essential resources (e.g. forest cover protecting watershed recharge areas).

However, MRV must be fit to the intended purpose of NbS projects. MRV systems required under certification schemes are designed to produce evidence only for the certification objective. For example, a project claiming carbon credits will generally follow a protocol for monitoring carbon capture or avoided emissions. Despite other socio-ecological co-benefits beside mitigation, if not verified the project cannot claim these additional benefits under its certification.

While best practices in MRV frameworks for NbS are still emerging, common factors for best practice mentioned in interviews and observed in literature (including project documentation), include one or more of the following:

- Design MRV according to specific and clear goals and indicators that can demonstrate achievement, and help establish the baseline for the NbS project.
- Integration of MRV into the various stages of the project life cycle, from design to completion.
- Provision of independent verification or auditing (particularly for projects that involve accessing finance).
- Carefully tailored indicators that can either demonstrate the achievement of objectives or the intermediate outcomes that will lead to the ultimate goals of the NbS project in the long run.
- Verification of community and stakeholder involvement in decision-making for the design and implementation of the project.
- Frameworks with embedded contingencies to overcome unforeseen challenges and barriers for the project.
- Considerations to assess the permanency (and long-term sustainability) of the obtained results of the project (particularly since NbS projects can take time to demonstrate impact i.e. recovered ecosystem).

Monitoring Plan and Design

Evaluation actions must be designed to cover the different phases of development of a NbS project **(Figure 3)**. While NbS projects can have the advantage of delivering multiple, synergistic benefits, they are complex to measure. The level of uncertainty in NbS project outcomes (and impacts) can be high as ecosystems are influenced by a number of variables, many of which cannot be controlled entirely by a planned intervention or project.[i]

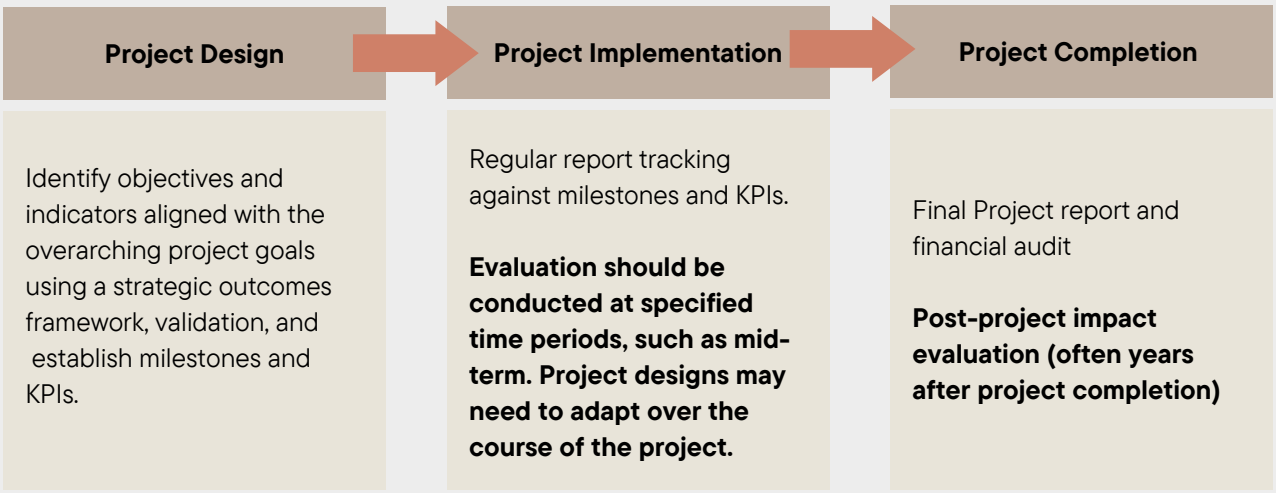


Figure 3: Illustration of evaluation within the NbS project cycle

Best Practice 7:
REGULARLY MEASURE, MONITOR AND REPORT PROGRESS (AGAINST BASELINE CONDITIONS) TOWARDS KEY PROJECT OUTCOMES AND GOALS

The ecological and socioeconomic data from monitoring can be used to inform the effectiveness or limitations of the interventions. Correspondingly, adapting implementation following evaluations enables project objectives to be met (or potentially altered). Impact reporting and communication are important and should be transparent and available to all stakeholders.

Interviewees also revealed that the Theory of Change model is a useful framework for evaluating the progress of complex, multifaceted and long-term NbS projects. It enables the tracking of short-term outcomes that enable the long-term impact. Interim reviews of activities, outputs and outcomes allows for adaptation and redesign to achieve the intended impact.[20]

[i] Natural cycles are often driven by time scales that will surpass project monitoring capabilities, leaving project managers with the challenging task of designing interventions with measurable intermediate outcomes that provide enough evidence of what the ultimate results will look like in the future (post project).

Input	Activities	Output	Outcome	Impact
Restoration and sustainable management of mangroves in a degraded area	Mangrove Planting	Restoration and sustainable management of mangroves in a degraded area	Conservation or restoration of ecosystems, increment of species diversity	**Biodiversity conservation**
	Capacity building and training for local communities		GHG emissions reduction/carbon sequestered	**Climate change mitigation**
	Collaboration with local community to co-develop sustainable business models		Improvement of ecosystem services, reduced vulnerability and risks e.g. exposure to storm surge	**Climate adaptation and livelihoods/ social**

Figure 4 Theory of change for a NBS solution for climate mitigation, adaptation and biodiversity outcomes (Source: Mana Impact) [ii]

Using the example of mangrove restoration, **Figure 4** illustrates applying a Theory of Change framework to link the inputs and outcomes for the main impacts of interest in this research – climate mitigation, biodiversity conservation, climate adaptation, and livelihoods.

Best Practice 8:
COMMUNITY-CENTRIC MONITORING, INCLUDING PARTICIPATORY MONITORING WHENEVER POSSIBLE

Community involvement is critical to project success. Enabling the local community to monitor the project helps to increase inclusion, but also improves the quantity of data collected at a more affordable cost compared to technology-intensive measurement methods.

[ii] This is a general framework depicting the potential outcomes and logic model for NbS in mangroves. In practice, the ToC framework is usually tailored to the site and the project developer and/or funder's objectives.

Global and industry standards and frameworks for MRV

Standards provide specific requirements for the 'what' and the 'how' in measuring NbS impact, including generally accepted metrics. Frameworks on the other hand act as a reference or guidance for best practice and are usually principles-based. However, this distinction is often not clear and the terms are sometimes mistakenly interchanged.

The frameworks and standards presented below provide an overview and analysis of the most commonly used or referred to for measuring the impact of NbS projects globally (**Figure 5**). These standards and frameworks are not applicable for the valuation of ecosystem services or natural capital accounting practices (such as the Taskforce on Nature-related Financial Disclosures or Aligning Accounting Approaches for Nature). A summary of each framework for MRV can be found in **Appendix D**.

Figure 5. Major standards and frameworks for Measurement, Reporting and Verification of NbS Projects

Best Practice 9:

ALIGNING MEASUREMENT AND REPORTING OF THE PROJECT WITH CONVENTIONALLY ACCEPTED STANDARDS AND MOST UPDATED SCIENTIFIC METHODOLOGIES

Projects should at a minimum align goals to global targets and goals (e.g. SDGs). The IUCN Global Standard for NbS provides a good starting point for understanding requirements and considerations that NbS projects should take into account. Verification standards also provide guidance on common methodologies that projects can adopt for measurement. It is crucial to keep in mind that impact measurement is ultimately context-specific and depends on the intended goals of the NbS project; bespoke MRV frameworks may be required in recognition of the complexity of interventions.

International conventions and targets provide benchmarks for NbS project goals and objectives. Some targets and corresponding indicators correspond to the UN SDGs, as well as the Convention for Biological Diversity's Aichi Targets and the Post-2020 Framework. These frameworks are generally easy to align with due to their broad nature, and provide a common basis for communication across sectors and countries.

An emerging international framework is the **IUCN Global Standard for Nature-based Solutions**, which seeks to standardise the definition and scope of Nature-based Solutions, and support a more consistent approach to designing, measuring and verifying solutions-oriented outcomes of NbS interventions. It identifies eight criteria that correspond to the principles with respective indicators for each criterion (**Figure 6**), and can be used as a self-assessment tool. Rather than specifying indicators to be used, it provides guidance on developing indicators that are context-specific.[21] Given that the framework was launched only recently (July 2020), it is yet to be widely used. Nonetheless, it holds the potential for grounding the design and evaluation of NbS projects in a science-based approach.

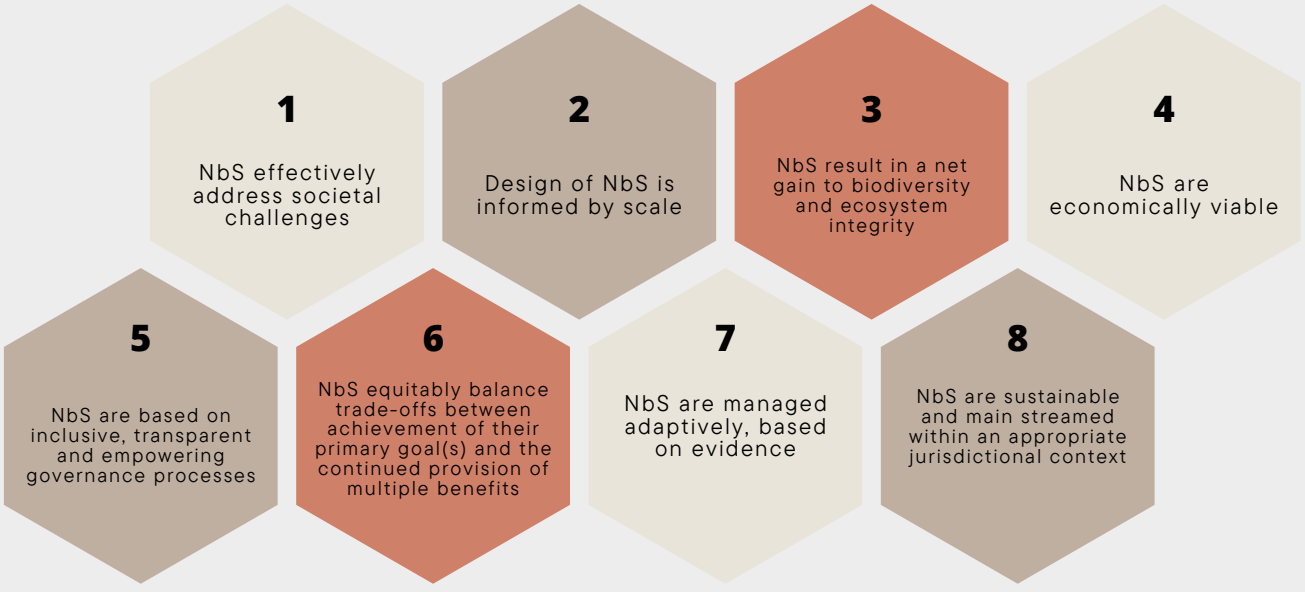


Figure 6. Criteria of IUCN Global Standard for NbS[22]

IRIS+ is one of the most common impact measurement and reporting frameworks currently used by impact investors.[23] The Navigating Impact Project has developed new investment themes related to NbS (largely in the Biodiversity theme) which help investors to frame and understand their investments' contribution to social or environmental impacts, and subsequently employ the framework for impact assessment and reporting purposes.[24] While the IRIS+ framework has not been used widely by NbS project developers, it could be of particular interest for investors in linking impact reporting from a project level to a portfolio level.

Third-party Verification

Verra, Gold Standard and Plan Vivo are some of the most recognized verification registries for NbS at present. In addition to the aforementioned general frameworks that can be applied across ecosystems and geographical boundaries, there are frameworks, standards and certifications that only apply to specific ecosystems or industries (**Appendix D**).

For example, prominent voluntary certification standards for the sustainable management of forest ecosystems tend to be sector-specific, including the **Forest Stewardship Council** (FSC) label and the **Sustainable Forestry Initiative** for the forestry sector, or the **Rainforest Alliance** for the agriculture sector. In particular, FSC has an Ecosystem Services Procedure (*FSC-PRO-30-006*) which provides a framework for verifying impact and ecosystem services claims. However, a common criticism of such voluntary certification standards is that many still lack a comprehensive coverage on the biodiversity and cultural aspects of NbS.[25]

Best Practice 10:
VALIDATION AND VERIFICATION OF PROJECT RESULTS BY A THIRD-PARTY, INDEPENDENT ORGANISATION

Projects that can be verified against recognized protocols avoid unfounded claims of project sustainability which could jeopardise the project's reliability and be dismissed as greenwashing. However, costs and access to third party verification (including auditor availability) represent real challenges associated with verification and certification, which are potential barriers in adoption - particularly for smaller-scale projects with less resources. This could be addressed by the project sponsors by adequately resourcing through the project cycle.

Gender is another aspect that has been explored by practitioners, in terms of ensuring gender equity in the NbS agenda.[26] In light of the disproportionate impact of climate change on women and women's essential role in biodiversity conservation, it is pivotal to ensure gender representation.[27] However, women face gender gaps including legal and social rights to resource access and underrepresentation in decision-making.[28] Moreover, metrics used tend to focus on quantifiable outputs such as the number of women employed or benefiting from projects, rather than qualitative criteria such as women empowerment and a generally more holistic gender framework as seen in the W+ Standard. The W+ Standard quantifies women empowerment in terms of time savings, income & assets, health, leadership, education & knowledge and food security.[29]

The role of technology in MRV for NbS

Advancing technology and tools are opening new possibilities to measure, report and verify the impact of NbS solutions. Most of these technologies have multiple applications and the data collected can be used for different purposes, including measuring, reporting and verifying ecosystem health, climate mitigation, climate adaptation and biodiversity. Technologies reviewed for this Report (**Figure 7**) include satellite and remote sensing (including drones), underwater drones, acoustic technologies, camera traps, environmental DNA (eDNA), mobile applications, and artificial intelligence software.

Camera traps and acoustic monitoring are some of the most established tools that have been used in the past few decades for ecology conservation efforts. Remote sensing has also been one of the game-changing technologies in the context of MRV of NbS, with multiple applications such as satellite and aerial imagery that verify forest cover, underwater cameras that measure the number or density of coral species in a specific seascape, or sensors that detect water quality, sedimentation and temperature. For instance, the **Allen Coral Atlas**, created through the use of high-resolution satellite imagery and advanced analytics, is the first map of the world's coral reef extent with unprecedented detail and accuracy.

However, most satellite imagery tools are not able to determine the health of trees or corals, or ecosystems in more granular detail. In order to determine ecosystem health, higher resolution images provided by hyperspectral imaging devices or LIDAR techniques are used to provide more detailed habitat maps and structure, and variables of interest such as estimates of aboveground carbon. Sonar technology, which combines a sound source with hydrophone to sense the surrounding environment, can provide information on water depth, seafloor topography, current, fish presence or absence, and thereby provide more insights on factors impacting coral health.

	What it is used for	Examples of Companies or Tools
Earth observation and spatial analysis: satellite and remote sensing (e.g. drones), and Geographic Information Systems	Use of satellite and aerial imagery, or other geospatial data to map, measure and assess land cover and land use changes to the ecosystem, such as forest cover	Chloris Geospatial, SATELLIGENCE, EARTH BLOX, SWIFTGEOSPATIAL, SPIRAL BLUE, opernicus
Acoustic monitoring	Using sound to monitor wildlife and biodiversity	WILDLIFE ACOUSTICS, RAINFOREST CONNECTION, Ocean Acoustics Ltd, appiko, OCEAN SONICS
Environmental DNA (eDNA)	Sequencing DNA from e.g., water samples to detect the presence of particular species	EnviroDNA, GENIDAQS, Applied Genomics, Precision Biomonitoring, WILDERLAB, NATURE METRICS
Artificial Intelligence and modelling	Supporting the interpretation of data, such as using AI to automate the identification of species in photos from camera traps and satellite, or modelling of carbon	cloud agronomics, Pachama, regrow, Lynker, WILDME, Conservation Metrics, ReefSupport
Cellular technology and cloud platforms	Enabling citizen science where users can enter data onto a platform, e.g., via a smartphone app	iNaturalist, ReefCloud, Merlin, SMART, MAMMAL, SeagrassSpotter
Underwater drones and robots	Collect ocean data from underwater imagery to water quality indicators	planblue, SOFAR, ACUA, aquaai
In-situ water monitoring devices		molluSCAN, Hohonu

Figure 7: Summary of Technologies Reviewed for this Report

Most technologies reviewed are designed to measure and capture particular dimensions or conditions of an ecosystem, but in order to make a comprehensive assessment of the state of landscapes and seascapes and impact of NbS interventions, there is a need to integrate and analyse different dimensions and parameters. Therefore, the real opportunity lies in technologies that can analyse various sources of data in real time and correlate these data sources to make an assertive evaluation.

There are an emerging number of data analytics platforms powered by machine learning and artificial intelligence that provide detailed and real time analysis of the state of the ecosystem by integrating different data sets and dimensions. On the forest carbon market front, some companies that have garnered major interest and attention from investors include **Pachama** (which raised US$55 million in its Series B round) and **Sylvera** (which raised US$32 million in its Series A round). Through leveraging AI to analyse data from remote sensing, LIDAR, satellite and aerial imagery, these companies monitor and evaluate projects to determine if they offer "high quality" and trustworthy carbon credits.

The increasing use of voluntary carbon markets has significantly increased interest, particularly among investors, for technologies that can measure carbon storage or predict the potential for carbon sequestration of different landscapes. Furthermore, these technologies also have the potential to significantly lower the costs of measurement and thereby create a more inclusive carbon market. Currently, MRV costs associated with meeting the requirements of the verifying bodies such as Verra or Plan Vivo are high and leave most smallholder farmers unable to benefit from the ecosystem services that such projects deliver.

However, accuracy levels for various key impact indicators have yet to achieve maturity (**Table 4**), which means deployment at scale beyond pilots is relatively rare. Therefore, depending on the levels of accuracy needed, it is best to complement the analytics derived from remote sensing technologies with on-the-ground manual measurements at present. As more data is collected and used by machine learning algorithms, accuracy will improve, enabling deployment at scale across different ecosystem types. Nonetheless, a survey of conservation technology practitioners led by **WILDLABS** highlighted Artificial Intelligence (e.g. machine learning and computer vision technologies), environmental DNA (eDNA), and networked sensors to be the top emerging conservation technologies with the highest potential to revolutionize data collection and analysis.[30]

Table 4: How various technologies can be leveraged to measure impact indicators [31-32]

Outcome	Key Metric	Applicable Technology	Usage of the Technology	Technology Maturity
Ecosystem Properties	Area (and connectivity) of natural land/ seascape conserved, protected, restored or sustainably managed	**Space-based remote sensing** i.e. satellite	• Map, measure and assess habitat cover, extent, condition and changes to the ecosystem. • Colour images can be related to geophysical variables e.g. temperature, patch size, habitat fragmentation, and connectivity.	Established technology, commercialised.
		Airborne remote sensing via aircraft, drones, UAV etc.		
Climate mitigation	Net amount of CO_2 stored/ sequestered/ removed/ reduced	Inferred from **space-based or airborne remote sensing** data	• Multispectral and hyperspectral images can provide more details on vegetation at the species level, and soils (geology, chemistry). • LiDAR also detects vegetation height, 3D structure and biomass to estimate aboveground carbon content.	Established for above ground data, low accuracy for soil and below ground data.
		Ground penetrating radar	Uses radar pulses (radio waves) to capture images of the subsurface, to estimate soil carbon content and belowground biomass.	Used mostly in agriculture; still nascent.
		Computing software: modelling	Modelling of carbon content based on other land cover data e.g. projecting belowground biomass based on aboveground biomass.	Currently used, but accuracy depends on the quantity and quality of input data, as well as the model. There is still major uncertainty associated with carbon below ground.

Climate Adaptation	Reduction in area or costs associated with damage by floods, wildfires, storms.	Inferred from **space-based or airborne remote sensing** data	Satellite and aerial imagery can help to map, measure and assess conditions and changes to the ecosystem e.g. area of burnt wetlands or grasslands, extent of flood damage etc.	Remotely sensed data and imagery have been applied for modelling and monitoring flood and fire risks and occurrence.
Biodiversity	Endangered, threatened or target species composition and trends (e.g. number of species or individuals impacted, conservation status).	**Camera traps** (including baited, or remote underwater video)	Capture images or videos after being triggered by an animal to monitor wildlife.	Established technology, standard tool
		Environmental DNA	Genetic material is collected from an environmental sample e.g. water, soil, sediment etc to assess the biodiversity in an area in the past & present.	Nascent and relatively expensive.
		Acoustic monitoring	Record sound in response to acoustic triggers or at pre-programmed intervals to monitor wildlife (vocal species).	Established technology
		Cellular technology e.g. smartphone applications	Smartphones have multiple sensors that can capture various data i.e. image, sound, ambient light, temperature, location etc. Mobile apps and access to the internet allow users to send data remotely, thus supporting data crowd-sourcing & citizen science.	Relatively novel / developing but low-cost.
		Computing software: databases and AI	Online databases and platforms: allow users to submit and/or retrieve data to facilitate data crowdsourcing and citizen science. Artificial intelligence: automated identification and sorting of species in images and sounds.	AI is relatively nascent and not widely used, but is developing rapidly.

Biodiversity	Seedlings: number and diversity of tree species, survival rates	**Airborne remote sensing** i.e. aerial imagery via aircraft, drones, UAV etc.	Multispectral and hyperspectral images can also provide more details on vegetation at species level, and soil geology, and chemistry.	

While there are a number of technologies available to measure biodiversity related outcomes, for most of the projects (available on carbon or nature markets) reviewed for this Report, the utilisation of these technologies is relatively limited to camera traps, or even reliance on manual biodiversity survey methods. This may be partially due to the costs involved for newer technologies such as eDNA, as well as the fact that the biodiversity verification requirements are not yet as rigorous by comparison to the verification needed for carbon credit purposes. Yet, it is interesting to note that the technologies for monitoring biodiversity (mentioned in **Figure 7** and **Table 4**) are frequently coupled with crowdsourced or community-based monitoring. For instance, the **SMART Conservation Tool** provides communities and practitioners with data models for biodiversity monitoring via a smartphone app, while **Rainforest Connection** works with indigenous groups and local partners to detect illegal logging and monitor species through bioacoustics technology and a platform with real-time sound data.

Moreover, the discussion of technology in NbS has mostly been relevant for measuring the indicators for climate mitigation and biodiversity, and to a smaller extent for social impact. Data collection on social and livelihood impacts are still driven by qualitative research methods on the ground, although the process can be supported with the use of smartphone apps, rather than remote data collection through MRV technologies.

In addition, technologies for terrestrial measurement are more advanced than for marine ecosystems, especially for measuring carbon sequestration. This is not surprising given there have been more spatial and temporal data captured for terrestrial projects, particularly forestry. This allows predictive models to have a higher degree of accuracy. There are opportunities to leverage and adapt existing technologies used in the terrestrial MRV for marine ecosystems. Challenges to this include access to marine datasets, high cost of measurement and the availability of data models that can accurately reflect carbon cycles in marine environments, which allows for real time data analysis.

Another observation is that there are significantly more data analytics companies in North America and Europe than in Asia. Given that the accuracy of data models depend highly on the source, quantity and quality of the data, promoting the development of more data analytics companies based in Asia will support the growth of more accurate measurement tools for NbS projects in the region. Therefore, impact investors or philanthropy organizations that are interested in catalysing NbS projects in Asia should consider this as an important ecosystem enabling opportunity.

Leveraging citizen science for data collection

Citizen science and crowdsourced monitoring has the power to generate additional sources of data that can complement and augment the amount of data available to make analytical models even more accurate for NbS MRV purposes (**Figure 8**). Many monitoring techniques require little technical skills, therefore teaching community members to be citizen scientists can be cost effective. It is however, extremely important that communities are trained on what type and format of data to capture to ensure data quality and consistency.

Furthermore, if communities can reap the benefits from the collection of data, then their contributions can be relied upon in the long run. One important factor to take into consideration is internet connectivity, as many of the areas where NbS projects are located are remote with poor connectivity. It is crucial therefore that data can be captured both online and offline. The main barrier to citizen science is the validation of information collected given that verification bodies such as Verra require the presence of experts for verification purposes.

Interviewee Perspectives

Past projects on ecosystem assistance have proven that citizen science offers a low cost and fixed cost approach to obtain information and provides great potential for involving the community. Engagement with the community allows them to understand how their livelihoods are connected to ecosystem health.

Figure 8: Example of citizen science in coral reef monitoring

THE NEW HEAVEN PROJECT

Monitoring of wildlife within the coral reefs of Koh Tao, Thailand

Image source: New Heaven Reef Conservation Learning Resources Koh Tao Maps

Overview

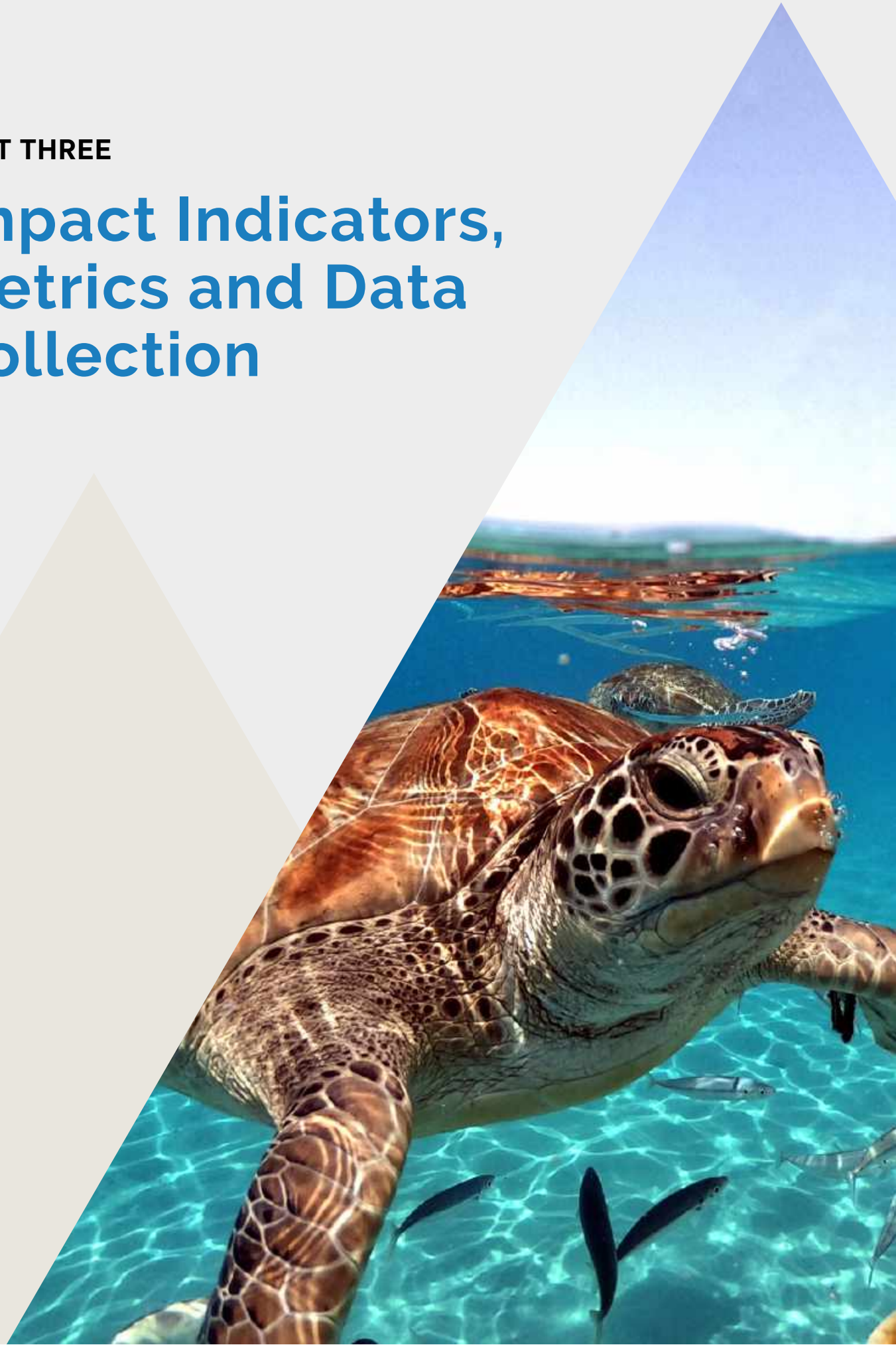
Citizen science within this project can be seen at all stages of progression. From the beginning with artificial reef creation to restore coral in addition to ongoing selective coral breeding and culturing projects. These citizen scientists are local and international visitors who are given the opportunity to upskill through various marine courses.

Additionally, since 2015 citizen science has played a major role in the co-benefit monitoring of this coral reef restoration project. Beginning with a Sea Turtle ID program which has successfully identified, recorded, and named over 70 turtles around Koh Tao. Following this, Koh Tao Whale Sharks was set up to collect pictures to identify whale sharks in the area, and add them to a citizen science website.

General monitoring through surveying and photographing of species inhabiting or damaging the reef are also commonly helped by citizen scientists, with predator species named corallivores, (animals which eat corals) closely monitored.[33]

PART THREE

Impact Indicators, Metrics and Data Collection



Indicators are a key element of an effective MRV system and can track different aspects and stages of a project according to the project's Theory of Change framework. Indicators can be broadly grouped into two categories: process (scope, input-output, project milestones) and results (outcomes and impact). In order to measure and monitor the ecosystem changes of NbS projects over time, a combination of lagging and leading indicators need to be considered. Other factors for indicator selection include:

- A **broad range of indicators and metrics that differ in specificity**. Academic papers that delved into project examples had more 'low-level' metrics and indicators. On the other hand, standards such as Plan Vivo and Verra, and frameworks from development financial institutions such as the Asian Development Bank and Global Environment Facility provided more high-level or 'umbrella' indicators.

- Indicators and metrics used are **aligned to overall goals or targets** of a project, since NbS projects rely on MRV and monitoring and evaluation systems indicators to provide evidence that NbS goals will be met.

- **Availability of data, methods and procedures** also shape the selection of indicators.

Interviewee Perspectives

Although it is generally advisable for projects to adopt a context-specific, bottom-up approach on monitoring indicators, it is also strongly recommended that the developers screen and compare existing methodologies for their applicability to the case. There are currently several methodologies, for instance Verra's greenhouse gas accounting methodologies and proposed indicators for several asset types. Various standards are seeking to limit the development of new methodologies for project activities for which other methodologies already exist, in a bid to ensure more universal consistency and standardisation in the indicators used.

Scale and connectivity of an ecosystem is particularly important for ecosystem services and biodiversity conservation. Projects need to look beyond the number of hectares of a project site, to whether there is fragmentation or leakage in the site.

Condensed summary of identified asset metrics / indicators

Several indicators were found to be commonly used in actual projects or mentioned in frameworks for all seven ecosystem types covered in this Report. These indicators are grouped in **Table 5** according to specific outcomes of ecosystem health, climate mitigation, climate adaptation, biodiversity and social/livelihoods.

Specific indicators for the different asset types are recommended in addition to the general indicators. The diagrams below (**Figures 9 to 15**) provide a snapshot of some of these indicators. A longer list and more details about each indicator can be found in **Appendix E**. It is important to note that the indicators listed here are not meant to be exhaustive, and are dependent on the context and purpose of the project.

Table 5: General indicators that apply to all ecosystem types

Outcome	Indicator
Ecosystem health	Area and connectivity of natural land/seascape conserved, protected, restored or sustainably managed
Climate mitigation	Net amount of CO_2 stored/ sequestered/ removed/ reduced
Climate adaptation	Reduction in area or costs associated with damage by floods, wildfires, storms Number of people trained or with awareness raised on climate change risks and adaptation planning
Biodiversity	Endangered, threatened or target species composition (e.g. number of species or individuals impacted, conservation status) Seedlings: number and diversity of native species, and survival rates (for restoration projects)
Social / livelihoods	Number of locals with improved skills through training (total and by gender) Number of jobs created/people employed (total and by gender) Number of people with improved livelihoods/income, or percentage increase in income (total and by gender) Representation and participation of women in governance e.g. number of women in leadership roles, or active in project discussions and decisions

Forest Indicators

In general, NbS metrics for forests adopt indicators that measure the protection, restoration or increment of ecosystem function such as biophysical and ecological dynamics that protect processes for water cycles, erosion and carbon sequestration. **Figure 9** summarises the indicators used by NbS interventions in forest ecosystems. More details about the scope and considerations of each indicator e.g. Forest composition and structure can be found in **Appendix E**.

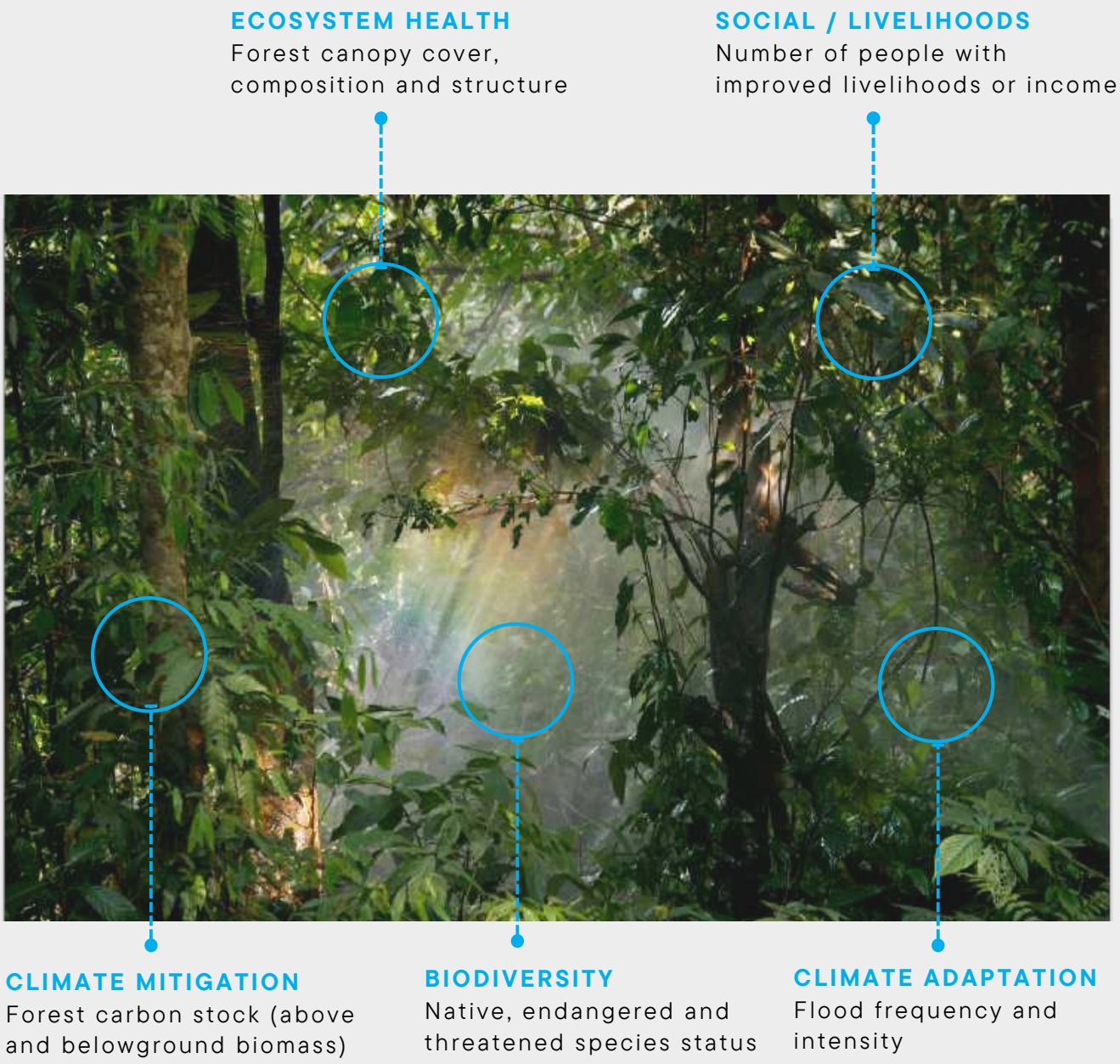


Figure 9 Representation of forest ecosystems NbS interventions, key indicators and targeted outcomes

Interviewee Perspectives

It is important to distinguish between 'quantity' vs 'quality' indicators. The former focuses on the amount of forest cover and condition to estimate the forest's potential to provide carbon sequestration and other services. In comparison, quality indicators are trickier to identify and monitor, from assessing the photosynthetic activity and biomass to tracking how well the forest is growing, as well as the interconnections with faunal species. Some scientific variables highlighted by academics, such as the Normalised Difference Vegetation Index (NDVI), are not commonly applied to projects yet because they tend to require specialist knowledge and specific resources, software or tools.

Savannah Grassland and Rangeland Indicators

In general, indicators for rangelands or grasslands can provide evidence for climate mitigation, biodiversity and ecosystem health **(Figure 11).**

However, vast areas of rangelands are vulnerable to droughts and fire risks, which cause significant carbon emissions. Grassland indicators for livelihoods and social aspects are of importance for NbS interventions involving the conservation of vast areas.

Land-tenure aspects and livestock productivity are metrics for sustainable management of grasslands directly impacting people's lives.

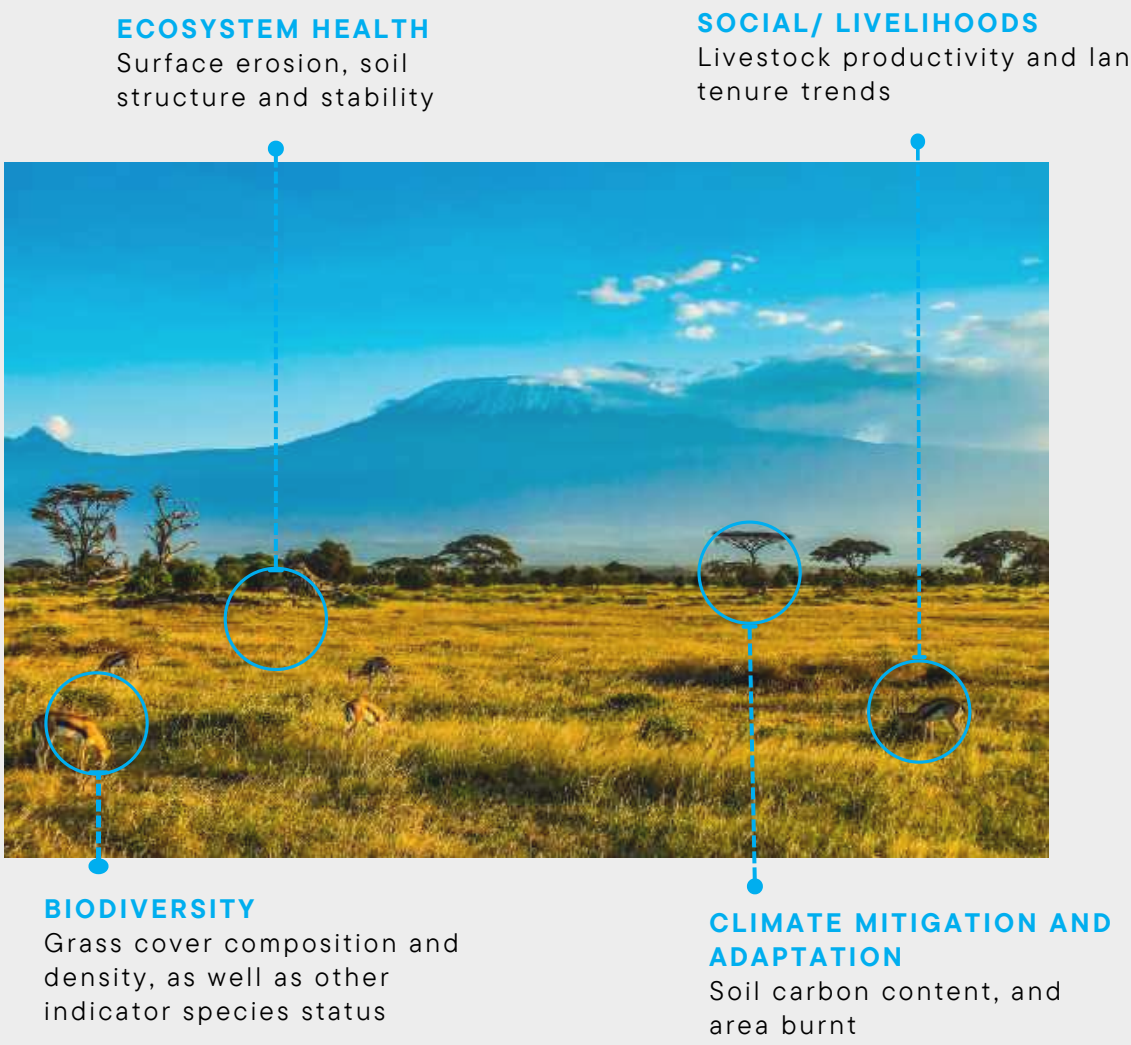


Figure 11 Representation of grasslands ecosystems NbS interventions, key indicators and targeted outcomes

Interviewee Perspectives

Grasslands are immensely diverse, from perennial grasslands and annual dominated grasslands to low productivity soils with different environmental constraints, challenges and threats. There is a need to track targeted biodiversity targets that are specific to the grassland area, depending on the species that are native to the area. Moreover, there are often competing goals, for instance carbon sequestration does not always go hand in hand with grassland restoration; grassland restoration in areas where grasslands loss is attributed to growing shrubs would mean removing the woody species, which also removes their carbon sequestration potential.

Freshwater wetlands/ marsh Indicators

NbS interventions in wetlands or marshes focus on outcomes for climate mitigation, adaptation, biodiversity, and the capacity to provide subsistence and commercial products (e.g. fish) to local communities. The quantity and quality of water retained in wetlands are the indicators of ecosystem health and plant and animal species diversity. Other indicators applied in NbS interventions in wetlands are shown in **Figure 12.**

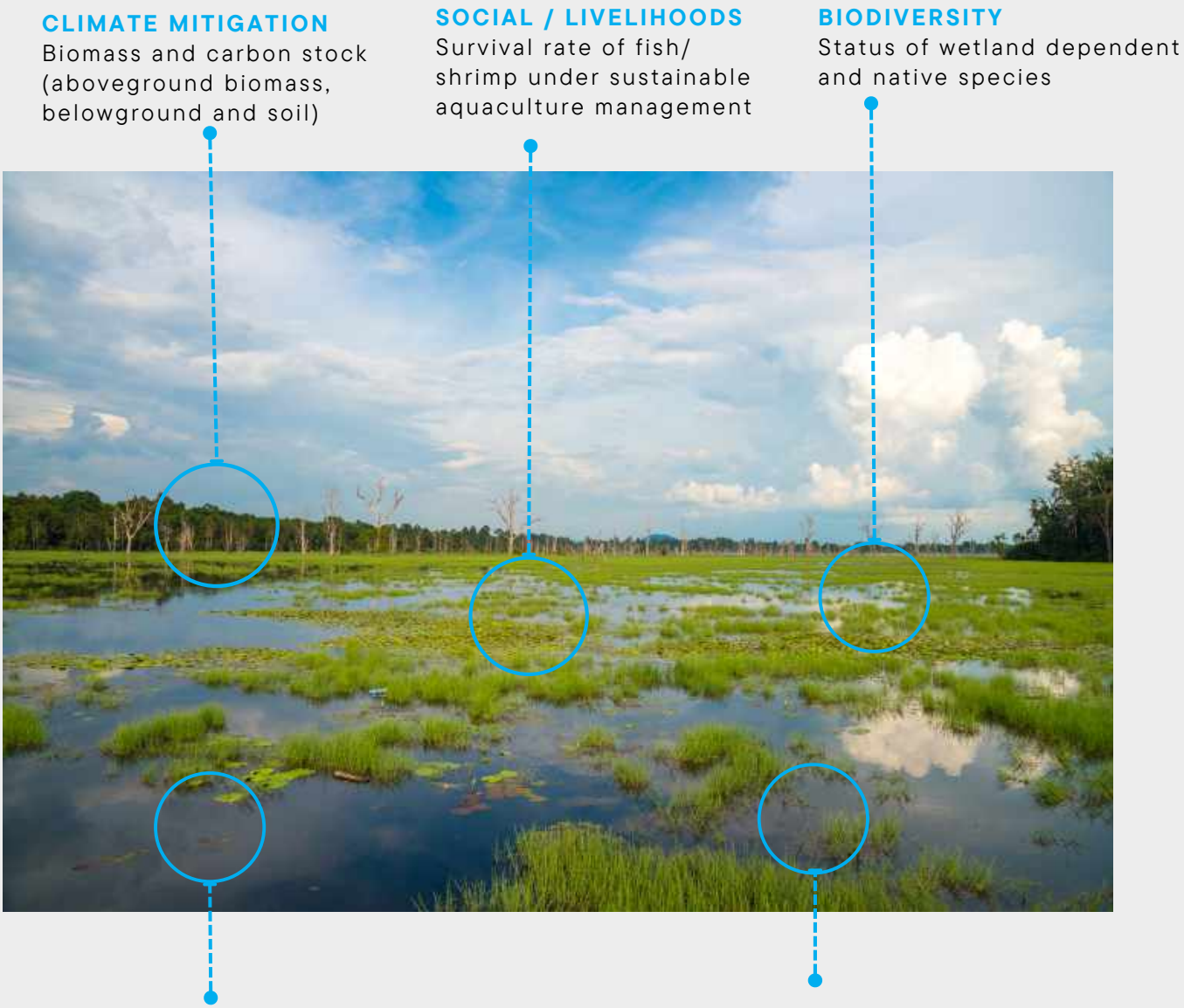


Figure 12 Representation of freshwater wetlands ecosystems NbS interventions, key indicators and targeted outcomes

Peatland Indicators

Peatlands refer to ecosystems with the presence of peat soil; peatlands may also have forests, shrubs or wetlands, and thus some of the indicators for ecosystems discussed in earlier sections may also be applicable. Indicators required depend on the condition of the peat; whether it is pristine, drained, or restored, and the corresponding intervention that is required. Peatland conservation involves preserving pristine peatlands through reducing or removing the main threats, such as land-use transformation, peat drainage, and pollution. On the other hand, peatland restoration includes rewetting drained peat soils, or improving ecosystem capacity through increasing forest cover to capture and store carbon and water (**Figure 13**).

Figure 13: Representation of peatland ecosystems NbS interventions, key indicators and targeted outcomes (Photo by Ken Shono on Unsplash)

Interviewee Perspectives

Peat forest conservation projects that are located in more remote areas may face challenges in including social components, and face higher costs of MRV.

Mangrove Indicators

NbS interventions in mangroves have recently focused on their capacity to capture and store carbon at rates that surpass land ecosystems (i.e. blue carbon). **Figure 14** shows some common indicators measured for mangrove projects. The state and health of the ecosystem measured through biochemical processes underpin the ability of NbS in mangrove ecosystems to successfully deliver the other goals, since increase in biodiversity, optimum carbon sequestration, and contribution to fisheries depend on a healthy mangrove ecosystem.

Figure 14 Representation of mangrove ecosystems NbS interventions, key indicators and targeted outcomes

Interviewee Perspectives

Below ground biomass is rarely measured at present because it is difficult to do so without intrusive methods e.g. cutting down trees. Moreover, biomass only accounts for roughly 30% of the carbon content in mangroves, while soil carbon accounts for the vast majority of carbon storage. Data collection is manually carried out as there are many factors on the ground that affect soil carbon, and the data cannot be accurately estimated through existing remote sensing technology such as satellite imagery.

Seagrass Indicators

Seagrass ecosystem health underpins the ability to provide ecosystem services such as carbon storage, coastal flood control and nursery habitats for key marine species. As for mangroves, NbS interventions in seagrasses have also focused on the ecosystem capacity to capture and store carbon (i.e. blue carbon) at rates that surpass land ecosystems (**Figure 15**).

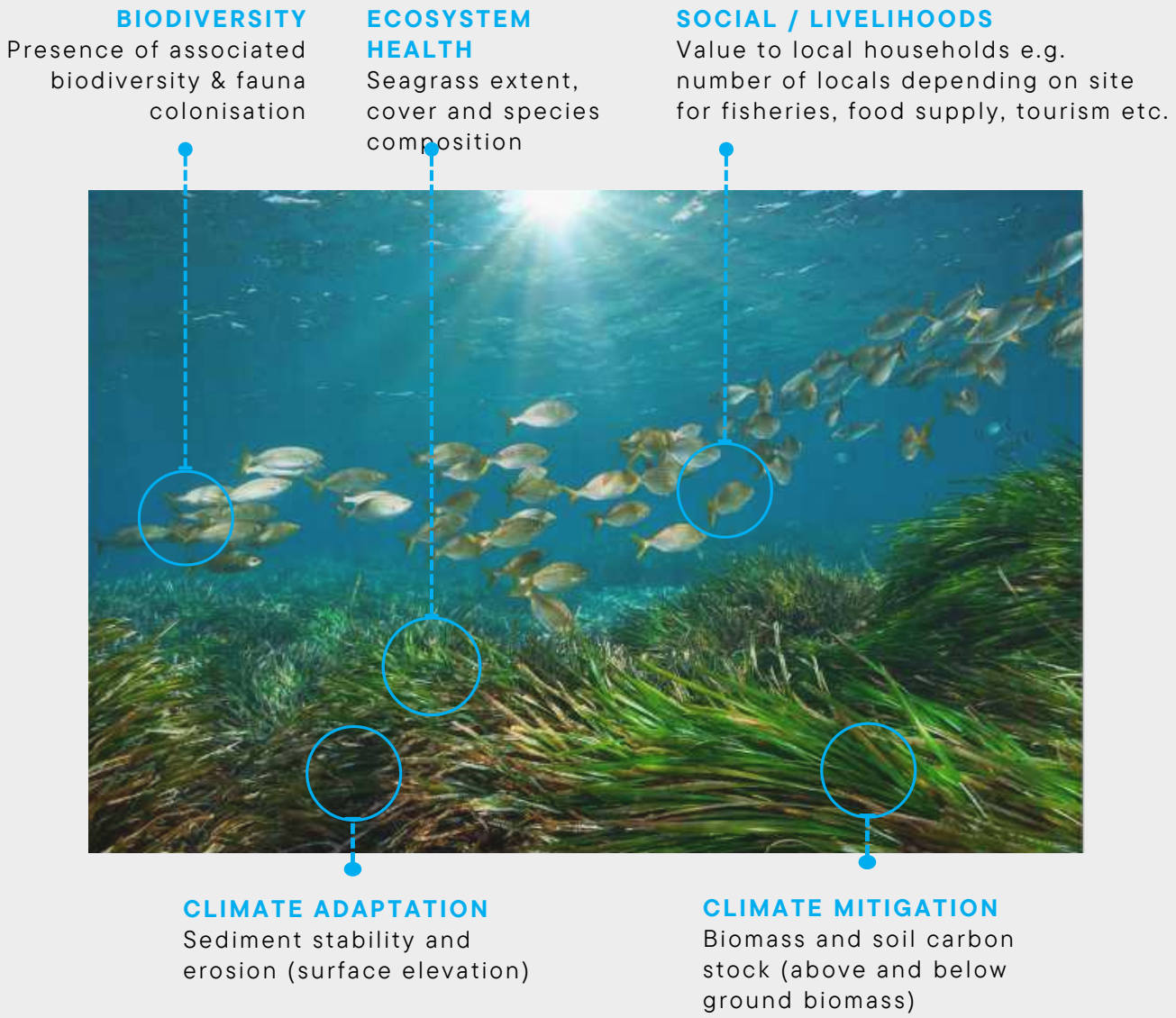


Figure 15 Representation of seagrass ecosystems NbS interventions, key indicators and targeted outcomes

Coral Reef Indicators

Coral reefs provide multiple synergistic ecosystem services: from coastal protection through the abatement of wave strength to providing habitats for key marine species and commercial value. Coral reefs are among the most vulnerable ecosystems to the impacts of climate change such as ocean acidification and increased ocean temperatures. NbS for coral reefs involve both active restoration and conservation. Restoration initiatives are still in the early stages of implementation and assessment, and intervention outcomes are not well understood. Conservation of large areas of continuous coral reef habitats, control of land-based stressors, monitoring coral bleach events and promoting sustainable management and tourism have been the prevalent actions to enable coral reef restoration.

Coral reef projects do not have access to carbon credits given that corals do not capture carbon. However, corals are important and interconnected with blue carbon ecosystems e.g. seagrass and mangroves. **Figure 16** shows indicators for climate adaptation as well as ecosystem function, health and biodiversity, such as coral habitat quality and physicochemical conditions.

Interviewee Perspectives

The indicators for marine ecosystems can learn from the standardisation of methodologies and indicators for terrestrial ecosystems. Nonetheless, there have been several citizen science methodologies and tools that help with data collection.

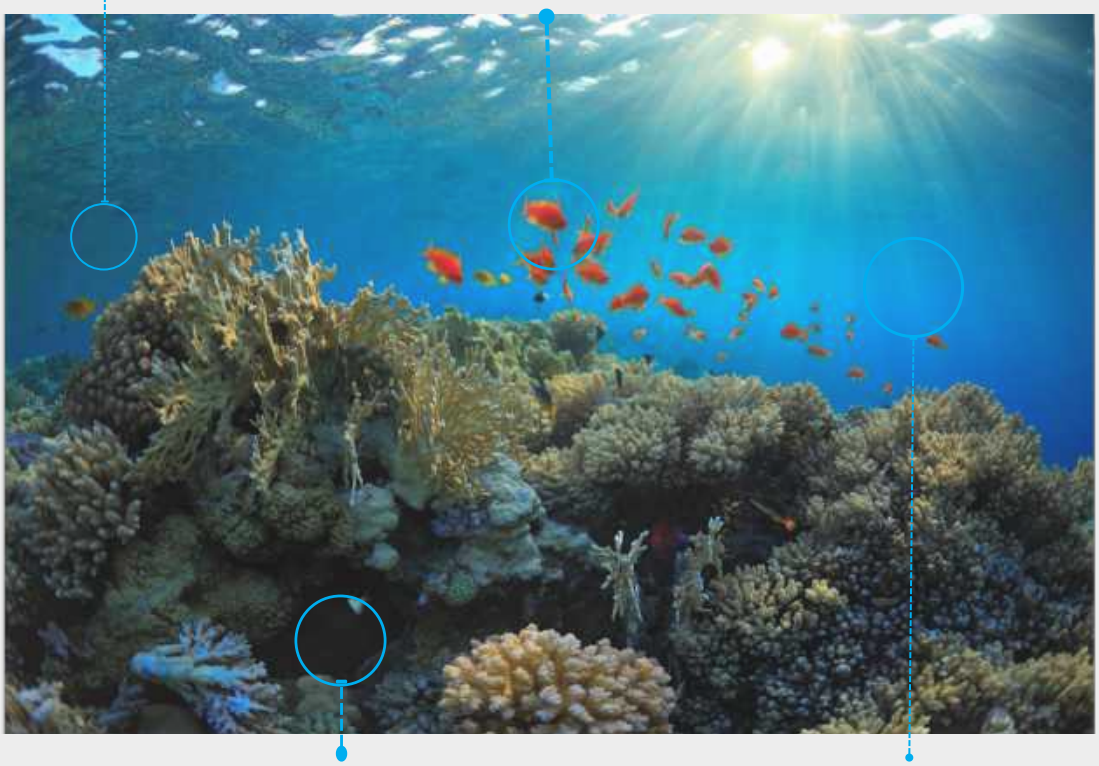
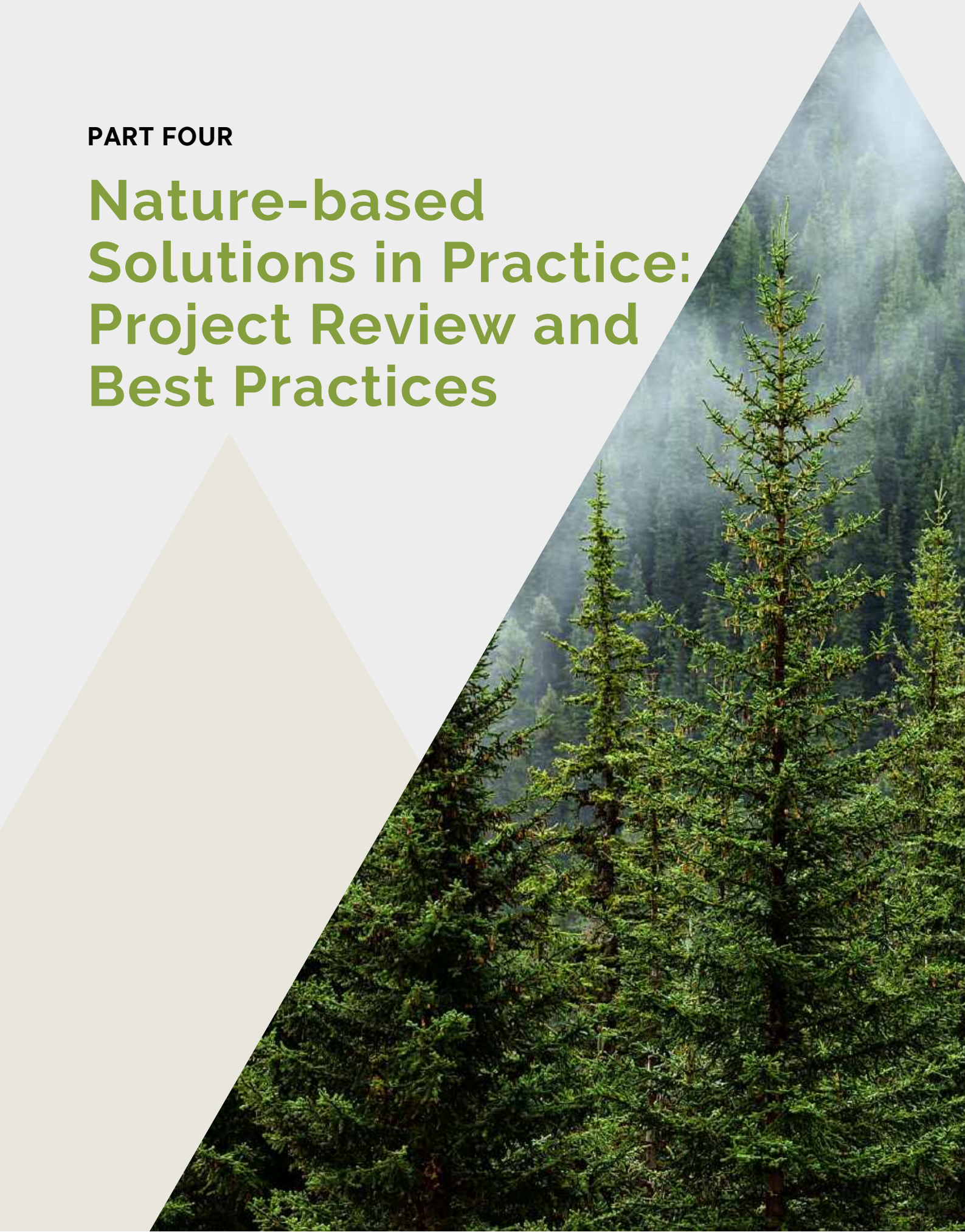


Figure 16 Representation of coral reef ecosystems NbS interventions, key indicators and targeted outcomes

PART FOUR

Nature-based Solutions in Practice: Project Review and Best Practices



4.1 Review of NbS Projects

The review of NbS projects in this Report was based on desktop literature, including reports and disclosures by projects on registries and relevant websites (**Appendix A**). A total of 560 projects from 10 secondary sources and several interviews were screened for this research. The analysis does not evaluate actual practices or outcomes on the ground, which would require interviews with the respective project developers and is beyond the scope of this Report. A high-level review of 21 NbS projects, with a focus on those based in Asia, was conducted for the purpose of understanding elements contributing to project success, as well as the indicators used and the current status of NbS project MRV practices in the field.

The projects received two levels of review as described in Table 6a and 6b:

1. Initial assessment (**Table 6a**): indication or validation that the project has elements of best practice according to market standards, assessments by other organisations, interviewees or literature review.
2. Detailed desktop evaluation (**Table 6b**): assessing projects against best practices identified in Part 2, i.e. project design, implementation and MRV practices.

Table 6a: Criteria used in the initial assessment of projects

Review	Criteria	Description
Initial Assessment	1. Project has obtained a certification, rating or award.	For example: Verra, Gold Standard, Plan Vivo or industry-specific certification e.g. FSC.
	2. Project is funded by development finance institutions or private financial institutions.	The project received funding from ADB, World Bank or other financial institutions, and hence had undergone due diligence.
	3. Project has been mentioned by environment-related international organisations or networks.	Mentioned by literature reviewed and / or organisations interviewed as a good case study.
	4. Project has been listed in an academic paper as a good case study, or recommended by experts in the interviews.	Recommended by interviewees and / or substantiated by best practice criteria described by subject matter experts.

Table 6b: Criteria used in the detailed evaluation of projects

Review	Criteria	Description
Detailed evaluation	Holistic considerations for **project design** in terms of **ecological quality** of the ecosystem as well as involving and addressing the needs of the **local community**.	• Has preserved or improved the **state of ecological health in comparison to baseline conditions**, while achieving intended outcomes for climate mitigation and adaptation, biodiversity, supporting livelihoods. • **Community-centric design**: co-designed and led or driven by the local community. • Provides **alternative economic opportunities** and benefit-sharing mechanisms. • **Enabling environment** in terms of land tenure and rights, policies and capacity building programs.
	Project **implementation capacity**	• **Partnerships** and engagement of **multiple stakeholders** with different expertise. • **Capacity building** for project implementation and community empowerment. • Replicability of the project's approach elsewhere in Asia.
	Project **evaluation** or MRV	• **Alignment** with conventionally accepted global and industry **standards for MRV**, as well as the most updated scientific methodologies • **Monitoring plan with results-based management**: Long-term monitoring plan (with short + long term variables) and adapting according to evaluation • **Impact reporting** and transparency • The project may involve a **pilot or use of technology for MRV,** or a **novel methodology**, or engage **citizen science** and **community-driven monitoring activities.**

These case studies are summarised in **Table 7**, and the details can be found in **Appendix F**. The following section features five projects displaying some of the best practices and innovative approaches to MRV described in Part 2.

Table 7: 21 case studies featuring best practice in some or all of project design, implementation or MRV

Asset type	Project name	Intervention type	Country
Terrestrial (multiple types)	Ibis Rice	Conservation and sustainable agriculture for biodiversity conservation and supporting livelihoods	Cambodia
Forest	Conservation Cooperative in Gunung Niut Nature Reserve	Forest restoration and sustainable management for biodiversity conservation and supporting livelihoods	Indonesia
	WithOneSeed Community Forestry Program	Reforestation for climate mitigation and supporting livelihood	Timor Leste
Peatland	Raja Musa Forest Reserve Rehabilitation Program	Peatland restoration and sustainable management for ecosystem conservation and supporting livelihoods	Malaysia
	Rimba Raya Biodiversity Reserve Project	Peatland conservation for climate mitigation and supporting livelihoods	Indonesia
	Sumatra Merang Peatland Project	Peatland restoration and sustainable management for climate mitigation, adaptation and supporting livelihoods	Indonesia
Freshwater wetland/ marshes	Boon Rueang Wetland Forest Conservation Group	Wetland forest conservation for livelihoods	Thailand
	Building Resilience of Urban Populations, Laos	Urban wetland and stream restoration for climate adaptation	Laos
	Restoring Qixian Wetlands	River restoration for climate change adaptation	China

Table 7 (cont.): 21 case studies featuring best practice in some or all of project design, implementation or MRV

Asset type	Project name	Intervention type	Country
Savannah Grassland/ Rangeland	LIFE Transilva Cooperation	Sustainable grassland management for biodiversity conservation and livelihoods	Romania
	Pastures, Conservation, Climate Action	Sustainable rangeland management for climate mitigation, livelihoods and ecosystem conservation	Mongolia
	The Northern Kenya Carbon Project	Grasslands restoration for soil carbon	Kenya
Coastal (multiple types)	Enhancing climate resilience of India's coastal communities	Coastal ecosystem (seagrass, mangroves, salt marshes and coral reef) restoration for climate adaptation and livelihoods	India
Mangrove	Community Mangrove Forest Conservation of Baan Bang La	Conservation and sustainable use for climate adaptation and supporting livelihoods	Thailand
	Delta Blue Carbon	Mangrove restoration for climate mitigation, adaptation, biodiversity conservation and supporting livelihoods	Pakistan
	Mikoko Pamoja	Mangrove conservation and restoration for climate mitigation, ecosystem conservation and supporting livelihoods	Kenya
Seagrass	ReMEDIES	Seagrass bed restoration	United Kingdom
	Seagrass Ecosystem Services Project - Community Centred Conservation (C3)	Seagrass and wildlife conservation for biodiversity conservation and livelihoods	The Philippines

Table 7 (cont.): 21 case studies featuring best practice in some or all of project design, implementation or MRV

Asset type	Project name	Intervention type	Country
Marine (multiple types)	Bird's Head Seascape	Coral reef and marine conservation, and sustainable management for biodiversity conservation and supporting livelihoods	Indonesia
Coral reef	Reefscapers Coral Reef Restoration	Coral reef restoration for biodiversity conservation and supporting livelihoods	The Maldives
	Southern Leyte Coral Reef Conservation Project	Conservation and restoration for biodiversity and livelihoods	The Philippines

4.2 Illustrating Best Practices - Case Studies

There is no consensus on the 'best' practices for high quality NbS projects. The success of a project is ultimately context-specific and the evaluation of each project depends on the goal and approach of the project (e.g. conserving vs restoring), the ecosystem conditions (e.g. pristine vs drained peatlands), as well as community factors. The following selected case studies embody best practices in project design, implementation and/or MRV systems described in Part 2.

CASE STUDY 1: CONSERVATION COOPERATIVE GUNUNG NIUT NATURE RESERVE, INDONESIA[34]

Forest

Yayasan Planet Indonesia developed a 'Conservation Cooperative' model where projects are governed and implemented by local communities. This model was piloted in the Gunung Niut Nature Reserve, which has a history of conflict between the local government and villages.

Deforestation as indicated by tree cover loss decreased by 56% in the first year (2017), and 31% in the second year (2018)

PROJECT DESIGN

Community engagement and alternative livelihood options

- The project began by conducting focus group discussions in villages to understand the needs and issues faced by the local communities. The results highlighted issues such as villagers' perceptions of stolen land, lack of access to financial services and healthcare, and agricultural issues that drive the exploitation of biodiversity for income.
- The Cooperative's approach thus attempted to address these issues and account for human well-being by altering existing livelihoods to be more sustainable, provide capacity building, participatory mapping for land tenure and rights, and developing infrastructure.

PROJECT IMPLEMENTATION

Capacity building for local empowerment

- This includes providing financial services, training in sustainable agriculture, agroforestry and other programs that offer livelihood improvement to the indigenous community when they sustainably manage and conserve forest resources.
- The Village Savings & Loans program has seen a growth in the Cooperative's total assets to US$15,970 in slightly more than a year.

MRV

Participatory project monitoring and the use of technology

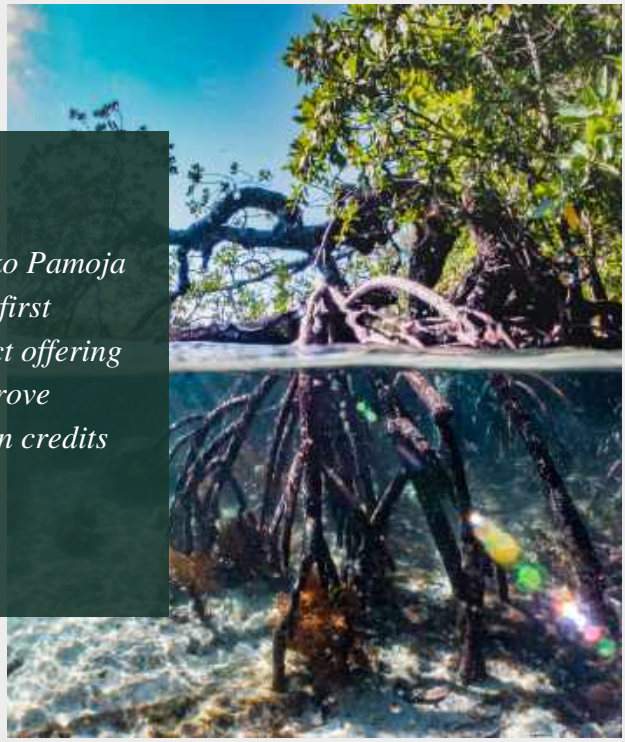
- Wildlife and Forest Protection Units (WPUs) were created with local communities to enhance enforcement alongside the local government units.
- The patrol units use an open-source Spatial Monitoring and Reporting Tool (SMART), which consists of software, capacity building, and protection standards for monitoring protected areas. This system helps the community to take ownership of local resource management and protect their land rights and resources against natural resource thefts by corporations, wildlife traders etc.

31% of the reserve is managed through SMART patrols

CASE STUDY 2: MIKOKO PAMOJA GAZI BAY, KENYA[35]

Mangrove

Mikoko Pamoja is a community-based mangrove restoration and conservation project which seeks to provide long-term incentives for the locals to protect mangroves. This includes raising revenue from carbon credits generated from community-based reforestation, and other income-generating activities e.g. ecotourism. The project conserves 117ha of mangroves and restores 0.4ha annually.



Mikoko Pamoja is the first project offering mangrove carbon credits

PROJECT DESIGN

Community-centric design and alternative economic opportunities

- Has strong benefit-sharing mechanisms and payment for ecosystem services.
- The project ensured that it had free, prior and informed consent from the local participants.
- Some of the income has been directed to fund water and sanitation projects, supplying water to 4,500 community members.
- At least 70% of PES income is directly received by locals.
- The community organisation managing the project has a minimum requirement of 40% female representation.

PROJECT IMPLEMENTATION

Capacity building for local empowerment

- The project also supports community development projects in education, in terms of both formal and informal education that also includes raising awareness about the importance of mangroves, as well as training in nursery establishment and monitoring activities.
- Long-term partnerships with stakeholders such as the Kenya Marine Fisheries Research Institute and the Kenya Forest Service.

MRV

Involves participatory monitoring, and is a verified project with a registry

- Discloses impact data via its website to the public and regular impact or progress reports to stakeholders.
- Verified and certified by Plan Vivo.

The project plants 2,000 seedlings annually

CASE STUDY 3: BLUE ABADI FUND FOR THE BIRD'S HEAD SEASCAPE, WEST PAPUA, INDONESIA[36]

Marine

The Blue Abadi Fund is a dedicated conservation trust fund designed to provide a steady long-term flow of funding, to ensure that local environmental stewards help to sustainably manage and protect the Bird's Head Seascape (BHS). The BHS spans across 22.5 million ha and houses 75% of the world's scleractinian coral species. The area is also home to threatened species and supports the main livelihoods of coastal communities. The fund focuses on five geographical priorities: Raja Ampat MPA, Tambraw, Fakfak MPA, Kaimana MPA and Taman Nasional Teluk Cenderawasih.

The Fund has two strategies:

1. To support the effective co-management of the BHS MPA network, and
2. To mobilise and empower local community organisations.

It provides 'Primary Grants' ranging from US$25,000 to US$500,000/year to local organisations, and smaller 'Inovasi' grants of US$1000 to US$25,000 to support small-scale civil society organisations.

PROJECT DESIGN

Clear measurable targets and alternative livelihood options

- The Fund has clearly identified (and reported) its strategic priorities, outputs and key indicators to track for ecosystem health, human well-being (economic, health, political empowerment, education, culture), MPA management and marine resource governance.
- The Fund not only focuses on managing the MPA through community-based patrol, but also provides funding to empower the local civil society organisations such as programs for environmental education, ecological and social monitoring, or other capacity development e.g. ecotourism training.

The project recorded an increase in percentage of live hard coral cover and turtle hatchling production in some regions

Increase in food security index and school enrolment rate

PROJECT IMPLEMENTATION

Multi-stakeholder partnerships

- The fund's governance committee comprises different stakeholders, from government officials and local leaders, to experts from environmental NGOs and the financial sector.
- By including decision-makers with different technical know-how as well as local representatives in both the governance and advisory committees, the fund is better able to consider the various factors that contribute to a project's success, from the environmental and social impact to its financial viability.

The following projects are highlighted for their innovations in enhancing project MRV, such as the use of technology to scale up the frequency and quantity of data collection, and building capacity around measurement techniques.

SPOTLIGHT 1: SUMATRA MERANG PEATLAND PROJECT, SOUTH SUMATRA, INDONESIA[37]

Peatland

Recorded over 210 unique species of flora and fauna, including 31 species classified as Threatened, Endangered or Critically Endangered

This project targets the Merang biodiversity corridor, which is one of the largest (and deepest) peat swamps in the Region. The project was launched after a massive forest fire and seeks to restore approximately 23,000 ha of degraded peatland forest which had been drained due to canals created for logging and plantation, and in turn mitigate the fire risks associated with the flammable drained peat.

MRV:

- The project works with a partner - Sustainability Tech – to leverage IoT for real-time monitoring. This includes the use of a variety of sensors that are connected to a dashboard to track water levels, rainfall and other fire risk indicators. The system provides hourly and daily reports.
- The project also implemented a biodiversity monitoring and camera trap program.

SPOTLIGHT 2: SEAGRASS ECOSYSTEM SERVICES PROJECT - C3, PHILIPPINES[38]

Seagrass

C3 engages in research and management of dugong populations in the Philippines, and pioneered a dugong conservation program and locally managed marine protected area (LMMA) in the country. It engages the local community in biodiversity conservation, habitat management, enterprise development and other capacity building activities.

MRV:

- Through working with the Tagbanua indigenous people, the project created a participatory monitoring program to investigate the spatial distribution, habitat-use patterns and risks for dugongs.
- The initiative also created an interactive online Dugong & Seagrass Research Toolkit which provides a guide for researchers and practitioners to select the most suitable methodologies for assessing seagrass status and dugong populations, based on factors such as the user's team capacity, budget, timeline etc.

It is the first organisation in the Philippines to use unmanned aerial vehicles (UAVs) to monitor and assess dugong populations.

4.3 Challenges on the Ground

While the case studies illustrate some of the leading practices observed in the field, interviews with experts and practitioners also highlighted various challenges on the ground that undermine a project's ability to adopt best practices.

Access to Finance

NbS projects that involve the issuance of ecosystem services or carbon credits incur a significant amount of upfront costs, most of these related to MRV. The costs for baselining, registration, and third party verification vary from tens of thousands to hundreds of thousands in fees. These costs do not yet include additional expenses incurred for project design, implementation, maintenance and data collection. However, it takes a few years before a project starts to generate and sell credits and financial returns from the issuance and sales of carbon or ecosystem credits. Therefore, this initial upfront need of capital is one of the main barriers for the development of NbS projects.

Furthermore, while projects targeting climate mitigation, particularly CO_2 sequestration now have greater access to financing opportunities due to the revival of the carbon markets, projects that aim for wider outcomes such as climate adaptation, biodiversity and social impact are not accessing as much capital given the higher projects costs incurred in engaging the community and wider measurements, yet longer payback periods.

Ecosystem Measurement Knowledge

The science surrounding some ecosystems functions and ecological relationships is still evolving. For example, soil carbon sequestration in grassland (and other) ecosystems are still being studied, and the science and methods for quantifying soil carbon sequestration are not particularly accurate at large-scale, e.g. through remote sensing and modelling. Although some literature promote the importance of fauna to the functioning of an ecosystem (i.e. mutualism), scientific evidence is still emerging, which makes it difficult to quantify and incorporate into specific biodiversity targets.

Project Implementation Capacity

There is currently a lack of of well-rounded project developers with both technical expertise, as well as execution experience implementing projects with communities on the ground. While there is demand for high quality NbS Projects that provide multiple outcomes, including climate mitigation, social and biodiversity benefits, not many developers in the market have the relevant internal expertise to design or implement those types of projects.

Interviewee Perspectives

From a third-party verification's perspective, there also exists capacity gaps in understanding verification standards. This would result in the project developer or implementers designing a monitoring plan that is not fit for the methodology or standard requirements. In the case that the monitoring plan is non-compliant, past monitoring efforts may be rendered insufficient and thus require re-monitoring.

Outcome Verification Limitations

Verification and certification by third party organisations are useful for ascertaining the impact claims of a project. However, current verification systems are not infallible, as there have been instances of low-quality projects being approved for carbon credit issuances. Furthermore, there are also elements of high quality NbS projects that are not as easily verified, such as the improved wellbeing of local communities, gender equity, or biodiversity gains.

Interviewee Perspectives

It is pivotal to ensure that benefit-sharing mechanisms are equitable for local stakeholders. There is currently a lack of transparency regarding the proportion of funding from carbon or ecosystem credits that are going to the local communities. This raises concerns about the equity issues of a project developer that is not sharing the proceeds, or political decision-makers who are perceived to be 'selling out' indigenous people. The amount of monetary benefits flowing to people in the area for maintaining the integrity of the ecosystem intact also affects the sustainability of the project in the long run.

4.4 The Case for Integrated Projects across Ecosystem Types - 'Ridge to Reef' or Landscape Approaches

Although the case studies and indicators in this report are categorised according to asset types, there is emerging interest in looking at continuous ecosystems rather than single ecosystem types. This requires integrated analysis across habitat types and between ecosystems, as well as the interconnectedness of land, water and coasts (watersheds or landscapes) as exemplified by the flow of water from sources to river basins to coastal ecosystems.

This concept entails a 'Ridge to Reef', 'whole-of-ecosystem' or 'integrated landscape / seascape management' approach. It recognizes that holistic intervention for protecting coastal and marine ecosystems involves targeting environmental degradation at the source; wetlands and marine environments are less vulnerable when upper habitats are in healthy condition.[39] Academic papers have identified synergies between coral reefs, seagrass and mangroves that contribute to NbS success when all three types are found adjacent to one another and treated as an integrated ecosystem.[40]

INTEGRATED CASE STUDY - SOUTHERN CARDAMOM REDD+ / 'RIDGE TO REEF' PROJECT, CAMBODIA[41]

Ecosystems include forests, wetlands, flooded grasslands, mangroves.

Image Source: Wildlife Alliance [42]

This project, established by Wildlife Alliance, Wildlife Works, the Royal Government of Cambodia, Everland and SeaTrees protects 497,000 hectares of tropical rainforest and coastal watersheds and protects a critical part of an ecoregion that is a high priority 'hotspot' for biodiversity conservation. It will generate VCS and CCB verified carbon credits for 30 years. The project also seeks to promote climate change mitigation and adaptation and sustainable livelihoods e.g. through community-based ecotourism (CBET) programs.

PART FIVE

Key Findings and Opportunities

The following key findings and opportunities were discovered throughout the research, and analysis of this report, which included the review of various standards and frameworks, NbS projects, case studies and conversations with multiple stakeholders.

Key Findings

1. **The most common type of NbS project involves terrestrial ecosystems; forests in particular.** There are relatively few NbS projects connected to marine ecosystems; this is due to a number of factors, including the lack of standardized frameworks and methodologies for accounting blue carbon.

2. **There is a significant concentration of NbS projects focused primarily on climate mitigation with carbon credits as the primary source of revenue.** There is a need to widen the range and scope of NbS projects to support climate resilience and adaptation, as well as community livelihood and biodiversity outcomes.

3. **While biodiversity projects are of strong interest to investors, it is not given as much importance in terms of measuring, reporting and verifying outcomes.** Opportunities to value biodiversity outcomes will lead to the development of MRV practices focused on biodiversity.

4. Remote sensing technology is being adopted as an additional tool for capturing data for MRV, but technology alone is not able to provide a full picture of the ecological and social changes on the ground. A **combination of both technology and on the ground verification** is needed to meet validation and verification requirements.

5. **Capacity and capability gaps are a common challenge** in NbS project implementation, especially in complex project types and / or remote locations where project developers have limited experience or understanding of the landscape and the communities.

Opportunities for funders to support the growth of high quality NbS project development and implementation in Asia

1. Support the **development of marine protection projects** and the further development of blue carbon standards that will **enable the protection of our oceans**. Particular ecosystems that require more focus include seagrasses and freshwater wetlands (since these ecosystems do not get as much attention as mangroves, for example).

2. **Develop integrated ecosystem (ridge to reef) projects rather than single natural asset NbS projects**, recognizing that these are more holistic and **explicitly designed for interconnectivity** and flows between different ecosystems, while also increasing the potential for projects to generate more significant amounts of carbon credits. **Greater complexity in designing and implementing integrated ecosystem projects** will be more expensive, spatially extensive, involve multiple government agencies, and often different land tenure regimes. Therefore, **capacity and capability building among project developers, government agencies, and local communities will be essential.**

3. **Grow the number and scale of NbS projects beyond carbon mitigation, to include climate adaptation, biodiversity and social outcomes.** High quality NbS projects need to ensure that biodiversity integrity is also a key outcome, and that communities benefit in an equitable and sustainable manner. **Elevate the importance of biodiversity outcomes** by contributing towards the development of biodiversity standards, frameworks and credit markets.

4 Foster the development and deployment of **more data analytics technologies in Asia,** particularly related to marine ecosystems. There is currently a large gap in the market and the development of such technology will enable the proper valuation and monetization of marine ecosystem services.

5 **Support the growth and capacity of project developers and implementation organisations** in an effort to grow and scale the number of NbS projects. There are a limited number of organisations with understanding of carbon markets, strong scientific and ecological background, strong connections and trust in the communities, strong execution capabilities and the capacity to execute on the ground.

6 **Allocate funds for long term monitoring and evaluation after project completion** to establish long term success (including cost-effectiveness). There is usually a time-lag between intervention and ecosystem restoration outcomes, and more focus is needed on ex post evaluations, including the appropriate selection of indicators and data collection and establishment of baselines.

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APPENDICES

APPENDIX A

Databases and secondary sources used to derive best practice case studies

Source	Link	Filter(s) applied	Number of projects reviewed
Accounting for Nature	Web	Certified projects (verified)	1
Gold Standard Registry	Web	Project type: Other	13
ICRI/UNEP Small Grants Programme 2021 winners	Web	Nil	6
Joint Nature Conservation Committee (JNCC) Database of NbS Case Studies	XLSX	Geographic region: Western Asia, South-eastern Asia, Southern Asia, Eastern Asia, Central Asia. Focal area: marine, terrestrial	87
Landscape Finance Lab	Web	Nil	7
Panorama	Web	Region: AsiaEcosystem: Rangeland/Pasture, Forest ecosystems, Marine and coastal ecosystems, Freshwater ecosystems, Grassland ecosystemsTheme: Biodiversity, Climate Change, Ecosystem conservation	165
Plan Vivo	Web	Status: current project	27
Pur Projet	Web	Nil	56
UNDP Equator Initiative's Equator Prize Winners	Web	Region: Asia and the PacificThematic Area: Biodiversity Conservation, Community-based Adaptation to Climate Change, Freshwater Management, Marine and Coastal Resource Management, Sustainable Forestry	69
Verra Registry	Web	Projects counted under AFOLU (for VCS), and projects in the CCB registry. Exclude Status “Project Withdrawn”, and delete duplicates of projects that are double-counted for both VCS and CCB. Country/region: Asia	124
Others (e.g. interviews, network)	NA	NA	5

APPENDIX B

Experts and Practitioners Interviewed

	Interviewee	Designation and Organisation
1	**Amy Schmid**	Senior director and manager, Verra
2	**Angelique Brathwaite**	Director Ecology & Management and Co-founder, Blue Finance
3	**Bayden Russell**	Associate Director, SWIMS; Associate Professor, School of Biological Sciences, The University of Hong Kong
4	**Carlos Muñoz Brenes**	Director Social Science, Conservation International
5	**Charles E. Bedford**	Founder and Chief Impact Officer, Carbon Growth Partners; Adjunct and Visiting Professor, Hong Kong University of Science and Technology
6	**Dan Friess**	Associate Professor, Department of Geography and the Mangrove Lab, National University of Singapore (NUS)
7	**Daniel Crockett**	Development Director, Blue Marine Foundation
8	**David M. Baker**	Swire Institute of Marine Science, The University of Hong Kong
9	**Dorothée Herr**	Manager for Oceans and Climate Change, IUCN
10	**Emily Darling**	Director of Coral Reef Conservation, Wildlife Conservation Society (WCS)
11	**Florian Reimer**	Head of Ecosystem Services, Lestari Capital; Technical Advisory Committee, Plan Vivo Foundation
12	**Florian Vernaz**	Managing Director, Sinar Hijau Ventures
13	**Fleur E. Matheson**	National Institute of Water and Atmospheric Research (NIWA)
14	**Ivy Wong Abdullah**	Lead, Environment, Strategy & Partnership, Yayasan Hasanah
15	**Jeannette Gurung**	Women Organising for Change in Agriculture and Natural Resource Management (WOCAN)
16	**Jonathan Baillie**	President and Chair of the Board, Natural State; CEO, On the EDGE Conservation
17	**Kirk Olson**	Conservation Director, WCS Mongolia
18	**Koh Lian Pin**	Director, Centre for Nature-based Climate Solutions at the National University of Singapore (NUS)
19	**Liesbeth Gort**	Co-founder and CEO Treevive, Form International
20	**Lorenzo Curci**	Chief Commercial Officer, Earthly

21	**Mark Beeston**	Project Lead, Fair Carbon
22	**Nicolas Pascal**	Executive Director & Co-Founder, Blue Finance
23	**Olivia Burge**	Ecologist, Manaaki Whenua - Landcare Research
24	**Ophelia Wang**	Deputy Technical Project Lead, Forest Carbon
25	**Paul Hol**	CEO and Founder, Form International
26	**Rhita Simorangkir**	Monitoring, Evaluation, and Learning Specialist, The Nature Conservancy - NatureVest
27	**Richard Unsworth**	Founding Director, Project Seagrass; Associate Professor in marine ecology, Swansea University
29	**Stephen Wood**	Senior Scientist, Agriculture & Food Systems, The Nature Conservancy
30	**Tim Coles**	Project Director and Founder, Operation Wallacea
31	**Vriko Yu**	CEO and Founder, Archireef
32	**Zheng Qiming**	Research Fellow, Centre for Nature-based Climate Solutions at the National University of Singapore (NUS)

APPENDIX C

Summary of Land policies, tenure and rights in Asia[43-44]

Country	Land policies, tenure and rights status
Indonesia	There have been some policies and attempts to recognize *Adat* rights in some jurisdictions. Indigenous territories which have been registered in the Badan Registrasi Wilayah Adat (BRWA, the Indigenous Territory Registration Body) are under review by the government. However, an Indigenous Rights bill which aimed to recognize indigenous customary laws and land rights has been stalled since 2012.[45]
Malaysia	Malaysia has adopted the UN Declaration on the Rights of Indigenous Peoples, and its Federal Constitution provides land rights for indigenous people and local communities. Malaysia also has a divided jurisdiction where Sabah and Sarawak have their own legislations for customary land tenure.
Philippines	Currently only half of all land parcels are formally registered in the Torrens Title System due to delays and high costs.
Thailand	There have been claims that national policies such as the Forest Act, the National Reserved Forests Act and the National Park Act have been used to prosecute or evict forest dwellers and indigenous communities from land belonging to national reserved forests and parks.[46]
Vietnam	The 2013 Land Law includes a specific policy for ethnic minorities land use, and communities are permitted to hold formal land-use rights through obtaining the LURC. However, groups that practice communal tenure and have yet to receive LURCs are particularly vulnerable to encroachment.
Cambodia	The Royal Government of Cambodia's Forest Law 2002 and Land Law 2001 recognizes traditional land use by Indigenous Peoples and provides community land titles (CLT). However, the process is complex and expensive, and only a few communities have obtained a CLT. Hence, the majority of communities' land rights are not registered or recognized, and are vulnerable to land grabs. Additionally, the economic land concession process is currently not transparent and has led to forced evictions.
Lao PDR	A large proportion of the population does not have formalised land rights. The legal framework for customary land tenure security for forest areas is still a work in progress.[47] Although the National Land Policy process and the Land Law revision seeks to improve the recognition of communal land use, the land is still centrally managed by the state which will decide how they are recognized.[48]

APPENDIX D

MRV standards, frameworks and tools

Asset type	Title		Resource type	Rationale for use
General	**IUCN Global Standard for NbS** • **Standard (Web)**[49] • **Guidance (Web)**[50]		Standard	The IUCN Global Standard seeks to provide clear parameters for defining Nature-based Solutions, and sets out eight best practice principles for implementing and scaling projects. The principles are accompanied by 8 criteria and recommended indicators for benchmarking and tracking progress.
	Open Standards for the Practice of Conservation 2020[51]		Standard	A living standard that is updated by contributors as needed, describes best practices for successful implementation of conservation projects. Provides a 5 step management cycle.
	International principles and standards for the practice of ecological restoration. Second edition[52]		Framework	Establishes 8 principles that underpin ecological restoration and highlights the role of ecological restoration in connecting community, sustainability, productivity and social impacts. Provides recommended performance indicators for restoration activities for a range of stakeholders to consider.
	Verra: Verified Carbon Standard (VCS)[53]		Standard and certification	A voluntary greenhouse gas program which issues tradable GHG credits as Verified Carbon Units. The Standard sets out requirements for developing, validating, monitoring and verifying projects for GHG removal or reduction. There are currently VCS methodologies for greenhouse gas accounting for the ecosystem types: Seagrass Beds, Mangroves, Peatlands & Freshwater Wetlands, Grasslands, and Forests
	Verra: Climate, Community and Biodiversity Standard (CCB)[54]		Standard and certification	The CCB standard certifies if a project addresses the triple outcomes: climate change, local communities, and biodiversity conservation. Verified carbon units that has the CCB means that the project's emission reduction unit was generated during the period where the project was CCB-verified.
	Verra: Sustainable Development Verified Impact Standard (SD VISta)[55]		Standard and certification	SD VISta provides a framework for assessing and reporting on the benefits of project in alignment with the 17 UN Sustainable Development Goals (SDGs). Projects may potentially issue SD VISta units, based on sustainable development benefits, that can be sold or retired and claimed

APPENDIX D

Asset type	Title		Resource type	Rationale for use
General	**Gold Standard for the Global Goals**[56]	Gold Standard for the Global Goals	Standard and certification	The Gold Standard allows projects to quantify and certify their projects towards climate change and the UN SDGs. The certification is issued to the areas of emission reductions (carbon credits), renewable energy, water benefit, gender equality, improved health and black carbon reduction.
	Plan Vivo[57]	PLAN VIVO	Standard and certification	Certifies smallholder and community projects based on their benefits for climate, livelihoods and environmental outcomes; Plan Vivo-certified projects can generate Plan Vivo Certificates (Plan Vivo carbon credits)
	Accounting for Nature[58]	ACCOUNTING FOR NATURE	Framework and certification	Offers a natural capital accounting framework which measures the actual change in condition of environmental assets (e.g. soils, vegetation, fauna & water) over time. Metrics include EcondTM (Environmental Condition) Index and Pcond (Production Condition) Index.
	Theory of Change[59]		Framework	A framework which reflects the process of thinking about and describing the change (i..e impact) an organization wants to see, and its plans for achieving that change. The logic model comprises 5 components: 1) Activity; 2) Quality; 3) Mechanism; 4) Outcome and; 5) Impact.
Forests	**Reforest Better: A Guide to High-impact Tree Growing Projects**[60]	Nature 4Climate	Framework and toolkit	A toolkit for assessing whether a forest restoration project is considered high quality based on scoring against 13 criteria.
	Criteria and indicators for the sustainable management of tropical forests[61]	ITTO	Framework	A framework that provides criteria and indicators for monitoring, assessing and reporting changes and trends in forest conditions and management systems on both the landscape and local scale in countries with tropical forests.
	FSC-PRO-30-006 Ecosystem Services Procedure[62]	FSC	Certification standard	The foundation for FSC ecosystem services claims. The associated certification (FSC-verified ecosystem services) verifies the impacts on carbon sequestration and storage, conservation of biodiversity, watershed services, soil conservation, and recreational services
	Sustainable Forestry Initiative SFI 2022 Forest Management Standard[63]	SUSTAINABLE FORESTRY INITIATIVE	Certification standard	A forest certification standard which promotes sustainable forestry based on principles, objectives, performance measures and indicators.

APPENDIX D

Asset type	Title		Resource type	Rationale for use
Forests	**FairForest rating**[64]		Certification standard	Provides an open source catalogue of ~170 metrics across 6 categories: social performance, environmental performance, financial performance, business environment, management performance and production security. Also provides voluntary rating (based on a questionnaire) and verified rating for certification of sustainable forest projects.
	Rainforest Alliance[65]		Certification standard	A certification program for sustainable agriculture that conserves natural ecosystems and protects ecosystem services. The Rainforest Alliance Indicator and monitoring framework provides indicators targeting environmental, social, and farming outcomes.
	W+ Standard[66]		Certification standard	Provides a framework that measures impact on women across 6 dimensions, and certifies projects that increase social and economic benefits for women participating in projects.
	REDD+[67]		Framework	REDD+ framework guides terrestrial activities that reduce degradation and deforestation under the Clean Development Mechanism. Under this framework, carbon storage by peatlands and mangrove ecosystems can also be accounted for.
Peatlands	**INCAS Standard Method – Peat GHG Emissions**[68]		Standard	Process used for quantifying GHG emissions from peatland in Indonesia.
	Peatland Code (web)[69]		Standard and certification	A voluntary standard for UK-based peatland projects; provides verification for restoration projects to enable them to join carbon markets based on carbon savings through emission reductions.
	Moor Futures		Standard and certification	A German-based standard that provides certification for peatland projects based on climate mitigation impact.
	Peatland mapping and monitoring Recommendations and technical overview[70]		Framework	Guidance to monitor peatlands; provides examples of parameters for monitoring different types of peatlands (pristine, drained, and restored), and the suggested minimum frequency and utility for climate reporting indicators.

APPENDIX D

Asset type	Title		Resource type	Rationale for use
Peatlands	**ASEAN Peatland Forests Project: The Peatland Biodiversity Management Toolbox (PDF)**[71]		Tool	This handbook provides a summary of the existing academic literature on the techniques and approaches for peatland restoration.
	Verra Methodologies	VERRA	Standard: Indicators and methodology	Several methodologies exist for peatland verification of GHG emissions: VM0004 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests v1.0; VM0027 Methodology for Rewetting Drained Tropical Peatlands v1.0; VM0036 Methodology for Rewetting Drained Temperate Peatlands v1.0.
Grasslands / Rangelands	**Grassland Regeneration and Sustainability Standard (GRASS)**[72]		Framework	Defines guidelines and procedures for sustainable grassland and rangeland management, and a validation quality assurance system. Although this standard was initially developed for Patagonia, it is being adapted for grasslands in other regions such as Mongolia.
	Ecological Outcome Verification (web)	ECOLOGICAL LAND TO MARKET VERIFIED 2021 OUTCOME	Certification	The EOV provides verification for Savory Institute's Land to Market program: empirically-based and outcome-focused protocols are used to verify farms and ranches, based on their land health in terms of soil health, biodiversity, and ecosystem function.
Freshwater Wetlands	**A New Toolkit for National Wetland Inventories (link)**[73]		Framework/ tool	A toolkit for assessing whether a forest restoration project is considered high quality based on scoring against 13 criteria.
	Handbook 18: Managing wetlands (PDF)[74]		Framework/ tool	Toolkit for countries that are party to the RAMSAR Convention to undertake and complete wetlands inventory. Includes examples of good practice and recommendations (plus links to other toolkits and guidelines).
	Wetland Management Planning: A guide for site managers (PDF)[75]		Framework/ tool	Prepared by the RAMSAR Convention secretariat, Wetlands International, WWF and IUCN. This guide provides a comprehensive wetland management planning and monitoring framework.
	Wetland Health Card (web)[76]		Tool	A tool employed by the environmental agency in India to assesses wetland using 9 indicators across 4 broad categories - Area, Hydrology, Biodiversity and Governance.

Asset type	Title		Resource type	Rationale for use
Mangroves	**Guidance on Mangrove Indicators in the Post-2020 Global Biodiversity Framework (PDF)**[77]		Framework	This document identifies and proposes indicators to be added in the monitoring and reporting for Mangroves, and seeks to contribute towards the Post-2020 Global Biodiversity Framework.
	Manual for Mangrove Monitoring in the Pacific Islands (PDF)[78]		Tool	A toolkit and guidelines for monitoring mangroves in the Pacific. Methodology is easily transferable to elsewhere. Provides step-by-step process guide to establishing monitoring programs for mangroves.
	Guiding Principles on sustainable mangrove ecosystem management (PDF)[79]		Framework	The 9 principles complement existing agreements (e.g. UNEA resolution and IUCN motion on mangroves) and are underpinned by sustainable development principles such as securing economic development, social equity and justice, and environmental protection.
	Mangrove carbon estimator and monitoring guide (FAO – PDF)[80]		Tool	Guidelines for mangrove and carbon monitoring. Provides methods and tools for project area mapping, carbon stock estimation, and mangrove monitoring.
	Socioeconomic and Ecological Monitoring toolkit: Huraa Mangrove Nature Reserve (PDF)[81]		Tool	Provides a framework for a socioeconomic and ecological monitoring program that can be undertaken by people with no prior experience.
	Protocols for the measurement, monitoring and reporting of structure, biomass and carbon stocks in mangrove forests (PDF)[82]	CIFOR	Framework	A framework for MRV for carbon in Mangrove forests that can be applied to other wetland forests. Framework is consistent with IPCC guidelines. Does not cover socioeconomic aspects such as governance, permanence, and leakage.
	Verra Methodologies	VERRA	Standard	Verra have several methodologies for verification of wetlands GHG emissions for crediting purposes, including VM0007 REDD+ Methodology Framework (REDD+MF) v1.6, VM0024 Methodology for Coastal Wetland Creation v1.0, VM0033 Methodology for Tidal Wetland and Seagrass Restoration v2.0.

APPENDIX D

Asset type	Title		Resource type	Rationale for use
Seagrass	**Dugong & Seagrass Research Toolkit (web)** [83]		Tool	The tool is designed to support stakeholders to decide on their method for researching and assessing seagrass, dugong populations and human communities. It also lists several relevant indicators, and the technologies for measurement.
	Seagrass-Watch Global Seagrass Observing Network: Seagrass Monitoring Guidelines (web) [84]		Tool	The Global Seagrass Research Methods and Manuals provide standards for measuring indicators in the field e.g. percent cover.
	SeagrassNet Manual for Scientific Monitoring of Seagrass Habitat: Worldwide edition (PDF) [85]		Tool	An ecological monitoring program which provides manuals for seagrass monitoring globally, and lists of species that are specific to various regions. The manuals provide guidelines to measurement methods and sampling protocols.
Coral Reef	**Five A's of the Coral Reef Indicators (web)** [86]		Framework/ standard	These indicators were recommended by ICRI for the post-2020 Global Biodiversity Framework in the context of coral reef health and integrity. The addendum with more details of the additional indicators can be found here.
	Coral Reef restoration: A Guide to coral restoration method (web) [87]		Tool	Offers an ecosystem services perspective on coral reef restoration, including an overview on the best available knowledge, and recommendations for management action.
	Coral Reef Restoration Monitoring Guide (PDF) [88]		Framework/ tool	Developed for coral reef restoration practitioners; offers both universal metrics and goal-specific metrics to measure coral restoration and monitor progress.
	Reef Check Protocol (web) [89]		Tool	Reef Check provides guidelines for its citizen science data collection program. Its standard Reef Check Data Forms highlight several indicators that are typically recorded for coral reef monitoring. Only data from certified Reef Check EcoDivers will be accepted into its global database.

Asset type	Title		Resource type	Rationale for use
Coral Reef	**AGRRA (Atlantic and Gulf Rapid Reef Assessment) protocol (web)**[90]	AGRRA Atlantic and Gulf Rapid Reef Assessment	Tool	Provides instruction guides for coral reef surveys and monitoring, specifically for benthic organisms, corals and fish. It provides data sheet templates as well.
	Coral Watch (web)[91]	CORALWATCH	Tool	A citizen science program which provides materials for coral health monitoring. In particular, it created a simple technique for volunteers to monitor coral bleaching based on its coral health chart.

APPENDIX E

Indicators Used for Different Ecosystem Types

Forest Indicators

Ecosystem health

- **Forest cover:** forest cover or canopy density is an indicator to measure success in quantitative terms i.e. forest growth for a restoration project. It is also used to monitor forest loss and ensure that there is no farmland or urban expansion into the project area if conservation is the main objective. The connectivity of the forest cover and wider landscape is also a key quality indicator.
- **Hydrological impact (water retention, stream flow):** forests provide services such as flood control and water regulation that maintain other ecosystem services such as habitat provision, and hence are also key to maintaining forest health as a whole.

Climate mitigation and adaptation

- **Forest carbon stock:** calculated based on the total above and below ground biomass stock and estimated across the entire managed area. Increased biomass is also an indicator of carbon storage, supporting climate mitigation.
- **Changes in flood frequency and intensity:** forest structure enables interception of rain and storage in the forest canopy, and improves soil infiltration capacities and litter storage. With a decrease in forest area, flooding events tend to increase.

Biodiversity

- **Forest composition (richness and abundance of plant species) and structure:** the higher the level of composition and structure, the richer and more diverse biodiversity will be within a forest. Such diversity helps a forest become more resilient.
- **Number of endangered / threatened species impacted:** this is important in understanding biodiversity values. If species are becoming endangered or falling below healthy population levels, it signals that there are generally more disturbances and threats to biodiversity within a forest.

Social / livelihoods

- **Representation and participation of women in governance e.g. number of women in leadership roles, or active in discussions and decisions** and **number of people with improved livelihoods/income (total and by gender):** equitable approaches to forest management interventions require balanced representation of women in decision-making roles. The number of women beneficiaries (and their roles) is a significant factor contributing to project success and social outcomes.

Grassland / Rangeland Indicators

Ecosystem health

- **Soil surface structure and stability and erosion:** erosion processes and rates are key features of grasslands with poor vegetation cover which are susceptible to loss of moisture and soil stability. Monitoring erosion processes is a key aspect of grasslands management.
- **Plant cover/density (including cover of perennial/long-lived grasses)**: dense plant covers in grasslands protect the soil against moisture loss and erosion, in addition to providing food for livestock. Estimation of species density per area can be an important metric to monitor carbon levels in grasslands and the resilience of ecosystems against wildfires.

Climate mitigation and adaptation

- **Area burnt:** grasslands store significant amounts of carbon that can be released if the habitat is burnt and destroyed.
- **Soil carbon stock:** more studies are revealing that healthy grasslands are important for maintaining soil organic carbon levels; changes in grassland management and degradation reduce the ecosystem's potential for carbon sequestration

Biodiversity

- **Grass species composition (proportion or number of native, invasive and dominant species):** ecological balance of native species is a significant factor for the maintenance of biodiversity levels. Species composition is the main indicator for observing this balance.
- **Indicator species (fauna):** presence or absence, including the status of ground nesting bird species and other species important to the area.

Social/livelihoods

- **Pastoral farming productivity rates and livestock census trends:** healthy grassland ecosystems produce vegetation cover that can maintain and support a higher number of livestock than degraded habitats. Therefore, tracking livestock productivity trends in grasslands is a key factor for communities that depend on this economic activity.
- **Land tenure status, trends and policy improvements:** unclear policies and land rights can trigger land ownership conflicts and potential social inequities; monitoring land tenure trends is a key indicator for grassland NbS projects.

Freshwater Wetland / Marsh Indicators

Ecosystem health

- **Trends and changes in nutrient levels: dissolved nitrate or nitrogen, Biological Oxygen Demand:** wetlands act as sinks for nitrate or nitrogen, therefore levels of such nutrients can provide an indication of wetland health. Biological Oxygen Demand is the amount of dissolved oxygen consumed by bacteria and various microorganisms while they decompose organic matter under aerobic conditions.
- **Wetland habitat provision index (high-low)** can be found with the combination of ecological integrity with historical extent and is described as the level of provision of shelter and protection of organisms. Typically, low values represent units of wetland which are small, depleted or have been degraded.

Climate mitigation

- **Biomass and carbon stock (above ground biomass, below ground (soil) and carbon sequestration rate (tCO_2 e):** freshwater wetlands store carbon in the plant biomass and in the organic material in the sediments trapped by the complex system of underwater roots and branches. A significant higher amount of carbon storage is expected for the below ground system than the above ground biomass making wetlands an efficient ecosystem to capture and store carbon. However, degradation of such ecosystems can release carbon trapped in the sediments.

Climate adaptation

- **Water storage / retention:** freshwater wetlands can serve as rechargers of underground aquifers, besides, organic soils in these ecosystems have high porosity, lower density and a higher holding capacity of water. Measuring water levels in freshwater wetlands is an important indicator of the water retention capacity of this ecosystem.

Biodiversity

- **Trends in the status of specific species (e.g. native species, IUCN red list, wetland dependent birds, amphibians)** provide an insight into the levels of biodiversity within a wetland.

Social/livelihoods

- **Survival rate and yield of fish/shrimp under sustainable aquaculture or silviculture management:** freshwater wetlands provide a rich diversity of fishes, and play a key role in providing shelter, food, breeding grounds and nurseries for juveniles to sustain freshwater species.
- **Percentage increase in income from fisheries:** locals who depend on freshwater wetlands for fish and food resources can benefit from healthy wetlands ecosystem services.

Peatland Indicators

Ecosystem health

- **Height of water table in peat:** the groundwater level in peat soils and canals enables assessment of hydrological and drainage conditions, which in turn are directly correlated with greenhouse gas emissions (calculated with the corresponding emission factor). Water content also influences fire risk; drained peatlands are more flammable.
- **Peat subsidence rate:** subsidence refers to the gradual sinking of the land area, which is more common in highly drained peatlands. Subsidence lowers climate resilience due to increased flood risk, and is also associated with carbon emissions.

Climate mitigation and adaptation

- **Greenhouse gas emissions from peatlands**: this indicator is important due to the unique nature of peat emissions. Drained peat continues emitting over long periods as organic matter decomposes.
- **Carbon stock, including above ground and below ground biomass:** peatlands store significant amounts of carbon that can be released if peatland habitats are burnt and destroyed.
- **Fire occurrence, risk and frequency**, and **area of burnt peat:** it is important to monitor peatlands after and between fire events for GHG emission calculations. Fire monitoring systems are also important for emergency response.

Biodiversity

- Similar to the other ecosystem types, the **land cover and return of native species**, as well as **status of endangered and vulnerable species** are key biodiversity indicators to track, depending on the particular composition of biodiversity in the area.

Social/livelihoods

- **Sustainable management practices and alternative livelihood options:** sustainable economic opportunities are important given that a prevalent threat to peatlands is deforestation. However, some projects may have little community component if a project is in a remote location. Alternative livelihood options are also vital in areas that do not have sufficient peat to generate carbon credits.

Mangrove Indicators

Ecosystem health

- **Crown, forest, vegetation cover:** mangrove density, measured as plants per unit area and density of leaves in each individual plant, are indicators of ecosystem health. These metrics often represent a habitat structure that is favourable for harbouring high levels of marine biodiversity.
- **Trends and changes in nutrient levels: dissolved nitrate or nitrogen, Biological Oxygen Demand, CO_2 nutrient and/or pH levels for coastal vegetation:** mangrove plants are adapted to specific variations of biochemical and physicochemical processes. Mangroves can be outcompeted by opportunistic flora if these processes are not at optimum ranges.

Climate mitigation and adaptation

- **Carbon stock (above ground and below ground biomass, and soil carbon):** mangroves capture and store carbon in the biomass and soil. Overall, mangroves are able to store roughly 10 times more carbon than terrestrial forests. The destruction of mangrove forests however, also has the potential to release large amounts of greenhouse gases. A key challenge is that underground biomass and carbon in soft sediments are less understood and challenging to monitor, and thus are less commonly measured.
- **Hectares of land regenerated to mitigate erosion:** exposed and flat coastal regions are more susceptible to coastal erosion with rising sea levels and higher frequency of storms. Mangroves are natural buffers through reducing wave energy and retaining water that could otherwise flood coastal areas. The area of regenerated mangrove can act as a proxy indicator for coastal areas protected against erosion.

Biodiversity

- **Seedlings and juvenile trees (count, native species, survival and growth):** it is pivotal to ensure seedling diversity and the use of native species, and track their survival rates to assess the success of restoration-related projects. Understanding the variation trends of mangrove biodiversity will support the efficiency assessment of restoration and preservation interventions.
- **Trends in the status of specific species (e.g. presence of native and threatened faunal species, richness of fish species):** the intricate structure of mangrove roots and understory provide food, shelter and suitable habitats for early life-cycle stages of many marine organisms, hence contributing to the conservation of biodiversity and abundance of key species.

Social/livelihoods

- **Value of avoided health and wealth costs through coastal protection and disaster risk reduction (flood, storm, extreme events):** as buffers for storm surges and flood events, mangroves protect coastal communities from these impacts.
- **Contribution of mangroves to fisheries e.g. fish yield or percentage increase in income from fisheries:** mangroves provide a healthy habitat, shelter and food for many species of fish, including species with commercial interest. Thus, healthy mangroves increase and maintain sustainable stocks for coastal communities reliant on fisheries as their main economic activity.

Seagrass Indicators

Ecosystem health

- **Algae and epiphyte abundance (percent cover)** can impede sunlight from reaching seagrass leaves, having an overall impact on the leaf performance and reducing the oxidation capability of its below-ground tissue.
- **Seagrass extent, cover (percent cover, shoot density, leaf area index), and species composition:** a positive trend provides an indicator of health of seagrass populations. Continuous extensions of seagrass beds and diversity of seagrass species can increase ecosystem resilience to external pressures such as pollution, land-use change or climate change related impacts.

Climate mitigation

- **Biomass and carbon stock (above ground / below ground biomass and sediment)**: due to a significant amount of tissue below ground in addition to the seagrass above ground, the total biomass and stock is used as an indicator for climate mitigation.
- **Removal of nitrogen (tons per year) via denitrification** is a dominant process occurring in seagrass beds and meadows. This process enhances the overall filter function of seagrass and their surrounding coastal systems.

Climate adaptation

- **Sediment stability and erosion (surface elevation):** seagrass plants roots form a mesh-like underground structure capable of trapping sediments and forming large subtidal beds. This helps attenuate coastal sediment transport by currents, providing stability for the coastline behind seagrass beds.

Biodiversity

- **Presence of associated biodiversity and fauna colonisation (including fish densities, use as nursery ground):** seagrass beds provide a habitat for many species due to the provision of shelter and food.

Social/livelihoods

- **Value of ecosystem to surveyed locals e.g. number of harvesters who say that the site is important for food supply, fisheries, or tourism:** seagrass beds provide nursery areas for fish species and other marine species that are commonly used by local communities.

Coral Reef Indicators

Ecosystem health

- **Coral conditions, including algae cover and bleaching** indicate environmental condition stressors. When the symbiotic algae which are hosted by coral are expelled, coral changes colour and turns completely white, which leads to the term 'bleaching'.
- **Habitat quality (water quality, benthic cover, coral recruitment, turbidity, and sedimentation, index of coastal eutrophication):** coral reefs provide important habitats for many species, however are highly influenced by the health of the surrounding ecosystems and waters.

Climate mitigation

- **Carbonate budget** refers to the quantitative measure of the net rate of carbonate production on a reef. This production is a result from a variety of biological, physical and chemical driven production and erosion processes.

Climate adaptation

- **Coastal protection risk to coastal communities from coastal inundation and erosion:** coral reef structures attenuate wave energy and associated impacts on beaches and low-lying areas, reducing the capacity of storm surges to travel further onshore or eroding coastal areas.
- **Assisted gene flow or migration success rate:** this is a coral conservation intervention that involves the intentional translocation of a species, whether lab-reared or from an active population elsewhere. Keeping a diverse gene pool increases the overall resilience of the system and its ability to recover from bleaching.

Biodiversity

- **Structural complexity, species richness and diversity of coral reefs** and **reef fish and invertebrate community: presence, abundance, species richness, diversity** are indicators that represent a greater heterogeneity, in turn supporting species richness and habitat complexity.

Social/livelihoods

- **Number of volunteers and citizen scientists involved in restoration activities**: the monitoring of capacity building, in particular the capacity for volunteers and citizen scientists to contribute effectively to restoration, provides evidence of a successful project with the restoration or growth of a coral reef.
- **Number of visitors and new ecotourism opportunities (e.g. training and restoration programs)** is an important indicator that can reflect the health of a coral reef, due in particular to visual improvement when the health of a reef is flourishing. Many communities around the world rely on coral reef tourism.

APPENDIX F

Case study summaries for each asset type featuring best practices

FOREST

CONSERVATION COOPERATIVE IN GUNUNG NIUT NATURE RESERVE (GNNR)

PROJECT SUMMARY

Yayasan Planet Indonesia first piloted their Conservation Cooperative model in the 91,759 ha Gunung Niut Nature Reserve, which is located in one of the last major forest complexes in Borneo – the 180,000ha Gunung Nyiut Penrissen Forest Complex. The GNNR comprises mostly sub-montane and montane rainforest, and is designated as an Important Bird Area by BirdLife International. It is also home to rural and indigenous Dayak communities.

The Conservation Cooperative model has a community-led governance structure and provides services in business, education and health to address rural social inequalities and the root cause of biodiversity loss. The project works with indigenous communities to co-manage the reserve with government agencies, such as through setting up SMART patrol units, and establishing 'no-harvest zones' based on indigenous knowledge and values. The CC model has also been scaled to other project sites.

Industry Standards or Awards

Equator Prize 2017

Location: West Kalimantan, Indonesia

Project lifetime: 2012 - present

Project implementer: PLANET INDONESIA

NOTEWORTHY PRACTICES

01 Community-centric project design

Rather than criminalizing locals for poaching and wildlife trade, the project conducted focus group discussions in villages to understand the drivers behind their actions, such as poverty and agricultural issues. In turn, they work with the villagers to create sustainable businesses, increase literacy, provide access to finance through a Village Savings and Loans (VSL) programme and provide alternative livelihoods.

02 Resolving conflicts arising from land tenure and rights

Many of the areas in the protected areas were once community-owned lands, leading to conflicts between villages and the state, and limited access to basic services by the local communities. The project conducted several large participatory mapping projects to clarify the boundaries and land rights of the communities, while facilitating collaboration between the government officials and the villages.

Source: Yayasan Planet Indonesia, Equator Initiative

FOREST

CONSERVATION COOPERATIVE IN GUNUNG NIUT NATURE RESERVE (GNNR)

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Reduction in tree cover and forest loss
- Number of wildlife snares removed
- Area managed through SMART patrols
- Number of individuals per kilometre for specific species

Other Project Metrics

- Protected Area Management Effectiveness Tracking Tool score
- Number of zonation created for villages to allow for limited resource use within PA boundaries

Social / Livelihoods

- Number of people engaged in forest patrol units; number of patrol units
- Number of households reached through sustainable agriculture and agroforestry training
- Number of households and individuals involved in Conservation Cooperatives
- Size of total assets in the Village Savings & Loans program

Image: SMART patrol unit (Source: Yayasan Planet Indonesia)

Key technologies or methods for MRV

Each CC has a community-based patrol unit which uses the Spatial, Monitoring, and Reporting Tool (SMART) which is a set of software and analysis tool that also has a mobile app. The units report and track the encounter rates of wildlife, detect illegal activities and remove wildlife traps.

Ground surveys by a biodiversity research team: point counts and transect surveys to measure biodiversity

Source: Yayasan Planet Indonesia, Equator Initiative

WITHONESEED COMMUNITY FOREST PROGRAM

FOREST

PROJECT SUMMARY

WithOneSeed seeks to build local economies and support sustainable living while contributing to climate change mitigation. The project works with subsistence communities in Timor Leste to reforest their land via setting up nurseries and community forestry programs. They then provide incentive payments for the farmers to maintain the trees over their lifespan through paying them annually for every tree that survives. Other activities include climate change education, and vocational training in agroforestry, permaculture and technology.

It is the first internationally certified carbon forestry program in Timor Leste under the Gold Standard Afforestation/Reforestation Certification.

Location: Baguia, Timor Leste

Project lifetime: 2009 - present

Project implementer: WithOneSeed

NOTEWORTHY PRACTICES

01 Leveraging technology for transparency and monitoring

The project uses TreeO2, a tree tracking technology and forestry management platform, to monitor all the trees that are planted. It uses smartphones, RFID technology and GPS to geo tag each tree's location and health, and the data is saved on a cloud database to track the impact (i.e. carbon sequestered) over time.

02 Alignment to market standards

The carbon credits from the program, referred to as CarbonSocial credits, meet the international & Australian carbon offset standards, and are also certified under Gold Standard to meet 10 of the 17 UN SDGs.

Industry Standards or Awards

Gold Standard for the Global Goals — **certified carbon forestry program**

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Number of trees planted and under management
- Number of hardwood trees

Climate Change

- Tons of CO_2e captured and removed

Social / Livelihoods

- Number of farmers engaged in community forestry
- Value of community income paid into the village economy since 2010
- Number of full-time and casual jobs created

Other Project Metrics

- Number of nurseries
- Number of seedlings
- Number of carbon credits sold

Key technologies or methods for MRV

TreeO2 community forestry tool and smartphone app

- Uses GPS to locate and map each tree to monitor their survival
- RFID chips are inserted into each tree to record data including planting date, species, circumference measurements, farmer payment information etc. The data is stored in a cloud-based server

Source: Gold Standard, Equator Initiative, Uplink World Economic Forum

FOREST +

IBIS RICE IBIS Rice

PROJECT SUMMARY

Named for the Critically Endangered Giant Ibis, IBIS rice aims to promote and provide a market channel for wildlife-friendly rice agriculture, so as to conserve biodiversity and ecosystems. It claims to be protecting 500,000 ha of forest and wetland in the Northern Plains, which is an important habitat for over 260 bird species and large mammals. The IBIS Rice project was first started in Kulen Promtep Wildlife Sanctuary, and was later implemented in Keo Seima Wildlife Sanctuary as an example of holistic conservation management.

The project works with local farmers to use organic farming methods, and to avoid poaching and deforesting habitats. The program provides seeds, agronomic support and training (e.g. on soil fertility and nutrient issues) and an increased market access through the IBIS Rice branding, and also buys back the crops above the market price.

Location: Northern Plains, Cambodia

Project lifetime: 2009 - present

Project implementer:

NOTEWORTHY PRACTICES

01 Project design – provides alternative livelihood opportunities

The project targets the root causes and threats of deforestation; it provides organic jasmine rice farmers with an above-market rate in return for more sustainable agricultural practices e.g. not using chemical inputs or expanding farmland into forests. Ecotourism is another economic opportunity; IBIS rice also partners Sam Veasna Conservation Tours (SVC) to offer wildlife and birding trips.

02 Alignment to industry standards

The program aligns its farming practices to industry-specific international standards. It has attained the USDA Organic, EU Organic and Certified Wildlife Friendly® certification.

Industry Standards or Awards

USDA ORGANIC

CERTIFIED WILDLIFE FRIENDLY

WINNER SUSTAINABLE FOOD AWARDS 2019 NEW SUSTAINABLE PRODUCT

EXAMPLES OF INDICATORS TRACKED

Social / Livelihoods

- Number of households involved in the Ibis Rice program
- Amount (kg) of organic rice sold through the IBIS Rice program in 2020

Source: Sansom Mlup Prey Organization, Wildlife Conservation Society, IUCN

MIKOKO PAMOJA

MANGROVE

PROJECT SUMMARY

Mikoko Pamoja is the world's first blue carbon project funding mangrove conservation and restoration. Located in Gazi bay, the project area has been exploited for fuel-wood. It seeks to prevent illegal harvesting of mangroves in the 117 ha of protected mangroves, and restore 0.4ha of mangroves annually.

The main activities include establishing a mangrove nursery, incentivizing conservation through carbon credits, raising awareness, and restoring mangrove in degraded shorelines. The project also provides alternative income channels such as beekeeping and ecotourism, and supports development projects in education, water and sanitation, and energy-saving stoves.

Location: Gazi Bay, Kenya

Project lifetime: 2012-2032

Project implementer: Association for Coastal Ecosystem Services

Mikoko Pamoja Steering Group
Mikoko Pamoja Community Organization

Industry Standards or Awards

PLAN VIVO – For nature, climate and communities

Equator Prize 2017

NOTEWORTHY PRACTICES

01 Community ownership and engagement, and benefit-sharing mechanism

The participatory approach meant that the community were involved in the design and implementation e.g. consultations and open forums, as well as monitoring. There is also a Community Organization which requires 40% representation by women, and at least 70% of the Payment for Ecosystem Services (PES) is directly received by the local communities

02 Exploring the feasibility of integrating seagrass ecosystems into the project

The project is attempting to include seagrass conservation to offer higher value mangrove + seagrass credits (where seagrass carbon is a voluntary non-accredited benefit)

EXAMPLES OF INDICATORS TRACKED

Climate Change

- Carbon stocks (above- and below-ground)

Social / Livelihoods

- Number of people provided access to clean water
- Number of mangrove-related local businesses & relevant income
- Revenue generated from sale of carbon credits
- Percentage of carbon income invested in education & water supply

Biodiversity

- Number of seedlings planted and survival/mortality rate
- Recruitment of new trees
- Faunal biodiversity status

Other Project Metrics

- Forest attribute: aboveground biomass (AGB), number of juveniles, stump count per hectare, stocking density, mean stump density
- Reported water availability by community members
- Surface elevation in protected area and beach plot
- Sedimentation rates in protected area and beach plot

Key technologies or methods for MRV

Participatory Monitoring
Mikoko Pamoja Community Organization leads teams that comprise of recruited locals to monitor forest health and illegal harvesting. The project also provides training (by KMFRI) on mangrove monitoring and carbon accounting.

Source: Plan Vivo, Equator Initiative

MANGROVE

BAAN BANG LA COMMUNITY MANGROVE FOREST CONSERVATION

PROJECT SUMMARY

The community in Bang La had formed an association to protect and co-manage mangroves since recognizing its importance of disaster risk reduction e.g. tsunami impacts. Some project programs specifically target youths for awareness raising, and women empowerment. The community has also established a community savings group and microcredit scheme to support alternative livelihoods and access to finance.

The project area saw the return of the protected Phuket Sea Otter, which was then used as the flagship species on awareness campaigns and a biological indicator for ecosystem health.

Location: Phuket, Thailand

Project lifetime: 1993-Present

Project implementer: **Baan Bang La Community**

Industry Standards or Awards

Equator Prize 2017

NOTEWORTHY PRACTICES

01 Securing land rights and tenure

The community declared itself an organization and advocated for its land rights. They had obtained a Memorandum of Understanding from the provincial government, and hence were able to establish a community-managed conservation area and prevent the area's conversion for industrial use.

02 Capacity building and networks

One of the main activities is to set up youth groups (Coastal Youth Conserving Mangroves) to engage youths in protecting mangroves, and serving as ecotourism guides. The Baan Bang La women's group also taps into community events to promote traditional food derived from mangroves, and these have been effective in raising public awareness. Through networks such as the Network of Coastal Youth for Mangrove Conservation, they exchange knowledge on management practices with other communities in the Phang Nga Bay area.

EXAMPLES OF INDICATORS TRACKED

Social / Livelihoods

- Number of youth groups set up and membership
- Number of participants in the women group
- Fish catch changes compared to the past decade
- Increase in the number of households in the Community Savings Group membership, and amount of funds

Other Project Metrics

- Hectares of community mangrove forests that grow along a key estuary kept intact.
- Hectares of mangroves protected as strict conservation zone

Biodiversity

- Number of trees planted
- Status of the oriental small-clawed otter, which is listed as vulnerable on the IUCN Red List

Source: Equator Initiative

MANGROVE

DELTA BLUE CARBON

PROJECT SUMMARY

Delta Blue Carbon is the world's largest blue carbon and mangrove reforestation project, spanning around 350,000 hectares of mangrove forest, and other coastal and estuary landscape features. Identified by the WWF as one of the Global 200 biological rich ecoregions, the area provides habitat for 11 species on the IUCN Red List and serves as a crucial feeding ground for migratory shorebirds. The area also has huge potential for carbon sequestration and is crucial in supporting fisheries.

The project conducts large scale mangrove planting on degraded land, and support local communities through improving the access to drinking water, education and healthcare.

Location: Sindh, Pakistan

Project lifetime: 2015-2075

Project implementer:

silvestrum CLIMATE ASSOCIATES

NOTEWORTHY PRACTICES

01 Project design and MRV for climate adaptation

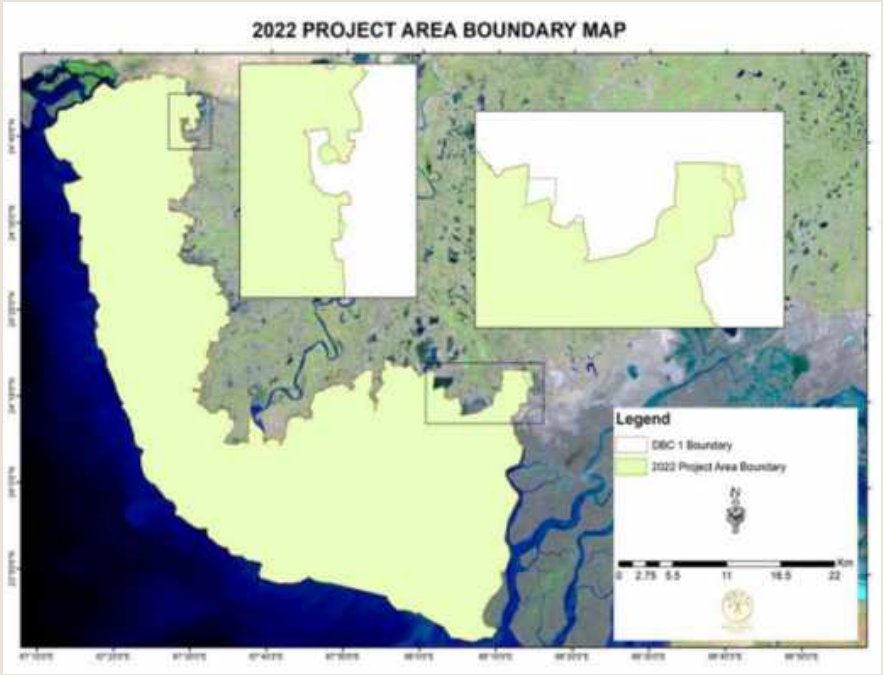
This is one of the first projects to use Verra's Blue Carbon tidal wetland methodology and account for the long-term effects of sea level change in the project design and monitoring (e.g. amount of erosion and salt water intrusion). The project improves the communities wellbeing and financial security to decrease their vulnerability to climate change impacts.

02 Gender Lens

Each Village Development Committees must involve both male and female representatives. Statistics of women impacted are also tracked for the other aspects of health and livelihoods

Industry Standards or Awards

Seeking verification from Verra's Verified Carbon Standard (VCS) and triple gold for Verra's Climate, Community and Biodiversity Standard (CCB)



Map of project zone (Source: Verra)

Source: Delta Blue Carbon, Verra, Trafigura

MANGROVE

DELTA BLUE CARBON

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Hectares of degraded and de-vegetated mangrove lands restored
- Species coming in through natural regeneration
- Trigger species population status and/or trends

Social / Livelihoods

- Verra's standardized metrics such as number of people with improved skills from training
- Direct employment and jobs creation through up-scaled ARR
- Support for fishing communities and sustainable fisheries
- Participatory land-use planning and awareness-raising
- Access to education; safe drinking water and hygiene; improved health care facilities

Climate Change

- Net estimated GHG emission removal and other VCS metrics
- Number of fishermen reporting increased and stable fisheries catch per unit of fishing effort
- Number of community members reporting reduction in number of hectares of shoreline eroded
- Number of community member reporting reduction in hectares of landscape damaged by flood or tidal water

Other Project Metrics

- Number of hectares brought under mangrove plantations
- Number of hectares restored or protected

Key technologies or methods for MRV

Ground survey to collect ecological and social data e.g. faunal surveys, community interviews

Satellite and GIS to assess the amount of coastal erosion and area of forest restoration

Source: Delta Blue Carbon, Verra, Trafigura

PEATLANDS

SUMATRA MERANG PEATLAND PROJECT

PROJECT SUMMARY

The project seeks to restore and actively manage 22,934 hectares of degraded peatland forest in the Merang-Kepayang peat dome. The ecosystem would have been converted into an industrial pulp and paper forest plantation in the absence of this project.

The project design involves peat rewetting and reforestation to restore the hydrological state so as to reduce the risk of forest fire and peat emissions. The project area is also a habitat for the Sumatran Tiger as well as over 210 species, including 31 species threatened with extinction. The project also works with local communities to build low-carbon livelihoods and strengthen the rural economy.

Location: South Sumatra, Indonesia

Project lifetime: 2016 - 2062

Project implementer:

FOREST CARBON

PT. Global Alam Lestari

Part of Althelia Climate Fund

Industry Standards or Awards

Verified Carbon Standard

Climate, Community & Biodiversity Standards

A VERRA STANDARD

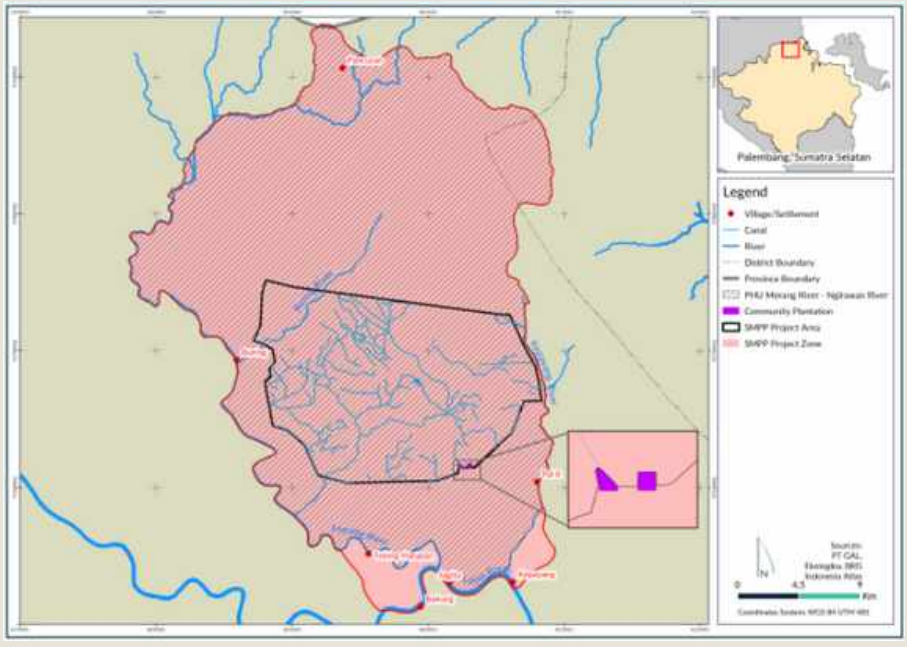
NOTEWORTHY PRACTICES

01 Baseline biodiversity assessment and monitoring

The project had partnered with the Zoological Society of London to conduct a biodiversity assessment and catalogue via mapping and drone surveys. It also established a camera trap program. This helps to provide baseline data and for monitoring species status and long-term trends.

02 Use of IoT and technology for real-time monitoring in large and/or inaccessible areas

Working with a technology partner Sustainability Tech, the project uses a range of sensors (e.g. water level and rainfall gauges) backed by Internet of Things (IoT) technology which provides reports of the ecosystem conditions and fire risks assessment in real time.



Map of project zone (Source: Verra)

Source: Forest Carbon

PEATLANDS

SUMATRA MERANG PEATLAND PROJECT

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Restoring habitat for unique and endangered species such as the Sumatran tiger, rhinoceros, hornbill and sun bear
- Number of species identified in the area

Social / Livelihoods

- Number of people provided with training
- Jobs created or supported e.g. in dam construction, forest patrols etc
- Gender & inclusivity: number of jobs created held by women
- Fair economic return: value invested in local communities

Climate Change

- Tons of CO_2 emissions reduced or avoided

Other Project Metrics

- Area classified as forest cover
- Number of rainwater catchment systems installed
- Number of dams installed for peatland rewetting
- Rise in water table height

Key technologies or methods for MRV

IoT sensors
to monitor water levels and other fire risk indicators in real time

Camera traps
for biodiversity monitoring

Drones and Satellite-based Early Warning Systems
to monitor illegal land clearance and forest fires

Source: Forest Carbon

PEATLANDS

RIMBA RAYA BIODIVERSITY RESERVE PROJECT

PROJECT SUMMARY

Rimba Raya is a REDD+ project with an initial climate-focused objective to prevent the conversion of 47,237 ha of High Conservation Value (HCV) lowland peat swamp forest into palm oil plantations, as well as create a buffer between plantations and the Tanjung Putting National Park. The area is also rich in biodiversity, and home to critically endangered and threatened species including the Bornean orangutan.

The project's intervention mostly revolves around establishing the reserve to prevent further deforestation and generating carbon credits through registries. It also seeks to protect and expand the contiguous forest habitat. Other project activities to benefit the community include the distribution of water filters, micro-credit programs, community clinics and libraries, as well as tree planting initiatives that provide employment.

Industry Standards or Awards

Verified Carbon Standard

Climate, Community & Biodiversity Standards — **Triple Gold Level**

Sustainable Development Verified Impact Standard

Location: Central Kalimantan, Indonesian Borneo

Project lifetime: 2008 – 2038

Project implementer:

InfiniteEARTH

Orangutan Foundation International

NOTEWORTHY PRACTICES

01 Project design for climate adaptation

The project identified several impacts of climate change on food security, income, health and biodiversity. Correspondingly, project activities to mitigate these risks include fire suppression and training, community based agroforestry and planting of native species, crop rotation/diversification, improving water conservation and irrigation practices, and the protection of contiguous forest patches.

02 Transparency: impact reporting and verification

The project attained certifications from Verra's standards, including: VCS, CCB Triple Gold Standard and SD Vista. It discloses its impact reports on Verra's registry and also on its website alongside details about its initiatives and impacts.

Source: Verra, Rimba Raya

PEATLANDS

RIMBA RAYA BIODIVERSITY RESERVE PROJECT

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Number and status of Endangered, Threatened or Vulnerable IUCN Red List species protected
- Number of saplings and number of native species planted, and survival rates

Social / Livelihoods

- Number of clean water filtration systems that have been distributed;
- Number of community children going to school and number of writing books;
- Hiring and training of locals for patrol, fire response, co-management of Tanjung Putting National Park, agroforestry etc

Climate Change

- Total Emissions Avoidance Capacity (emissions avoided over the project lifetime)
- Net GHG emission reduction or removals per year (tCO_2e)

Other Project Metrics

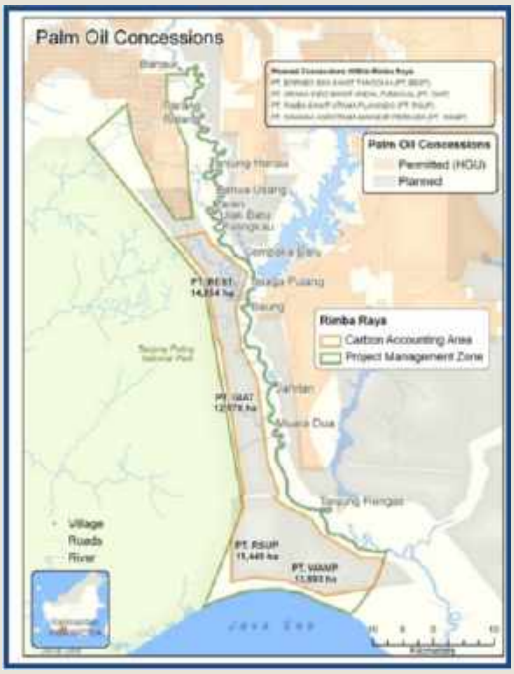
- Change in forest cover and condition
- Water quality measurements e.g. dissolved organic matter, sedimentation loads, pH and etc.
- Occurrence of fire

Key technologies or methods for MRV

Routine ground-based data collection including forest observation patrols and water sampling

Camera traps for biodiversity monitoring

Remote sensing and GIS to monitor land cover change and activities annually. The data collection and processing is aligned with the GOFC-GOLD Sourcebook procedures.



Map of Rimba Raya Project Zone

Source: Verra, Rimba Raya

PEATLANDS

COMMUNITY-BASED RAJA MUSA FOREST RESERVE REHABILITATION PROGRAM

PROJECT SUMMARY

Covering an area of 35,656 ha, Raja Musa is one of the four forest reserves that make up the larger North Selangor Peat Swamp Forest (with an area of 81,304 ha). The area provides vital services to the local community, such as water supply. However, the peat swamp forest faces a history of degradation due to fires, unsustainable agriculture practices in the adjacent areas and illegal encroachment.

The project involved the rehabilitation of the degraded peat swamp area such as canal blocking to restore the hydrological regime, tree planting campaigns, awareness raising and developing alternative livelihood opportunities such as handicrafts and ecotourism.

Location: Selangor, Malaysia

Project lifetime: 2011 - present

Project implementer:

NOTEWORTHY PRACTICES

01 Community ownership and engagement

The "Friends of North Selangor Peat Swamp Forest" group – a community association – was established to actively involve the local community in activities such as rehabilitating the reserve, facilitating tree planting, outreach programs, fire patrols and firefighting operations. The community members have also established a nursery, sell handicrafts made with peatland resources, and are also involved in ecotourism development e.g. agritourism homestays.

02 Multi-sectoral partnerships

The Selangor State Forestry Department, Global Environment Centre and the local community worked together to implement the management plans, while organizations including HSBC Bank Malaysia, the EU, the GEF Small Grants Programme and the UNDP provided funding for various initiatives.

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Number of seedlings/trees planted

Social / Livelihoods

- Number of Peatland Forest Ranger workshops and number of students who participated

Other Project Metrics

- Area of degraded peat swamp forest rehabilitated
- Number of canal blockings constructed
- Number of volunteers involved in tree planting activities

Source: Global Environment Centre, GEF Small Grants Programme

THE NORTHERN KENYA CARBON PROJECT

GRASSLANDS

PROJECT SUMMARY

The Northern Kenya Carbon Project is the world's first large-scale grasslands soil carbon project. The sale of this sequestered carbon from community rangelands in northern Kenya will create additional and much needed income for the communities and enhance conservation efforts, including the improvement of habitat for four endemic endangered species - the Eastern black rhino, Grevy's zebra, Reticulated giraffe and Beisa oryx, as well as addressing impacts of climate change.

The project spans 1.9 million hectares (4.7 million acres) and is an initiative that will improve grazing for pastoralists and generate additional revenue for 14 community conservancies, increasing the financial viability of conservation and making community conservancies more resilient.

Location: Isiolo, Marsabit and Laikipia counties, Kenya

Project lifetime: 2012-2021

Project implementer: NRT, SOILS FUTURE, native

NOTEWORTHY PRACTICES

01 NbS for land management of livestock

The project tackles the issues of degraded rangelands and conflict over scarce resources across the entire region by implementing coordinated rotational grazing of domesticated livestock and other proven land management practices.

02 Combined efforts provide returns on carbon, biodiversity and community

The carbon funding will help diversify community income, and will also support specific community needs, including clean water, education, and infrastructure projects.

Industry Standards or Awards

Verified Carbon Standard

Climate, Community & Biodiversity Standards

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Biodiversity surveys on impacts of species that are indicative of grassland health, such as dung beetles, grasshoppers, birds, and plants

Social / Livelihoods

- Amount of funding for education available, water infrastructure, healthcare facilities, employment rates.

Climate Change

- Soil carbon stocks across the region

Other Project Metrics

- Livestock numbers and movements every month to help assess the local impact of droughts.

Key technologies or methods for MRV

Rangers gather data on their daily patrols and input the information into the database WildlifeCoMMS. This enables the Conservancy management to have a clearer understanding of the status of wildlife and illegal activities.

Annual satellite imagery also assesses project success by comparing monthly changes in vegetation within and outside the project area.

Source: Verra, Northern Rangelands Trust

GRASSLANDS

THE PASTURES, CONSERVATION, CLIMATE ACTION PROJECT

PROJECT SUMMARY

This community-driven project is developed under the Plan Vivo Standard and implemented by the Mongolian Society Range Management. Through improving rangeland management, it seeks to provide livelihood benefits for the nomadic herders while conserving the biodiversity heritage, ecosystem services and contribute to carbon sequestration. The project is collaborating with more than 140 herder households and conducted at three different sites in Mongolia that represents mountain, steppe and desert steppe environments. In total the territories of these groups cover an area of approximately 78,500 ha.

Location: Mongolia

Project lifetime: 2013 - present

Project implementer:

University of Leicester

Darwin Initiative

Industry Standards or Awards

PLAN VIVO
For nature, climate and communities

Map of project areas in Mongolia (Source: Plan Vivo)

NOTEWORTHY PRACTICES

01 Community involvement leading to success

Community (herders) are involved in all sections of this project. From identifying indicators used to monitor, to community members trained in animal survey techniques by the Zoological Society of London (ZSL). This has allowed for complete project buy-in and increased participation in decision-making from those involved supporting the drive for success.

02 Conjunction of livelihoods and environmental benefits

An aim is to increase herders' income by maximising value from livestock products and developing new sources of income. Such activities, in conjunction with the biodiversity conservation/ ecosystem service protection activities, are also designed to contribute to wider well-being and perceptions of security amongst participating herding communities and as evidenced through participatory well-being indicators.

Source: Plan Vivo

GRASSLANDS

THE PASTURES, CONSERVATION, CLIMATE ACTION PROJECT

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Statistically significant increase in populations of key species
- Sapling replanted success
- Pasture management
- Estimation of biomass utilization rate

Climate Change

- Amount of carbon emissions avoided through improved land management and/or reduction in livestock numbers

Social / Livelihoods

- Annual household income (percentage by income category)
- Monthly non-food expenditure
- Participatory poverty/ livelihood evaluation
- Total and mean annual movement by households (km)
- Percentage of female headed households

Other Project Metrics

- Number of herder groups that participated in the project development, training events and workshops

Key technologies or methods for MRV

The local community is trained by the Zoological Society of London (ZSL) in animal survey techniques.

Manned surveys and camera trap surveys are conducted to monitor and protect threatened target species including the Mongolian gazelle, red deer, argali, and marmot.

Source: Plan Vivo

GRASSLANDS

THE LIFE TRANSILVACOOPERATION PROJECT

PROJECT SUMMARY

The unique landscape of the Natura 2000 sites comprises a mosaic of small plots of cultivated land that are rich in habitats and species. However, these sites are threatened by land-use change due to the loss of small-scale farms and increase in holding sizes.

The project adopts a cooperative approach for conserving grasslands at landscape scale, and improving effectiveness of agri-environment measures. Activities include habitat restoration actions (e.g. returning grassland to hay meadow, prevent overgrazing), demonstrating biodiversity-friendly farming to local stakeholders, and training farmers in biodiversity management. It seeks to halt the loss of species and habitats of importance to the region.

Location: Transylvania, Romania

Project lifetime: 2020-2023

Project implementer:

Sigrid Rausing Trust, Rainforest Concern, Earthworm Foundation, Carpathian Convention, European Commission, LIFE+, Fauna & Flora International, Fundatia Orange Romania, Innovation Norway, Swiss-Romanian Cooperation Programme, Darwin Initiative

NOTEWORTHY PRACTICES

01 Addressing local needs through capacity building

An issue faced by locals is that traditional land management has become uneconomic, and thus small-scale farming is no longer attractive to the younger generation. This project seeks to change this perception through training farmers, many of whom are young on how cooperative landscape-scale biodiversity management can be economically viable due to the low-input management techniques and other enabling policies e.g. Regional Development Programme payments.

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Monitoring of results-based indicator species
- Returning grassland from pasture to hay meadow, fencing of parcels to reduce stocking rate

Climate Change

- Assessment of per tCO_2 sequestration costs at varying levels of destocking

Social / Livelihoods

- Number of farmers trained in Natura 2000 sites, especially young farmers, in cooperative landscape-scale biodiversity management.
- Number of courses in biodiversity management of protected grasslands offered

Key technologies or methods for MRV

Study and evaluation of various tools for farm assessment including platemeter for measuring plant mass in fields, Soilmentor soil and biodiversity monitoring app, and access to analysis software provided by UNISECO project (implemented by WWF), the SMART and Cool Farm Tool.

Source: European Commission

FRESHWATER WETLANDS

RESTORING CHANGYUAN RIVER WETLAND NATURAL PARK IN QIXIAN

PROJECT SUMMARY

The Changyuan River restoration project in Qixian, Shanxi province relies on nature-based solutions to restore essential ecological heritage and increase the capacity of local ecosystems to adapt to climate change. The project offers a model for preserving wetlands in arid or semi-arid climates around the world.

The project involves wetland restoration and species conservation, including the restoration of 11.5 km of permanent riverbed, creation of a bird sanctuary and fifty bird islands, riverbank re-naturalization and reintroduction of local plants that had disappeared.

Location: Shanxi province, China

Project lifetime: 2014-2034

Project implementers:

AFD
AGENCE FRANÇAISE DE DÉVELOPPEMENT

NOTEWORTHY PRACTICES

01 Ecotourism was successfully embedded into NbS

Development of ecotourism was a key aspect of the project, including the creation of an eco-museum.

02 Building an enabling environment for improved resource management

Waste, wastewater and energy management: the project saw the creation of a biogas plant fed with local biomass, a 2-hectare filtering garden to treat 10,000 cubic metres of wastewater per day, as well as local capacity-building initiatives to enable sustainable park management practices.

Industry Standards or Awards

Changyuan River Wetland Natural Park won the Sustainable Infrastructure Grand Prize of the 2019 Green Solutions Awards at the China level + a mention for the international Sustainable Infrastructure Grand Prize.

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Number of bird species and plant species.

Social / Livelihoods

- Effective sanitation solutions and alternative job opportunities.
- Cultural continuity along river

Other project metrics

- Green infrastructure for ecological museum

Image source: Construction21

Source: AFD, Phytorestore, Construction 21

FRESHWATER WETLANDS

BUILDING RESILIENCE OF URBAN POPULATIONS IN LAOS

PROJECT SUMMARY

This project aims to restore urban wetlands and streams for water flow regulation and flood risk reduction. It seeks to promote the integration of nature-based solutions as compared to prevalent hard infrastructure to strengthen the natural capacity of ecosystems in water management. This in turn reduces the vulnerability of local populations to climate change impacts.
By restoring 1,500 hectares of urban wetlands and streams, the project exemplifies a climate adaptation solution by reducing flood and storm risks to cities in Lao PDR, which are among the areas most prone to flooding in Southeast Asia.

Location: Lao PDR

Project lifetime: 2020-2025

Project implementers:

Ministry of Natural Resources and Environment and Ministry of Finance, State of Lao PDR

UN environment United Nations Environment Programme

GREEN CLIMATE FUND

Preliminary evaluation

This project is ongoing and hence is yet to be a conclusive "best practice" case study. However, the elements necessary for this to be a "best practice" example are there; it will be a useful example for a Climate Adaptation NbS if it is successfully implemented.

NOTEWORTHY PRACTICES

01 Building climate awareness and resilience in the community

This project aims to build the community's awareness of climate change. It also involves the creation of a knowledge hub in collaboration with the National University of Laos for research and monitoring, as well as to develop the technical capacity of government agencies and other decision-makers to implement and maintain wetland rehabilitation projects

02 Adopting a gender lens through a "Gender Action Plan"

The project seeks to establish management groups with an equal representation of men and women, and has intentionally set minimum targets such as participation rates of women in surveys and training programmes. The project will also designate an officer to monitor if the gender-related objectives are met.

EXAMPLES OF INDICATORS TRACKED

Climate change

- Change in expected losses of lives and economic assets due to the impact of extreme climate-related disasters in the area of intervention

Social / Livelihoods

- Hectares of land restored for multi-use energy and livelihood benefits (Level of effectiveness, aim for 3 of 4 cities with improved effectiveness)
- Higher productivity from agricultural lands secured in face of climate change

Source: Green Climate Fund, Panorama Solutions

FRESHWATER WETLANDS

BOON RUEANG WETLAND FOREST CONSERVATION GROUP (BRWRCG) PROJECT

PROJECT SUMMARY

The conservation group was formed by Boon Rueang villagers in response to the threat of conversion of the wetland forest for industrial use. The community manages the 483 ha project area using a landscape conservation model with a set of regulations that govern the communal use and protection of the wetland forest and river, e.g. prohibition of hunting or fishing in conservation zones. These measures help to protect local species of wildlife and flora.

Location: Chiang Rai, Thailand

Project lifetime: 2015 - present

Project implementers: Boon Rueang Wetland Forest Conservation Group, in partnership with local NGOs, local government agencies, universities and RECOFT

Industry Standards or Awards

Equator Prize 2020

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Number of species of flora and fauna protected, particularly local fish species, exotic species, food plants, and medicinal plants.
- Presence of mammals registered on the IUCN Red List of Threatened Species, e.g. Sunda Pangolin etc

Social / Livelihoods

- Number of families with livelihoods affected
- Value of direct income for villagers

Other Project Metrics

- Number of hectares protected

NOTEWORTHY PRACTICES

01 Prevented proposed conversion of wetland into industrial park via advocacy

Advocacy and social media campaigns by the BRWFCG helped to raise awareness about the value of the wetland to the local community, and prevented a proposed Special Economic Zone conversion of the wetland into an industrial plot in 2015

02 Community-led, culturally-influenced education

The wetland and community has a 200-year long history of being locally managed. The BRWFCG promotes the local knowledge and use of medicinal plants, protection of endangered species as well as traditional practices and ceremonies to strengthen the community's connection to nature. The group also created a walking trail for visitors to learn about the ecosystem and the community's practices.

Key technologies or methods for MRV

Community-based data collection and ecosystem quantitative valuation

Source: Equator Initiative, RECOFTC

SEAGRASS BEDS

SEAGRASS ECOSYSTEM SERVICES PROJECT – COMMUNITY CENTERED CONSERVATION C3

PROJECT SUMMARY

C3 engages in research and management of dugong populations in the Philippines, and pioneered a dugong conservation program and locally managed marine protected area (LMMA) in the country. It engages the local community in biodiversity conservation, habitat management, enterprise development and other capacity building activities.

The Seagrass Ecosystem Services project has demonstrated the scalability of its approach; C3 works with field practitioners, coastal communities and technical experts in Indonesia, Malaysia, Philippines, Thailand and Timor-Leste.

Location: The Philippines

Project lifetime: 2019-2022

Project implementers:

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Seagrass species: trends and status
- Seagrass and dugong distribution, health and abundance

Other Project Metrics

- Number of hectares protected

Social / Livelihoods

- Number of residents impacted

Source: Dugong & Seagrass Conservation Project

NOTEWORTHY PRACTICES

01 MRV practices

It is the first organisation in the country to use unmanned aerial vehicles (UAVs) for monitoring dugong populations. Through working with the Tagbanua indigenous people, the project created a participatory monitoring program to investigate the spatial distribution, habitat-use patterns and risks for dugongs.

02 Capacity building - research tools

The project also created an interactive online Dugong & Seagrass Research Toolkit which provides a guide for researchers and practitioners to select the most suitable methodologies for assessing seagrass status and dugong populations, based on factors such as the user's team capacity, budget, timeline etc.

Key technologies or methods for MRV

Participatory monitoring program with locals, using survey methodologies such as the SeagrassWatch method, and the dugong catch and bycatch survey

Drones and UAVs to monitor turtle and dugong populations

SEAGRASS BEDS

REDUCING AND MITIGATING EROSION AND DISTURBANCE IMPACTS AFFECTING THE SEABED (REMEDIES)

PROJECT SUMMARY

ReMEDIES is a £2.5 million marine conservation partnership project. It seeks to reduce pressure from recreational activities, restore degraded and sensitive seagrass beds, and raise awareness in five Special Areas of Conservation in Southern England.

Location: United Kingdom

Project lifetime: 2019-2023

Project implementers:

NOTEWORTHY PRACTICES

01 Reducing anthropogenic pressures on sensitive habitats

The project designs initiatives that seek to create behavioural change and reduce recreational activity impacts (e.g. recreational boating anchoring and mooring practices) on seagrass beds.

02 Multi-stakeholder partnership

The project involves collaboration between various stakeholders with different expertise and contributions to the project. For example, Natural England provides project management, finance and administrative support; the Ocean Conservation Trust conducts seagrass replanting and habitat restoration; The Royal Yachting Association and The Green Blue provides guidance on sustainable anchoring and Advanced eco-Mooring Systems (AMS); and the Marine Conservation Society educates schools and communities.

EXAMPLES OF INDICATORS TRACKED

Biodiversity

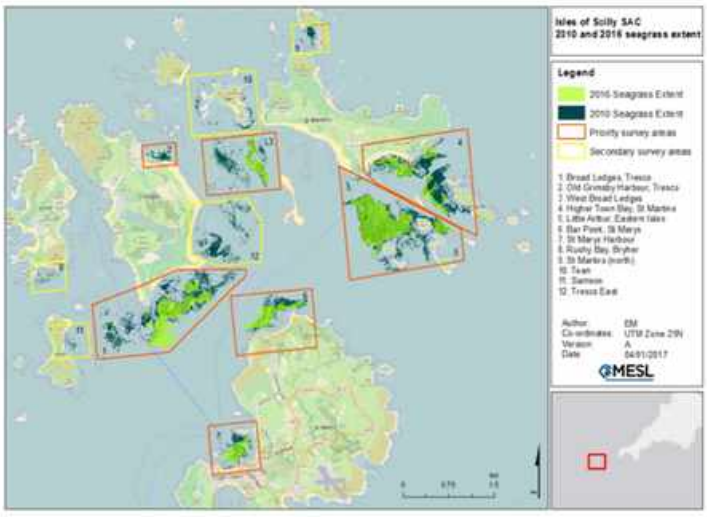
- Number of bags of seagrass planted
- Success and growth rates of seeds from outplanting
- Area covered by seagrass (ha)
- Species number
- Specific species abundancy

Social / Livelihoods

- Number of residents impacted

Climate Change

- Soil carbon stocks across the seagrass meadows



Map of Seagrass coverage of the Isles of Scilly Special Area of Conservation (Source: Life Recreation ReMEDIES)

Source: Save Our Seabed, Westcountry Rivers Trust, Ocean Conservation Trust

COASTAL

ENHANCING CLIMATE RESILIENCE OF INDIA'S COASTAL COMMUNITIES

PROJECT SUMMARY

Through adopting an ecosystem-centred and community-based approach, the project aims to increase the resilience of vulnerable populations, particularly women, in coastal areas to climate change impacts and extreme weather events.

The project seeks to scale up the adoption of ecosystem-based adaptation in India's coastal regions. It aims to restore and manage 14,945 hectares of coastal ecosystems (including 85 hectares of seagrass beds, 10,575 hectares of mangroves, 700 hectares of saltmarshes, 35 hectares of coral reefs and 3,550 hectares of coastal watersheds) to buffer against the current and future impacts of climate change.

Location: India

Project lifetime: 2019-2024

Project implementer: Governments of Andhra Pradesh, Maharashtra and Odisha, and the Ministry of Environment, Forest and Climate Change, and the Green Climate Fund

NOTEWORTHY PRACTICES

01 Enabling environment: government level policy support for local implementation

The project strengthened coastal and marine governance and institutional frameworks such as a new "National Coastal Mission" to integrate climate change adaptation and NbS into coastal management.

02 Gender lens

The project has conducted a gender-sensitive vulnerability assessment and developed a gender action plan to ensure that women actively participate in the process. This includes setting targets for the proportion of recipients receiving technical support and training who are women.

EXAMPLES OF INDICATORS TRACKED

Climate Change

- Tonnes of carbon dioxide equivalent reduced
- Coverage/scale of ecosystems protected and strengthened in response to climate variability and change
- Investment in ecological infrastructure to buffer against climate change impacts and climate-induced disasters

Social / Livelihoods

- Total number of direct and indirect beneficiaries (percentage of whom are female)
- Direct and indirect beneficiaries from improved shoreline protection
- Number of males and females engaging in or benefitting from diversified, climate resilient adaptive practices and alternative income generating activities
- Percentage increase in income at the household level, linked to implementation of diversified climate adaptive practices

Source: Green Climate Fund, UNDP

CORAL REEFS

REEFSCAPERS CORAL REEF RESTORATION

PROJECT SUMMARY

Reefscapers restores coral reefs damaged by coral bleaching and degraded seabeds in Kuda Huraa and other islands in the Maldives through its coral propagation and transplantation programme. They developed artificial coral frames for the corals to grow on, and the data regarding the coral genotype and location are recorded on a database.

Targeting island-based resorts, Reefscapers work with partner resorts, and tourists or guests can sponsor the coral frames or adopt coral fragments to finance the restoration program. The project also involves local communities in different islands, for example, the coral frames are made in Fulhadhoo, thus providing employment opportunities. Other activities include establishing a sea turtle rescue and rehabilitation centre, and resort marine centres to raise awareness for marine conservation.

Location: The Maldives

Project lifetime: 2001 - present

Project implementers: REEFSCAPERS

NOTEWORTHY PRACTICES

01 Capacity building

In addition to increasing awareness about coral reefs and conservation stewardship, the project provides training in marine biology, hospitality and other topics. Moreover, the restoration program contributes towards scientific knowledge on coral propagation and restoration techniques, which can potentially benefit the wider scientific community and projects elsewhere.

02 Development of monitoring technology

Reefscapers has developed an autonomous reef monitoring catamaran which captures and uploads images. They also built an artificial intelligence software to automatically identify coral species, so as to monitor coral health and growth over time

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Number of coral frames deployed
- Number of transplanted coral fragments
- Number of rescued turtle patients
- Number of turtles identified in the database

Social / Livelihoods

- Number of marine biologists in the Maldives
- Number of locals trained through apprenticeships

Other Project Metrics

- Number of monitoring photographs

Key technologies or methods for MRV

Underwater photography to monitor the coral frames bi-annually with images uploaded online along with the scientific data, species name and satellite location. The data is visible to donors.

Artificial intelligence software and autonomous underwater drones to collect images and videos, while the software automatically identifies species captured in each image

Source: Reefscapers, Morand et al. (2020)

SOUTHERN LEYTE CORAL REEF CONSERVATION PROJECT (LRCP)

CORAL REEFS

PROJECT SUMMARY

The Southern Leyte Coral Reef Conservation Project (LRCP) aims to conserve biodiversity and alleviate poverty in local communities through assessing, protecting and restoring coral reefs and marine ecosystems in the area.

The project trains teams of staff, volunteers and scholars in data collection and monitoring techniques, and the methods are aligned to established protocols for coral reef surveys e.g. Reef Check protocols and SCUBA based protocols. The project completed ecological assessments and used the results to provide recommendations, thus facilitating the establishment of more than 10 small-scale MPAs ranging from 5 to 78 ha.

Location: The Philippines

Project lifetime: 2002- 2020

Project implementers:

NOTEWORTHY PRACTICES

01 Building knowledge and scientific capacity of local stakeholders

In addition to increasing awareness about coral reefs and conservation stewardship, the project provides training in marine biology, hospitality and other topics. Moreover, the restoration program contributes towards scientific knowledge on coral propagation and restoration techniques, which can potentially benefit the wider scientific community and projects elsewhere.

02 Citizen science to expand the reach of the project

Through equipping volunteers and staff with the relevant skills and knowledge, the project was able to tap onto citizen science for data collection and surveyed the coastal waters of 28 independent Barangays. The data was also shared with global open source platforms such as the Allen Coral Atlas.

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Number of fish recorded
- Number of invertebrates recorded
- Scleractinian coral cover (%),
- Nutrient Indicator Algae (%),
- Fish abundance
- Fish community sample diversity
- Invertebrate abundance
- Invertebrate community sample diversity
- Commercially important fish biomass (kg)

Social / Livelihoods

- Number of volunteers
- Number of scholarships awarded (from 2003-2020)
- Number of educational events

Other Project Metrics

- Number of Independent ecological surveys undertaken by volunteers, staff & scholars
- Number of technical reports scientific publications published and delivered
- Number of MPAs established
- Number of survey sites, and MPAs surveyed
- Area of reef surveyed (km2)

Key technologies or methods for MRV

Citizen science by volunteer-led survey teams: data was mainly collected using Underwater Visual Census techniques e.g. transect line surveys

Source: Coral Cay

MARINE

THE BIRD'S HEAD SEASCAPE INITIATIVE

PROJECT SUMMARY

The Bird's Head Seascape (BHS) spans across 22.5 million ha and consists of a network of 26 Marine Protected Areas (MPA) protecting about 5.2 million ha. It houses 75% of the world's scleractinian coral species and more than 600 species of corals, 1,669 species of reef fish, and other threatened species of sea turtles and cetaceans. The marine resources also support the main livelihoods of coastal communities.

The initiative seeks to protect the marine and coastal ecosystems while ensuring that the local community are able to benefit from ecosystem services through six strategies, including the development of local management to monitor and enforce the MPA, building capacity in resource management, establishing a BHS Secretariat, embedded the MPA within the nation's plans and strategies, improving tourism practices, and providing environmental education for school children.

Source: Bird's Head Seascape Initiative, Blue Abadi Fund

Location: West Papua, Indonesia

Project lifetime: 2004 - present

Project implementers: Government of Indonesia, local communities, and international NGOs including

CONSERVATION INTERNATIONAL

The Nature Conservancy

WWF

NOTEWORTHY PRACTICES

01 Capacity building

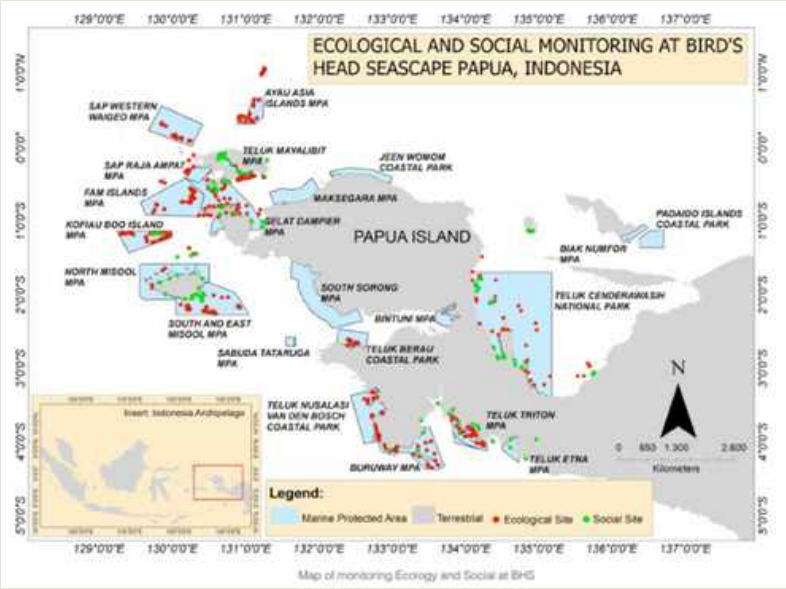
The Blue Abadi Fund was set up to provide financing to help locals manage and protect the BHS. The grants provided do not only focus on managing the MPA through community-based patrol, but also provides funding to empower the local civil society organizations such as programs for environmental education, ecological and social monitoring, or other capacity development e.g. ecotourism training.

02 Multi-stakeholder partnerships

The marine conservation efforts have been led by Government of Indonesia alongside the local communities, civil society, universities and international NGOs. By including decision-makers with different technical know-how as well as local representatives, the initiative is better able to consider the various factors that contribute to a project's success, from the environmental and social impact to economic opportunities e.g. in tourism.

MARINE

THE BIRD'S HEAD SEASCAPE INITIATIVE



Map of BHS Project Zone (Source: Bird's Head Seascape)

EXAMPLES OF INDICATORS TRACKED

Biodiversity

- Biomass of key fisheries species
- Biomass of fish functional groups
- Benthic composition: percentage live hard coral cover

Social / Livelihoods

- Household material assets
- Household food security index
- Household marine tenure
- School enrolment rate
- Place attachment index

Other Project Metrics

Management assessment tools used

- World Bank MPA Score Card was used to assess progress in achieving the initiative's MPA management goals
- E-KKP3K: Indonesian management effectiveness score

Governance

- Proportion of users actively participating in design of marine harvest rules
- Proportion of important habitats subject to appropriation rule
- Number of sanctions employed to enforce compliance with appropriation rules
- Mean time required to resolve conflict between users or users and officials

Key technologies or methods for MRV

Community-based monitoring: the MPAs employ locals to survey the MPA, and train divers for data collection

Focus group discussions, village surveys and interviews to monitor knowledge, attitudes, governance practices etc.

Source: Reef resilience, Bird's head Seascape

ABOUT MANA IMPACT

Mana Impact is a boutique impact investment and advisory firm that seeks to direct investments towards positive social and environmental impact in Asia. Its focus lies in the areas of ocean health, food and agriculture, circular systems, and more recently nature-based solutions. Mana Impact is a female-owned and led business, with inclusiveness as a core value of the company.

ABOUT ENVIROSTRAT

EnviroStrat is a natural resource and sustainability advisor, and impact investment project developer based in New Zealand, with international projects in Vietnam, India, Papua New Guinea and the United States. We work with public and private sector clients, tribes and industry in a range of sectors with a very strong focus on marine and coastal, climate adaptation, agriculture and freshwater issues. Our work typically operates at the intersection of investment and science, in particular with the impact projects we have developed and are executing.

ABOUT THE UBS OPTIMUS FOUNDATION

The UBS Optimus Foundation is an independent foundation aligned with UBS AG, the world's largest wealth manager, pioneering innovative ways to tackle some of the world's most pressing social and environmental problems. UBS OF funds programs with the proven potential to make a big difference, focusing on education, health, child protection and the environment. It is a leader in social finance, applying an impact first, investment-based philosophy and specializing in outcomes-based funding programs. UBS OF is increasingly engaging in blended finance structures – where philanthropic funding catalyses private investments – to draw in funding at scale to social and environmental programs.