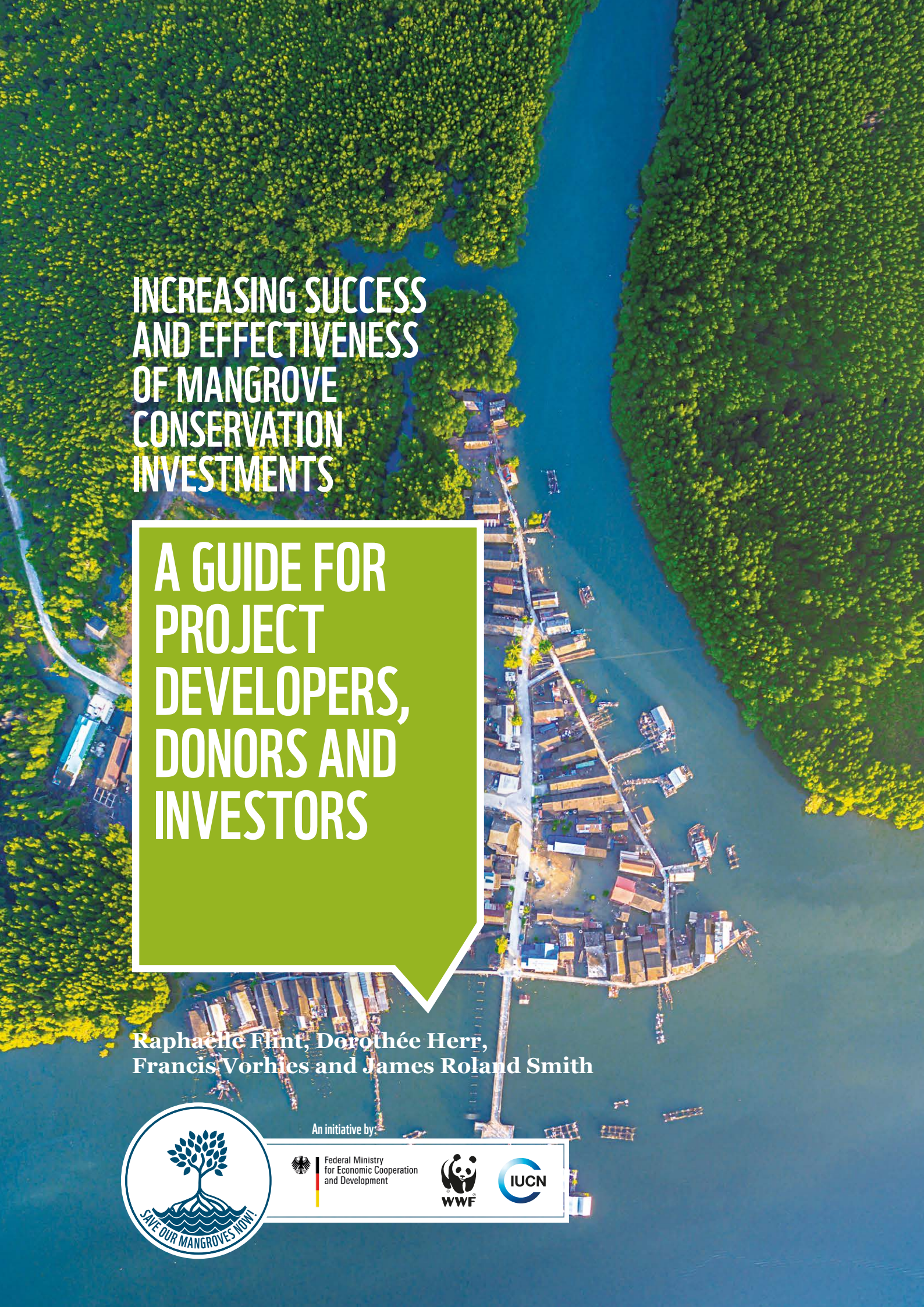

INCREASING SUCCESS AND EFFECTIVENESS OF MANGROVE CONSERVATION INVESTMENTS

A GUIDE FOR PROJECT DEVELOPERS, DONORS AND INVESTORS

Raphaëlle Flint, Dorothée Herr, Francis Vorhies and James Roland Smith

An initiative by:

SAVE OUR MANGROVES NOW!

Federal Ministry for Economic Cooperation and Development

WWF

IUCN

Raphaëlle Flint, Dorothée Herr,
Francis Vorhies and James Roland Smith

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ABOUT THE SAVE OUR MANGROVES NOW! INITIATIVE

The German Federal Ministry for Economic Cooperation and Development (BMZ), World Wide Fund for Nature (WWF) and International Union for Conservation of Nature (IUCN) join forces in the international mangrove initiative "Save Our Mangroves Now!" to halt the global loss of mangroves.

"Save Our Mangroves Now!" is a joint commitment of the above named partners to intensify efforts in mangrove conservation. It aims to upscale and focus global efforts to stop and reverse the decrease and degradation of mangrove habitats, and supports the target of the Global Mangrove Alliance (GMA) to increase the global area of mangrove habitat by 20% over the current extent by 2030.

Backed by BMZ's strong bilateral portfolio and building on IUCN's and WWF's wide engagement and sound experience in mangrove conservation, this initiative has the ambition to create a variety of partnerships and cooperation with other mangrove organizations, initiatives and countries. "Save Our Mangroves Now!" – together with the GMA, provides a platform for knowledge sharing and the exchange of experience in order to encourage collaborations and to foster synergies.

"Save Our Mangroves Now!" acts on three fields of action:

1. Embedding ambitious objectives on mangrove protection and restoration in international and national political agendas such as the Sustainable Development Goals, the Aichi targets and the Nationally Determined Contributions under the Paris Agreement increasing awareness among decision makers about the importance of mangrove conservation as part of the global conservation, sustainable development and climate solutions.

2. Pooling leading expertise, enhancing knowledge-sharing and closing existing knowledge gaps on mangrove conservation and restoration.

3. Supporting innovative lighthouse projects, fostering the dissemination of best practices and mainstreaming of mangrove conservation into national development plans in the Western Indian Ocean.

"Save Our Mangroves Now!" is open for partnerships with countries, other initiatives and organizations in order to increase the momentum for mangrove conservation.

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ABBREVIATIONS

A	
ADB	Asian Development Bank
B	
BNCFF	Blue Natural Capital Financing Facility
C	
CBD	Convention on Biological Diversity
CBA	Cost-Benefit Analysis
CCB	Community, Climate and Biodiversity standards
CEA	Cost-Effectiveness Analysis
CBMM	Community-Based Mangrove Management
CDM	Clean Development Mechanism
CI	Conservational International
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CPIC	Coalition for Private Investment in Conservation
D	
DFI	Development Finance Institutions
E	
EbA	Ecosystem-based Adaptation
ESMS	Environmental and Social Management System
F	
FSC	Forest Stewardship Council
G	
GEF	Global Environment Facility
GIIN	Global Impact Investing Network
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit / German Society for International Cooperation
I	
ICAO	International Civil Aviation Organization
IFC	International Finance Corporation
IRIS	Impact Reporting and Investment Standards
ITMOs	Internationally Transferred Mitigation Outcomes
IUCN	International Union for Conservation of Nature
M	
MAM	Mangroves and Markets
MAP	Mangrove Action Project
MARD	Ministry of Agriculture and Rural Development
MDGs	Millennium Development Goals
MFF	Mangroves for the Future
MPCO	Mikoko Pamoja Community Organization
MPSG	Mikoko Pamoja Steering Group
N	
NAMAs	Nationally Appropriate Mitigation Action
NbS	Nature-based Solutions
NDCs	Nationally Determined Contributions
P	
PES	Payment for Ecosystem Services
PFES	Payment for Forest Ecosystem Services
R	
REDD+	Reduced Emissions from Deforestation and Forest Degradation
S	
SDG	Sustainable Development Goals
SOMN!	Save Our Mangroves Now!
T	
TNC	The Nature Conservancy
U	
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
V	
VCS	Verified Carbon Standards
W	
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Mangroves are among the most important ecosystems on the planet. They provide nursery grounds for a wide variety of marine and land-based species, sustain livelihoods of coastal populations, and protection from ocean swell and extreme weather events. However, mangroves are being cleared, degraded, or lost at a rapid pace due to unsustainable exploitation and land-use changes as well as by the adverse impacts of climate change. Scientists estimate that over 35% of the world's mangroves have disappeared over the last five decades. While some areas have gained protection and are under better management practices, others are still under threat.

To increase the success rate of mangrove conservation projects – both in terms of protection as well as restoration – existing guidelines and technical knowledge need to be applied rigorously. Additionally, sources of finance, particularly through the engagement of the private sector and the development of longer-term business models are required. There is also a need to sensitize project developers and investors, from the public and private sectors, on the key factors determining a successful mangrove project to ensure better planning and decision-making.

This report is targeted at project developers, donors and investors. It aims to serve as a guide to improve the long-term environmental, social and economic returns from mangrove conservation investments by highlighting the opportunities as well as risks of such endeavours. The report provides a set of recommendations and lessons learned, derived from a literature search, interviews and case studies from Viet Nam, Kenya and Madagascar.

The report starts by presenting in Chapter 2 the business case for investing in mangroves, which can result in a number of benefits, including improving the livelihoods of local communities and contributing to biodiversity protection, resilient coastal risk management, and sustainable fisheries and aquaculture. There is an opportunity for the private investment sector to earn revenue from this through a number of financing mechanisms. This chapter aims to stimulate a better understanding of the different investments generating either a return or cost-savings that are available to flow into mangrove conservation. This will help develop more innovative business models that have positive impacts on mangrove conservation and ensure longer-term, sustainable mangrove management beyond short-term public or philanthropic funds.

The case studies (summarized in Chapter 3 and detailed in the supplementary documentation) investigate the costs and benefits, successes and challenges associated with three projects – Mikoko Pamoja (Kenya), Manambolo-Tsiribihina (Madagascar) and Mangroves and Markets (Viet Nam).

Mikoko Pamoja demonstrates that due to site-specific factors, such as the close relationship between the project developers and community and the latter's engagement in the design process, the project has become a great success; the community benefits directly from the revenues generated from selling mangrove carbon credits. Key lessons learned from this case study include the need to: look more systematically at the flow of project revenues and costs; have the flexibility to look for new sources of revenues; and investigate carefully whether the revenue actually has the positive impacts as intended. Other forms of mangrove-friendly incomes such as sustainable harvesting of mangrove resources and ecotourism could increase the direct income to the communities, as well as secure longer-term sustainable management practices.

The Manambolo-Tsiribihina seascape project in Madagascar aims to conserve and restore the mangrove ecosystem through community management and the sustainable use of mangrove-based goods and services. Key lessons learned from this case study include the importance of looking at a wide scope of possible economic activities, from carbon credits to

fisheries and tourism, which could be aligned to mangrove conservation, and securing adequate grant financing to enable the project to develop and mature over a longer time period.

The Mekong Delta Mangroves and Markets project in Viet Nam focuses on mangrove conservation by incentivizing shrimp farmers to restore mangrove cover on their farms to over 50% with organic certification and access to a premium market. With good governance, responsible management and secured markets for certified shrimp, this project shows opportunities for scalability and attracting impact investors who are keen to invest in sustainable aquaculture. Key lessons learned from this case study include the recognition that such market-based projects are scalable, though likely to require significant upfront development costs in the form of grant funding. There are risks of market fluctuations and the quality of the mangrove conservation effort may not be strongly linked to the export of certified products.

Chapter 4 summarizes the key factors as to why past mangrove conservation projects have succeeded or failed (see Annex 2 for more details). Successful projects include an extensive planning phase for site selection, comprehensive stakeholder engagement, effective implementation and monitoring, and protection/enforcement of the results. Failures often include inadequate planning without extended knowledge about local environmental and social conditions, lack of dedicated funding support, and lack of long-term funding and partnerships to ensure sustainability.

The types of investors engaged in mangrove projects are described in Chapter 5. They included both non-profit and impact investors. More successful conservation projects tend to be designed in a holistic, flexible way with a range of benefits to a variety of stakeholders. If greater understanding of the benefits, as well as the available economic returns of mangrove conservation, spread within the investment community, some of their available capital could be directed at mangroves and other conservation projects.

Finally, Chapter 6 and the conclusion outline potential innovative business models that have positive impacts on mangrove conservation and ensure longer-term, sustainable mangrove management. To sustain mangrove management from a financial point of view, an increasingly promising option is emerging partnerships between non-profit and impact investors using approaches like blended finance, which could substantially contribute to de-risking such projects vis-à-vis the private sector.

Stopping mangrove loss and providing full protection to what remains are the most effective methods for people to benefit from this ecosystem – socially, environmental and economically. Mangrove conservation, both protection and restoration, can also play an important role in achieving the UN Sustainable Development Goals and other national and international biodiversity and climate targets. This can be achieved by building up technical capacity where it is underdeveloped, sharing best practices and using established knowledge materials to make a noticeable contribution to mangrove conservation worldwide. With the greater range of financing schemes available today, new partnerships between the non- and for-profit sectors could open up options for long-term, efficient and effective projects.

1

INTRODUCTION

Chapter summary

Mangroves are under threat globally due to land conversion, overexploitation and other anthropogenically induced stressors. Various stakeholders, including governments and non-governmental organizations (NGOs), have been working on the conservation and restoration of mangrove ecosystems for years with mixed results.

To increase the success rate of mangrove projects individually and ensuring long-term success of mangrove conservation efforts broadly, two key areas have been identified:

- The need for increased technical knowledge and capacity building.
- The need for longer-term and additional sources of finance, through the engagement of the private sector and the development of longer-term business models.

In addition, there is a need to:

- Sensitize project developers and investors, both from the public and private sectors, on the key factors determining a successful mangrove project to ensure better planning and decision-making.
- Outline opportunities to develop and combine new, innovative financing mechanisms and instruments for mangrove conservation efforts in order to attract new investors.

Currently, such guidance material is very limited. This report aims to address this gap. The target audience for this publication are mangrove project implementers and investors with an interest in mangrove conservation, including public and philanthropic support and private financiers. The report provides a set of recommendations and lessons learned, primarily derived from case studies from Viet Nam, Kenya and Madagascar.

Mangroves provide a suite of ecosystems services such as climate and water regulation, coastal protection, carbon sequestration, provisioning services (e.g. food, fuel, construction materials and pharmaceuticals) and cultural services (Das *et al.*, 2009; Donato *et al.*, 2011).

Despite increasing success stories on mangrove conservation, the annual percentage of global mangrove loss is still four times higher at 0.66% than terrestrial forest loss (FAO, 2007; Bayraktarov *et al.*, 2016; Wylie *et al.*, 2016). While the rate of loss has since stabilized, between 1980 and 2000, about 35% of mangroves were lost (Duraiappah *et al.*, 2005). These figures continue to be driven by unsustainable exploitation, land-use changes, sea level rise and increasing frequency (and severity) of extreme weather events, the last two primarily due to climate change (Kairo *et al.*, 2001; Giri *et al.*, 2008; Krauss *et al.*, 2014; Richards *et al.*, 2016).

Globally, over 100 million people are dependent on mangroves for their natural resources and services (see Figure 2) (UNEP, 2014). Successful conservation practices and secured, long-term finance for sustainable mangrove conservation and protection remains a topic of great consequence.

Box 1. Terminology

When discussing mangrove conservation projects and programmes, it should be noted that this encompasses the care, rehabilitation, restoration (afforestation and reforestation), sustainable use and management, maintenance and protection of mangrove forests.[1] Where a particular activity in conservation is singled out, a specific term might be used. However, in general, the term "mangrove conservation" will encompass all these aspects.

"Blue carbon" is mentioned often in this document and refers to the carbon physically sequestered in coastal and marine ecosystems. For this publication, carbon is in reference only to vegetated coastal ecosystems such as mangroves, salt marshes and seagrass.

Since the majority of mangrove conservation tends to occur in the form of projects, much of the available literature is also focused on projects. This report, therefore, focuses primarily on project-related activities. However, there are also a few large-scale and wide-ranging programmes (e.g. Save Our Mangroves Now! and Mangroves for the Future) and some of the recommendations in the report apply equally to these mangrove conservation programmes.

The traditional definition of an investor is "*a person or organization that puts money into financial schemes, property, etc. with the expectation of achieving a profit*" (Oxford English Dictionary, 2017). This report takes a broader description that expands to include persons or organizations investing into schemes with an expectation of an economic, and also (or primarily), an environmental and social return. The report, thus, differentiates between the for-profit impact investor and the non-profit investor or donor.

Related to the above distinctions, the report explicitly uses the word *grant* when referring to public or philanthropic support, seeking no financial return on investment. In contrast, the report uses word *finance* to refer to financial investments conducted by the private sector seeking a financial return on investment.

1 Adapted from IUCN definitions.

Audience

The results of this publication aim to inform:

- Traditional mangrove donors to support more effective outcomes and ensuring long-term environmental, social and economic impact of project activities
- Mangrove project developers to propose mangrove projects which appeal to finance and capital from sources other than public or philanthropic funding
- Impact investors about opportunities to generate returns with a real, quantifiable and positive impact on mangrove ecosystems and surrounding local communities

1.1. The content: Topics and scope to be addressed by this guide

Each mangrove project operates within a distinct set of ecological, social, economic, political and legal conditions, all of which can affect its success or failure. These conditions also differ between and within countries. However, gaining an understanding of key factors that contribute to such success (or failure) is of great importance to guide future mangrove project proposals and investors' decisions.

Grant funding for individual coastal projects is inadequate in terms of duration (1.5-5 years) and size, creating a mismatch with the needs to achieve conservation objectives and leading to a fragmentation of efforts (Bayraktarov *et al.*, 2016). Additionally, to meet the global need for conservation funding in general, investments into conservation projects need to be at least 20-30 times greater than they are today, reaching US$200-300 billion per year (Credit Suisse *et al.*, 2014). There are currently limited figures for mangrove conservation finance, and note that finance mechanisms today are underdeveloped to secure mangrove projects in the long term.

The need to mobilize additional grants, as well as finance and to use these funds more effectively, is now relevant more than ever in order to reach global targets to increase mangrove cover, let alone stop the current loss (Global Mangrove Alliance, 2017). Much information already exists on best practices in mangrove conservation, but it is not being picked up by the majority of practitioners. Since many public funds are at their capacity limit due to competing needs,[2] there is scope for the private sector to fill this gap (Credit Suisse *et al.*, 2014).

This publication will take readers through the successes, challenges and status as it relates to investments (financial and otherwise) in mangrove projects and produce a series of recommendations to improve on both. Understanding why mangrove conservation projects fail or succeed will address the needs of the target audience by helping to:

- Increase technically relevant project knowledge and support capacity-building efforts
- Inform public and philanthropic grant making to be spent in a more targeted and effective way
- Develop projects meeting the needs of the impact investors, including having an attractive risk-return profile for private sector engagement in mangrove conservation projects

A better understanding of the possible returns on investments and cost-savings associated with investments available to flow into mangrove conservation projects will help:

- Develop innovative business models, which include, or have positive impacts on mangrove conservation
- Ensure long-term, sustainable mangrove management beyond the mostly short-term funding

This guide outlines in detail:

- Why to invest in mangroves (Chapter 2)
- Snapshots from existing mangrove projects, based on case studies in three countries

2 From https://public.tableau.com/views/RioMarkers/ByProvider?:embed=y&:display_count=no&%3AshowVizHome=no%20#3.

Box 2. Mangrove conservation in the context of national laws, regulations and policies

National policies and regulations – touching on issues of national development to the management of natural resources use – are crucial for the success of mangrove conservation efforts. For example, in order for carbon-driven mangrove efforts to succeed, various options – from REDD+ to carbon offset projects – are possible. To facilitate that decision on a national level, guidance from the National Blue Carbon Policy Assessment Framework already exists (Herr, Himes-cornell, *et al.*, 2016).

Details on the legislative and policy options for mangrove conservation efforts will be specifically addressed in another publication in 2018 as part of the SOMN! initiative. Some information is, however, available in the case study analysis (Chapter 3 and supplementary documents) as well as in Chapter 4.

(Chapter 3 and supplementary document)

- Lessons learned based on these case studies (Chapter 4 and Annex 2)
- The types of investors engaged in mangrove projects (Chapter 5)
- Opportunities and risks for future investments in mangroves projects with long-term environmental, social and economic returns (Chapter 6)

Throughout these chapters, the report provides practical guidance and links for developers to design projects appropriate to the specific needs of their project site and investors' needs. These same points are available to investors for them to ask the appropriate questions from their developers to improve chances of success and effectiveness.

While many other factors have influence on project/programme success, these have not been included in the scope of this publication due to them being highly site specific and deserving more in-depth work. Some of these factors include site selection, the lack of political will, misuse of existing finance, governance, community cultural structures and user rights, etc. Many of these have already been covered in specific best practice guidance and manuals, which can be further referenced in Table 2.

Lastly, mangrove ecosystems, to perform their multitude of ecosystem services such as coastal protection and carbon storage, often interact with other coastal ecosystems including seagrass meadows and coral reefs (Das *et al.*, 2009; Donato *et al.*, 2011; Huxham *et al.*, 2018). There are strong ecological linkages between the various coastal and marine ecosystems and effective project developers interested in the landscape financing approach should take this into consideration. Given the need to remain within the scope of this document, specific factors (management activities, ecological and hydrological factors and monitoring needs) of these other coastal and marine ecosystems will not be directly tackled in this publication.

1.2. The rationale: Why this guide is needed

To inform project development and investments driven by improved NGO focus on mangrove conservation

Improved understanding of the role of mangroves in climate change and biodiversity and their contribution to local livelihoods have placed additional urgency on mangrove conservation efforts worldwide. Most recently, the Global Mangrove Alliance (GMA), a coalition of international nature conservation organizations, has set the ambitious target of restoring 20% of mangroves over the current

extent by 2030.[3] Despite improved expertise in project design and implementation, particularly from an ecological and hydrological perspective, many projects, especially restoration efforts, continue to underperform and even fail (Quarto, 2013; Bayraktarov *et al.*, 2016; Wylie *et al.*, 2016; Kodikara *et al.*, 2017).

In a review of all mangrove-related projects in Sri Lanka, Kodikara et al. (2017), for example, found that only three out of 23 project sites showed seedling survival rates of over 60%; generally, a successful project is considered "successful" when the survival rate is 85% or over (Bayraktarov *et al.*, 2016; Kodikara *et al.*, 2017). As a consequence of project failures, both private sector finance and public funds have been lost, local stakeholders may lose faith and the perceived risk of investing in these ecosystems has increased. This has likely already and could probably continue to scare away conservative investors and dampen the attractiveness of such investments (Primavera *et al.*, 2008).

To inform project development and investments driven by increased social and environmental impacts

Along with their contributions to ecosystem services, such as coastal protection, climate change mitigation and adaptation, mangrove conservation can be a target of investments directed at poverty reduction, local development and gender equality. Various examples of projects already exist where mangrove conservation is the driver of positive social and economic change (Herr *et al.*, no date; SNV, 2010; Mikoko Pamoja, 2011; Blue Ventures, 2015; World Bank, 2016).

While NGOs, foundations and public funds are traditionally the source of grants in conservation projects, the wide-ranging environmental and social impacts of recent projects are increasingly drawing interest from the private sector (Credit Suisse *et al.*, 2014; natureVest *et al.*, 2014). At a time when highly illiquid assets provide very limited returns (occasionally negative returns), high-net-worth individuals, retail and institutional investors (e.g. pensions and sovereign wealth funds) interested in wealth preservation are more likely to find conservation projects of interest (Credit Suisse *et al.*, 2014).

In this broad context of conservation generally, Credit Suisse reported that these impact investors could target as much as 2-5% of their total assets, a significant percentage of which could be dedicated to the relatively new field of conservation investing. Today, typical investment levels in such products are far below 1% (Credit Suisse *et al.*, 2014). However, the value of conservation finance assets managed by impact investors in recent years is increasing, from US$21.5 in 2009 to a projected US$200 billion in 2020 (Credit Suisse *et al.*, 2014). Mangrove-specific data does not yet exist.

Global and multi-generational interest has similarly increased, indicating that the sector's demand for products delivering a triple bottom line (social, environmental and financial) will continue to increase (Credit Suisse *et al.*, 2014; The Economist, 2017). Mangrove projects are in a strong position to benefit from the availability of capital in this sphere, due to their ecosystem service provision and direct link to climate change mitigation and adaptation, biodiversity conservation and livelihoods, all of which are bankable.

To inform project development and investments driven by increased international commitments for climate mitigation and adaptation

National and international donors and the private sector have increased their financial support for mangrove projects over the last two decades, especially following the devastating 2004 Indian Ocean tsunami (Hinrichs, no date). Furthermore, investments in ecosystems sequestering carbon are projected to increase as signatory countries to the United Nations Framework Convention on Climate Change's (UNFCCC) Paris Agreement join forces to reduce greenhouse gases globally (UNFCCC | UNFCCC, 2018).

3 Note that there are other regional and global efforts supporting the conservation of mangroves, such as Mangroves for the Future and the Mangrove Action Project.

A significant commitment by developed countries is to raise US$100 billion annually in climate finance to support adaptation and mitigation of developing countries by 2020 (UNFCCC, 2018). Mangroves, and the local communities depending on them, are increasingly well placed to benefit from these funds (Blum *et al.*, 2017b). Some recent improvements in success rates of coastal conservation come from trends in Nature-based Solutions (NbS) using mangroves for mitigation and adaption. A few examples here are proposed as Blue Solution projects (see Box 8), have been listed in Wylie et al., (2016) and include other standalone projects like Mikoko Pamoja (see Chapter 3). However, further improvements are needed to develop integrated adaptation and mitigation projects in the coastal zone (Day *et al.*, 2016).

New ways are needed to promote integrated projects that also offer benefits for local livelihoods and better management of coastal ecosystems, such as mangroves. This could happen, for example, via the integration of other revenue-generating sectors such as renewable energy and fisheries into mangrove conservation projects (BNCFF, 2017).

To inform the global audience that targeted guidance for effective, yet innovative mangrove investments is still missing

A range of actors, including governments and NGOs, have been active in mangrove conservation and management for years with mixed results (Richards *et al.*, 2016, and D. Friess, personal communication, July 2018). While some larger-scale programmes and newer mangrove projects are generally considered more successful than previously, there is still a long way to go to improve overall efficiency of projects from a technical and cost-effective point of view.

Detailed best practice for successful mangrove projects does exist (see Table 2), however, only limited targeted guidance is available on finding adequate funding sources and securing long-term financing needs and how these two interact (Locatelli *et al.*, 2014; Herr *et al.*, 2015). These reviews also indicate that more sustainable, long-term financing (and business) models are required, involving the private sector and combining different revenue streams from existing goods and services through established markets (sustainable fisheries and aquaculture, carbon credits, renewable energy technologies).

Attention must be given to the use of other promising eco-markets to access the full portfolio of coastal ecosystem services, including from mangroves. This could include revenue streams from payments for ecosystem services (PES) like carbon credits and fisheries, income generation through cost savings (damage, maintenance and adaptation investment cost savings through insurance for example, compared to built or artificial adaptation infrastructure) and impact investments. Mangroves are often strong candidates for PES as a market-based approach for conservation (Locatelli *et al.*, 2014) (see Chapter 2.2).

To encourage impact investors to divert finance/capital towards sustainable mangrove projects

> *"We are at a critical turning point in history, where all stakeholders are increasingly aware of the urgency of sustaining nature for the benefit of all. Public sector finance and philanthropic capital alone is not sufficient to meet these challenges."* – **Inger Andersen**, IUCN Director General (IUCN, 2016)

Impact investors seek an acceptable risk-return profile on investments, a condition that current mangrove projects find difficult to fulfil (see Chapters 3 and 6). New approaches are therefore needed to explore the different revenue streams mangrove products and/or services can provide, and seek out whether they can be invested in individually or as part of a broader concept. Efforts investigating the natural capital of ecosystems could be the missing link between long-term investments, impact investors' requirements and sustainable mangrove management.[4] These new approaches to scale up the potential impactful projects are needed to realize the "standard shift" – from pure for-profit investment towards impact investments (Huwyler *et al.*, 2016) (see Chapter 6).

1.3. The methodology

Research for this publication took the form of a desk review, drawing on published information as well as phone interviews to augment the published data. These phone interviews (see Annex 1 for guiding questions) were conducted with project managers and international experts in mangrove conservation and finance.

To be able to discuss details and inform overarching recommendations, the report uses case studies of projects in three countries. The analyses of the case study projects in Viet Nam, Kenya and Madagascar (found in supporting documents) examine the factors for success and challenges as well as the effectiveness of the chosen projects from a holistic and investment point of view. Where too little information is available to make an informed judgment, the report strives to provide guidance on what information would be needed for future attempts (see Box 1 in supplementary documentation).

The case studies were chosen to: cover a global distribution (with, however, the Western Indian Ocean as a focal region for SOMN!); occur over at least three years and; critically, show a sufficient level of available information, i.e. technical and financial reports. Incorporating socio-economic and environmental benefits/ proof of effectiveness into traditional economic assessments proved challenging, thus the report includes a qualitative cost-benefit analysis (CBA) rather than the more quantitative cost-benefit analysis, or a cost-effectiveness analysis (CEA) (see supplementary documentation for more information) (Vorhies *et al.*, 2016).

Throughout this text, where necessary and appropriate, the report supplements the lack of specific data on mangroves (see Box 4) with information on the wider coastal conservation/ management effort. For each of the three case studies, the project is presented, the costs and benefits reviewed (where information is available) and an assessment is made. A summary of the case studies is presented in Chapter 3 and details can be found in the supplementary documentation.

4 For example, the goal of the Blue Natural Capital Financing Facility is to support coastal nature-based projects linked to climate adaptation and mitigation to become bankable, and thus also interesting to private investors.

Box 3. Lack of data available for mangrove and other coastal ecosystems

A review of over 954 coastal marine rehabilitation projects found that only 33% reported implementation costs and only 28% detailed the costs (Bayraktarov *et al.*, 2016). This general lack of data (costs and otherwise) for coastal ecosystems, including mangroves, is corroborated by another report, which notes that for many of the larger-scale projects, baseline information was insufficient to evaluate the results such that many potential lessons from a comprehensive programme were lost (Primavera *et al.*, 2008). Research noted that there was a lack of data regarding finances like non-market costs (volunteer labour, etc.), which would be important to link project finance to outcomes.

Where reports do exist, authors may be motivated to record data quickly and with a focus on the optimistic and successful aspects of the project rather than failures and lessons learned; data was often not scientifically complete. This was supported by Bayraktarov et al. (2016) and Primavera et al. (2008), who found cases where mangrove survival rates were reported as rounded-off numbers, or as a single figure for the whole municipality and basis for calculations were not explained. Additionally, the majority of projects had no donor-driven obligation, or funds to revisit the site some years after the project ended. With no further reporting or monitoring, the ecosystem and the communities were left to live with the vacancy and no additional supporting activities (Bayraktarov *et al.*, 2016).

Measuring success, measuring impacts

Ideally, any measure of impact would describe the difference or healthy status in ecosystem function and resilience to stress at the end of a conservation project, generally agreed to be highly relevant to project outcomes (Primavera *et al.*, 2008; Bayraktarov *et al.*, 2016). Instead, mangrove restoration projects tend to use specific success criteria; for example, mangrove restoration efforts with an 85-90% survival rate after a defined number of years of monitoring are described as successful projects (Walters *et al.*, 2008; Locatelli *et al.*, 2014).

The mangrove survival rates are dependent on such specific factors as:

- Biological factors – mangrove species and pests (e.g. algae, barnacles, insect larvae)
- Physical factors – tidal level and inundation, substrate, waves/typhoons, sedimentation
- Human factors – harvesting of materials and food, grazing, fishing gear, management and enforcement
- Land tenure prospects

These factors do not, however, provide information on the success of a project in terms of its impacts on livelihoods or biodiversity as well as on long-term sustainability and financial viability. Broadly speaking, the successful management of coastal and marine ecosystems, including mangroves, should aim, but is not limited, to:

- Reducing the pressure on coastal and marine ecosystems and creating incentives for restoration and sustainable use practices
- Incentivizing sustainable, long-term management of coastal and marine natural resources through, for example and where appropriate, the use of rewards or payments schemes
- Including and respecting local communities and the authorities in relevant planning and implementation efforts and ensuring initiatives are inclusive and equitable
- Involving a broad and comprehensive planning horizon (e.g. in both time and space through approaches like integrated coastal zone management or marine spatial planning for the coastal zone)
- Clarifying and improving contradictory or incoherent laws, policies and institutional structures

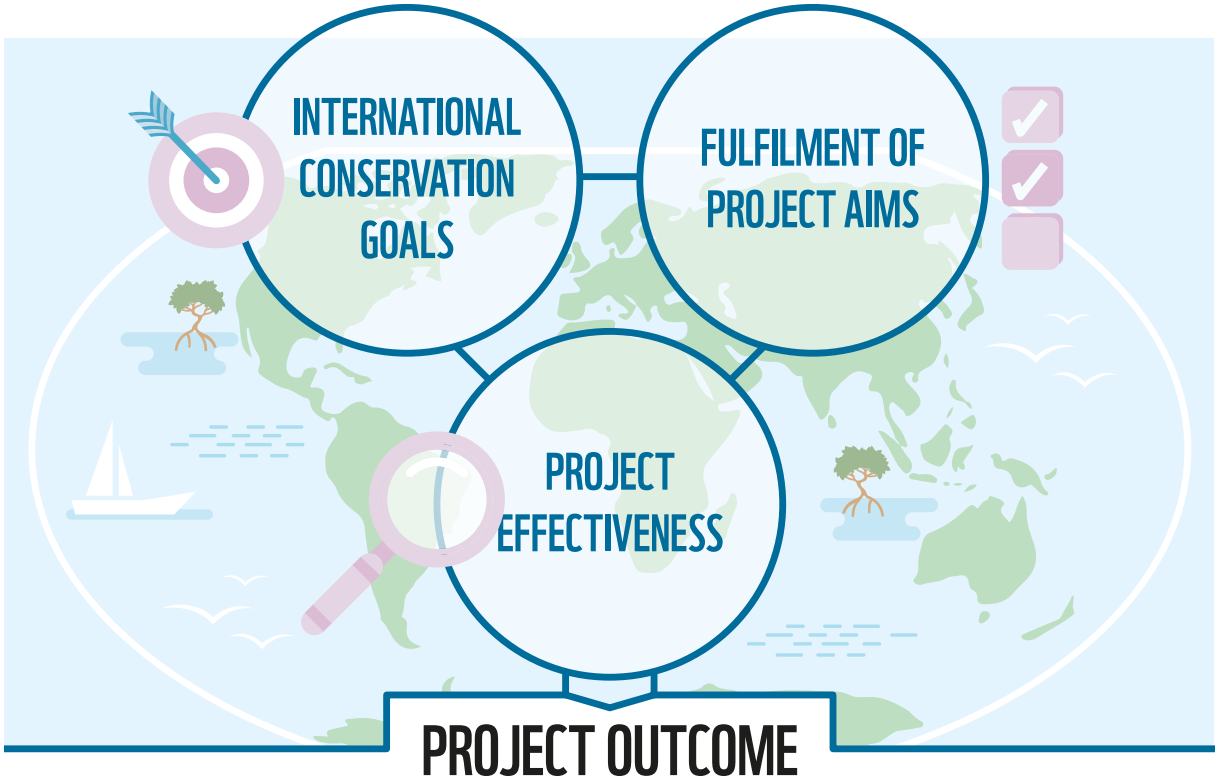

Figure 1. Measuring success by assessing to what extent a project fulfills a set of international conservation goals, the projects aims and is effective

This being the case, to measure success and impact, this report combines two approaches: extent of success (long-term preferably) and effectiveness (see Figure 1).

The first is based on the aims of international conservation conventions and organizations.[5] Here, a project is considered successful when its goals or outcomes encourage and assist societies to conserve the integrity and diversity of nature, and where use of natural resources is ecologically sustainable and equitable so that future generations can live in harmony with nature. To this end, the project's specific goals are combined (using case studies as examples in Chapter 3), identified at the start of each project, and the extent to which these goals have been fulfilled.

As an additional indicator of success, the report looked at the effectiveness of the case studies by doing a qualitative CBA; estimating the financial and non-financial costs of a project against its benefits (see more on this in the supplementary documentation). The two together will act as indicators of success or failure of a particular project.

5 A combination of mission statements from IUCN, WWF and the Convention on Biological Diversity (CBD).

2

THE BUSINESS CASE FOR MANGROVES: WHY INVEST IN MANGROVES[5]?

The goal of this chapter *is to stimulate a better understanding of the different investments generating either a return or cost-savings that are available to flow into mangrove conservation. This will help develop more innovative business models which include, or have positive impacts on mangrove conservation and ensure longer-term, sustainable mangrove management beyond short-term public or philanthropic funds. This* chapter *should demonstrate the benefits and services of mangroves, as well as the opportunities for cash flow and direct beneficiaries.*

CHAPTER SUMMARY

Mangroves provide valuable ecosystem services estimated to be worth about US$33,000-57,000 per hectare, and play an important role in climate change mitigation and adaptation. Investing in mangroves can result in a number of benefits. These include supporting local communities and contributing to biodiversity protection, resilient coastal risk management, and sustainability of the global fisheries and aquaculture industries. There is scope for the private investment sector to earn revenue from this through a number of current and new financing mechanisms. Yet despite the increased recognition of mangrove's value, these ecosystems are still being degraded, lost, or poorly restored.

Mangrove conservation contributes to the achievement of the UN Sustainable Development Goals (SDGs) and other national and international environmental targets and commitments (e.g. Convention on Biological Diversity Aichi targets, UNFCCC Paris Agreement).

5 Much of this chapter has been built on the work done by Nathalie Roth, Managing Director and Founder, 4 Climate; Moritz Von Unger, Principal, Climate Policy, Silvestrum; and Torsten Thiele, Visiting Fellow, Institute of Global Affairs, London School of Economics for the feasibility assessment for the BNCFF (2017, unpublished).

2.1. An overview: Ecosystem services provided by mangroves

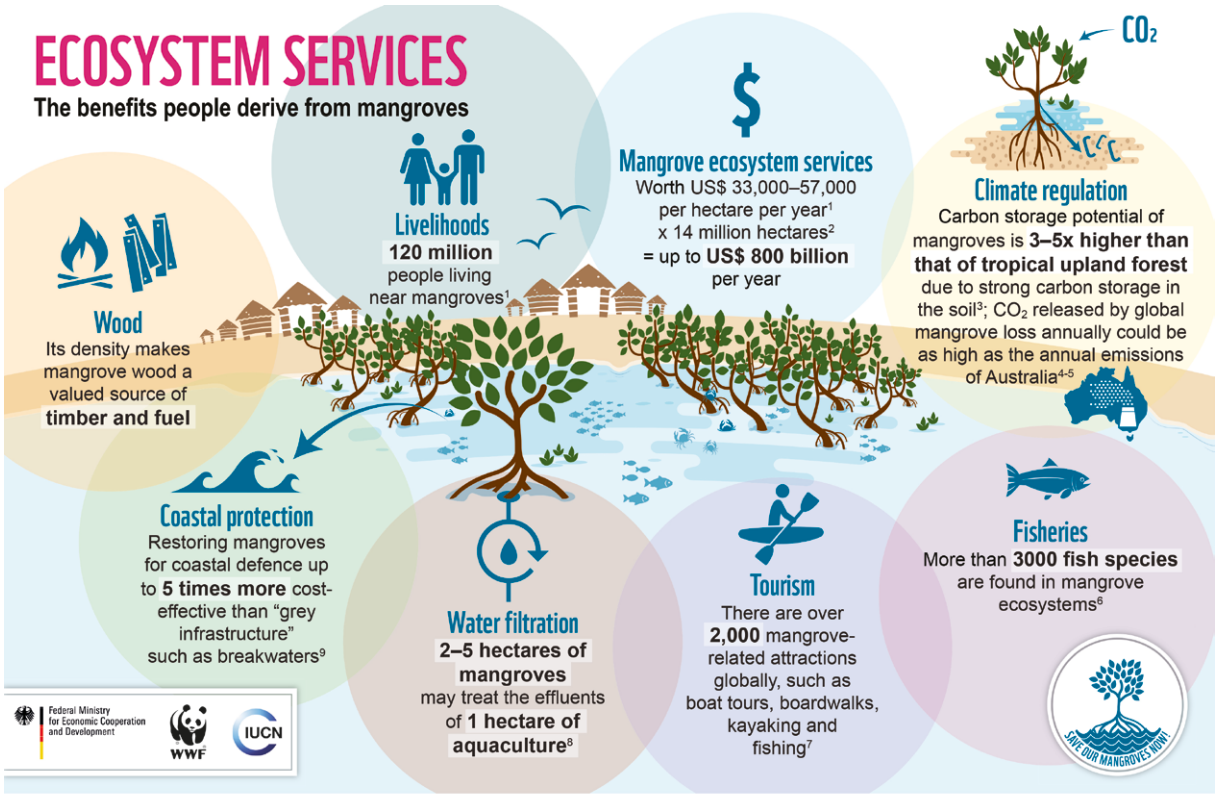

Figure 2. Ecosystem services and benefits derived from mangroves

Defined as "the benefits people derive from ecosystems", the global value of ecosystem services and goods per year in 2011 was estimated at US$125 trillion, two-thirds of which comes from marine ecosystems like mangroves and other coastal wetlands (Forest Trends and The Katoomba Group, 2010; Costanza *et al.*, 2014). The 120 million people living within 10 kilometers of mangroves benefit from their many services, which have themselves been valued at US$33,000-57,000 per hectare (UNEP, 2014; Spalding *et al.*, 2016; United Nations, 2017).

2.2. Climate change adaptation benefits and potential revenue streams

Benefits and revenue streams here came from two potential and differing sources. First, mangroves can contribute greatly to cost avoidance and minimization; this is of great interest to NGOs, governments and the insurance industry. Second, other interventions with mangroves can generate cash flow opportunities and revenue streams, which is of greater interest to impact investors.

Adaptation and mitigation – Cost avoidance

Relating to cost avoidance, there is an increasing need to adapt to climate change in coastal areas. Over the past year, insurers have paid out more than US$300 billion for losses from storms along coasts (Forest Trends and The Katoomba Group, 2010; World Bank, 2016). Extreme weather events have caused an annual economic loss of approximately US$70 billion in 2013 (84% were accounted for by natural catastrophes), up a tenfold increase since the 1950s (Millennium Ecosystem Assessment, 2005). Mangroves are shown to have a positive impact on these numbers

and restoration of mangroves extent would provide significant adaptation advantages. In the Philippines, mangroves are predicted to have saved the country over US$1.6 billion in damages from catastrophic storms and if lost, flooding damage to people and infrastructure would increase by 25% annually (Beck *et al.*, 2017).

Coastal ecosystems provide a variety of adaptation benefits to society, including protection from storms and flooding. Studies show that damage is reduced by 40-60% while shoreline stabilization and erosion reduction, protection of freshwater reservoirs and agricultural land from saltwater intrusion are some of these benefits (Badola *et al.*, 2005; Das *et al.*, 2009; IPCC, 2012; Blum *et al.*, 2017b).

and the Economics for Climate Adaptation Model. Models predicting the economic result of mangrove loss and gain have proven robust in the Philippines (Beck *et al.*, 2017). These support findings that ecosystem-based adaptation (EbA) measures to climate change can offer significantly more cost-effective solutions for coastal protection, compared to engineered and built solutions, with high-benefit cost ratios (Baig *et al.*, 2015; Beck *et al.*, 2017).

A cost-effectiveness analysis conducted in the Philippines compared different approaches to supporting a coastal community adapt to the impacts of climate change (Beck *et al.*, 2017). The protection of existing mangroves, when compared to a 500-metre seawall, was assessed as the most

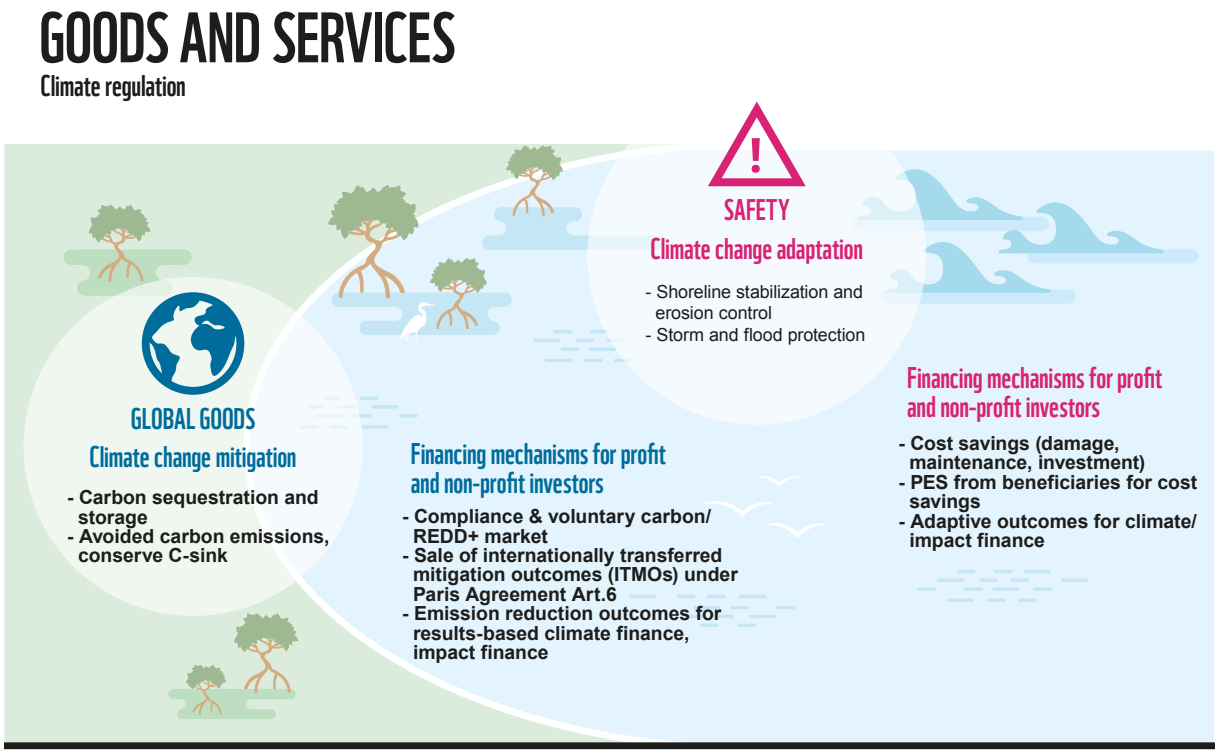

Figure 3. Goods and services from climate regulation and their potential financing mechanisms

Some coastal protection benefits can be measured since the physical protective barrier function of coastal ecosystems is now well understood. Adaptation benefits of coastal wetlands can be economically quantified and valued with established tools already used by the insurance sector, engineering firms and development banks. These include the Expected Damage Function

cost-effective option. The mangroves in this study were further estimated to provide an additional service of US$170,000 annually by supporting fisheries, ecotourism and carbon sequestration (Baig *et al.*, 2015).

These levels of benefits to costs should lead to coastal wetlands being preferential adaptation

investments resulting in lower costs while performing the same protective function with high co-benefits. For example, mangroves have been known to reduce wave height by up to two-thirds per 100 meters of mangroves (Blankespoor *et al.*, 2016; Sheng *et al.*, 2017). Furthermore, there are strong reported benefits of combining natural and engineered solutions, which lead to reduced maintenance costs of built infrastructure. Funds spent on natural infrastructure also "packs more punch per buck". If just 10% of international aid grants on rebuilding coastal built infrastructure were invested in green infrastructure (natural infrastructure), funds for the latter would increase tenfold (Mccreless *et al.*, 2016).

This need for adaptation and mitigation will further grow in the coming years and drive a strong demand from individuals, businesses and public authorities for improved resilience solutions. The demand creates a market for effective adaptation solutions which encompasses mangrove conservation.

Adaptation – Revenue streams

There is a strong potential to capture the value of mangrove adaptation solutions for EbA services.

First, this can be done by identifying public and private beneficiaries who are willing to provide payments for ecosystem services (PES). Linked to cost savings and avoidance, the greater disposable income from these savings could be used by EbA beneficiaries to pay an adaptation investor for PES, thus creating an avenue stream for the adaptation investor (see Figure 3) (UNEP, 2010).

Second, returns stemming from stated adaptation outcomes – based on specific indicators and which can potentially come in the form of subsidies – can provide access to concessional adaptation funding. Examples of these are grants, guarantees, junior debt with reduced interest, mainly from multilateral funds (see more in Chapter 6.2) (Baumann *et al.*, 2017). In some cases, investors and developers can use these funding mechanisms to reduce costs leading to higher equity returns for investors (see Figure 3) (Baumann *et al.*, 2017). These options lead to an emerging field of blended finance where different finance mechanisms from the private and public sector are combined to enable greater impact (Baumann *et al.*, 2017; Environmental Defense Fund *et al.*, 2018). The option is discussed further in Chapter 5.

2.3. Climate change mitigation benefits and potential revenue streams

The potential of coastal wetlands, especially mangroves, to act as a significant long-term carbon sink is well documented and exceeds most terrestrial forests on an area basis (Alongi, 2012; Howard *et al.*, 2017). The carbon storage potential of mangroves (ca. 1,000 tC/ha), for example, is five times higher than tropical upland forests due to the carbon rich sediments in these ecosystems (Donato *et al.*, 2011; UNEP, 2014). If disturbed, mangroves can contribute up to 10% of the global deforestation emissions, despite accounting for just 0.7% of tropical forest area (Donato *et al.*, 2011; Alongi, 2012). The conservative annual carbon sequestration rate of mangroves is around 174g C m^{-2} $year^{-1}$ (i.e. 14% of the global carbon sequestration per year) (Alongi, 2012).

The Paris Agreement – through its Nationally Determined Contributions (NDCs) – is creating a strong demand and market for greenhouse gas (GHG) mitigation actions also in developing countries. As wetlands (especially mangroves) restoration is part of some NDCs in tropical countries, these countries are likely to provide some form of legal framework or a carbon price for its restoration and conservation (public budget lines, subsidies, tax reductions, enabling national emission reduction markets, or trading for carbon credits under the Paris Agreement) (see Figure 3) (Herr and Landis, 2016; Herr, Himes-cornell, *et al.*, 2016).

Mitigation – Revenue streams

The voluntary market is currently the leading market for ecosystem-based mitigation interventions, i.e. activities to reduce or sequester GHG emissions from land use, land-use change and forestry. A well-known example of this is the

Plan Vivo scheme, which is currently funding the conservation of mangroves in the Mikoko Pamoja project in Kenya (see Chapter 3 and supplementary documentation) (Huxham, 2013). Despite being relatively small, with a value of US$88 million and US$67 million in 2015 and 2016, respectively, for forestry and land use, the voluntary market is driven by steady corporate social responsibility (CSR) initiatives and consumer demand for carbon neutrality. Average prices for forestry and land-use offsets are around US$5/$tCO_2e$ (range US$4.2-9.5/$tCO_2$) and new structures like REDD+ bonds are emerging.

The compliance, regulation-driven market is not yet embracing international REDD+ credits, but there are encouraging signs that the cap-and-trade system in California and the future offsetting mechanism CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) sponsored by the International Civil Aviation Organization (ICAO) may provide windows for international REDD+[7] demand.

The biggest call for coastal wetland-related emission reductions, including mangroves, might come from host countries themselves, as they recognize these projects as cost-effective solutions to implement the Paris Agreement NDCs and invest in them through national budgets, national carbon markets and international funding support. The new trading mechanisms anchored in Art. 6 of the Paris Agreement (Sustainable Development Mechanism and Cooperative Actions with trading of Internationally Transferred Mitigation Outcomes (ITMOs)) may eventually provide an important source of financing for blue carbon interventions, especially if integrated into national appropriate mitigation actions. The insurance industry is also an increasingly active and interested player collaborating with NGOs, but this is explored in more detail in Chapter 5 and Box 9.

Significant amounts of funding have been pledged for the coming years (US$4.4 billion) and provided recently by the public sector (US$1.1 billion) for forest and land use-related activities (BNCFF feasibility study 2017, unpublished). These funds have been put into larger funding vehicles, which provide concessional finance or directly buy, REDD+ type mitigation outcomes. These results-based financing opportunities provide a very positive and promising outlook for mangrove projects, especially if it can also be effectively combined to leverage private funding (Rotich *et al.*, 2016). This is, however, restricted to countries that consider mangroves as forest.[8]

2.4. Other ecosystem service benefits and potential revenue streams

Beyond their contribution to climate change adaptation and mitigation, mangroves continue to provide a suite of other ecosystem services – some with a potential financial revenue stream (see Figure 4).

Provisional services are typically the easiest to quantify, as they represent tangible products people use on a day-to-day basis. When provisioning services result in products that can be traded, economists can discern the economic and financial value of buying and selling them on the market. For instance, the annual economic value of mangrove fisheries and forest products are often estimated based on market values of these tradable commodities; however, these estimates rarely include the full cost of fishing, collecting, or harvesting to natural systems. When goods are not bought or sold (e.g. fibres or honey used for subsistence purposes), the value can be inferred from market values or the cost of replacing what nature provides with the nearest substitute.

Many ecosystem services are not traded in markets, and/or it has been shown that conventional markets are not the best institutional frameworks to manage these services, which are considered public goods or common pool resources (Costanza *et al.*, 2014). However, there are other estimates which refer indirectly to the contribution of

7 REDD+ encompasses a wide array of activities that should soon include mangroves, namely: reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks. See http://www.un-redd.org for more details.

8 Blue carbon environments also share many threats and drivers of deforestation and degradation, notably from agriculture and timber extraction.

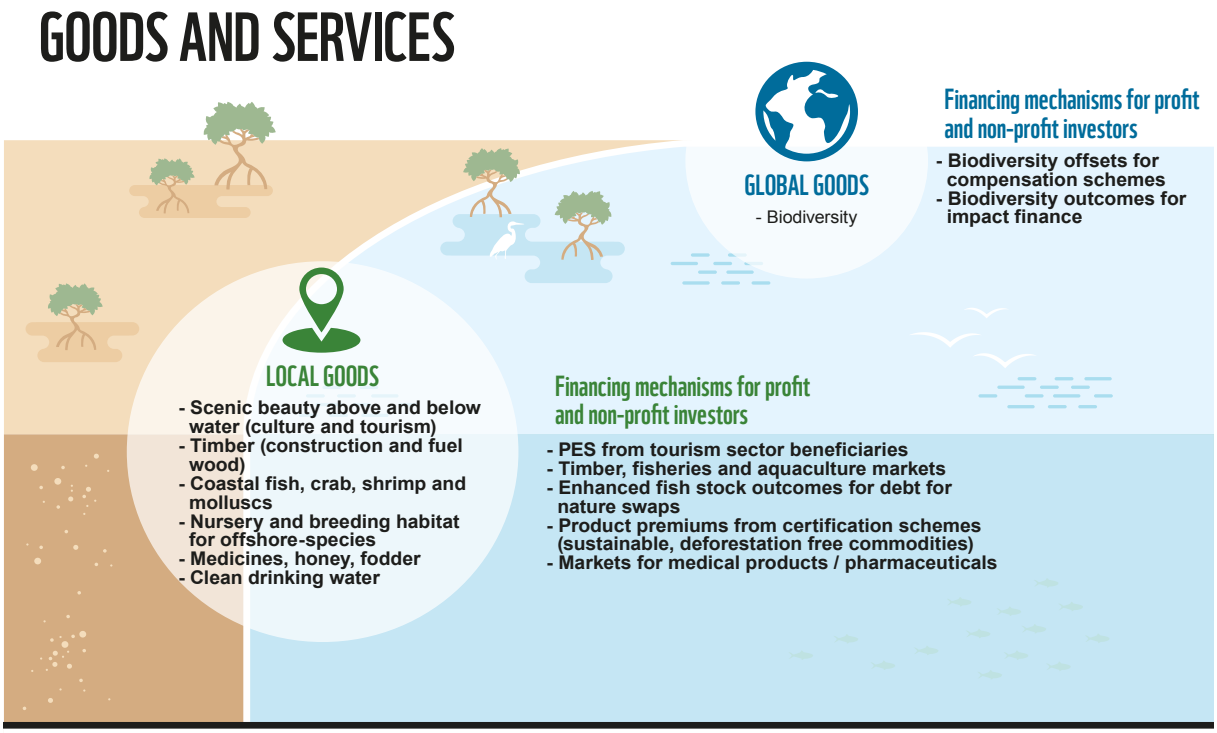

Figure 4. Goods and services from non-climate regulation, provisioning and cultural services, and their potential financing mechanisms

coastal ecosystems to national GDPs. In Belize, for example, tourism associated with coastal ecosystems is said to contribute an estimated US$150-196 million (2007), which is about 12-15% of Belize's economy (Hoegh-Guldberg *et al.*, 2015). Some of this can include spiritual and religious values often of great importance to coastal communities, but are rarely calculated.

Mangrove forests and their soils also absorb toxins and other pollutants like heavy metals and excess fertiliser running off the land (Alongi *et al.*, 2000). As natural filters, they play a significant role in regulating waste that would otherwise harm other coastal ecosystems like seagrasses and coral reefs. The biofiltration value of mangroves has been estimated to range from US$119,300 to US$582,000km^{-2} year^{-1} depending on site specific conditions (Alongi *et al.*, 2000; Trump *et al.*, 2015, Walters *et al.*, 2008).

Other ecosystem services – Revenue streams

Climate mitigation returns and adaptation-related cost savings alone – which can constitute a key source of project income – may not be sufficient to attract private sector investments into mangrove conservation and restoration finance. Therefore, other ecosystem services might need to be considered to create a more interesting investment package. Investors seeking a return are mainly focusing on the following sectors generating a sellable product on the market: sustainable aquaculture and sustainable coastal fisheries, improved forest management and ecotourism (see Box 8 for some examples of this in the mangrove context).

Marine and coastal aquaculture has been one of the main drivers of mangrove loss since the 1980s (Richards *et al.*, 2016). About one-third of global mangrove loss is estimated to be caused by mangrove clearing for aquaculture plants, mainly shrimp farms (Valiela *et al.*, 2001; Richards *et al.*, 2016). The sector is predicted to continue growing as an important contributor to the rising needs for global protein, with many countries targeting aquaculture as a means to feed their increasing populations (FAO, 2014, 2018). It is of utmost importance to introduce sustainability criteria into the aquaculture sector in order to stop the mangrove loss and allow the sector to grow more sustainably. Some Bio Labels (like Naturland) and the Aquaculture Stewardship Council (ASC)

provide certification schemes supporting better responsible practice for conventional and organic aquaculture. Although a big step forward, many experts see the ASC as minimum standard, which should be improved upon in the future.

There is a growing demand for certified shrimp and fish globally. Some aquaculture companies (e.g. in Madagascar and Indonesia) are frontrunners for aquaculture certification. The Business and Sustainability Development Commission (BSDC), set up to find opportunities for the private sector to contribute to the delivery of the SDGs, has predicted an increase of 10-30% (or US$20-125 billion per year) in demand for aquaculture products (Rob Fletcher, 2018). However, while many countries still continue to convert mangroves to conventional aquaculture ponds (mainly fish and shrimp ponds), research shows that local stakeholders often benefit more from low-intensity and sustainable aquaculture (Gunawardena *et al.*, 2005). Commercial fisheries, estimated to be worth US$14-16 million per year, are dependent on reefs and mangroves (Hoegh-Guldberg *et al.*, 2015). This number is likely to be much higher as many artisanal and other non-commercial fisheries are often lacking representation in data collections and are underrepresented (Hoegh-Guldberg *et al.*, 2015).

Although most of the timber exploitation in poorly managed mangroves is illegal and contributes significantly to the ongoing loss and degradation of mangroves, sustainable timber production through an accreditation scheme might be another potential avenue for sustainable revenue generation. In Indonesia, selective and sustainable logging of healthy mangrove forests is being tried in an effort to place a market value on the ecosystem (Kate Evans, 2013). The managing company leases 140,000 hectares of mangrove forest from the government and plans to harvest up to 3% per year on a 20-year rotation, although the company is looking into fitting the rotation period and harvest quotas on the management need of mangroves (Kate Evans, 2013; Friess *et al.*, 2016). Wood from these forests is then exported for woodchip and charcoal – a high-quality product. The company is applying for FSC (Forest Stewardship Council) accreditation and is further interested in REDD+ developments, which would make it a first mangrove FSC-accredited business (Kate Evans, 2013).

Other market and crediting approaches could be applied for goods and services from mangroves (see Figure 4), which can be quantified and commoditized under a PES system. These include: certification schemes for premium products (see the Mangroves and Markets case study in the supplementary materials), biodiversity offsets, or compensation (from extractive industries) (Meijaard *et al.*, 2011; Siikamaki *et al.*, 2012; IUCN, 2018). The 2010 Forest Trends and The Katoomba Group report contains helpful guidance on how PES deals work, who potential buyers and sellers are, and what payment systems can be used for coastal ecosystems like mangroves.

There are also opportunities to bundle or stack different PESs (Ingram, 2012). Bundling and stacking is seen as an opportunity to support biodiversity-related conservation efforts, as biodiversity or other services are harder to monetize. “Stacking” enables landowners (or the people with the user rights) to receive financial compensation for multiple ecosystem services from one area of land, coast or sea, using different payment schemes whose credits are being sold separately in different markets (see Chapter 6).

Where revenue generation is not an aim for investors (as in the case for donors investing their resources), cultural services to local inhabitants have also been shown to be of value, some of which has been measured in monetary terms. In West Papua, the traditional uses of mangroves (an area of 300,000 hectares) by 3,000 local community members was estimated to have a value of US$10 million per year (Ruitenbeek, 1992).

2.5. Mangroves as a cross-cutting asset to achieve multiple SDGs

Maintaining and restoring well-functioning mangroves can contribute to a number of the internationally agreed UN Sustainable Development Goals (SDGs), including SDG 1 (no

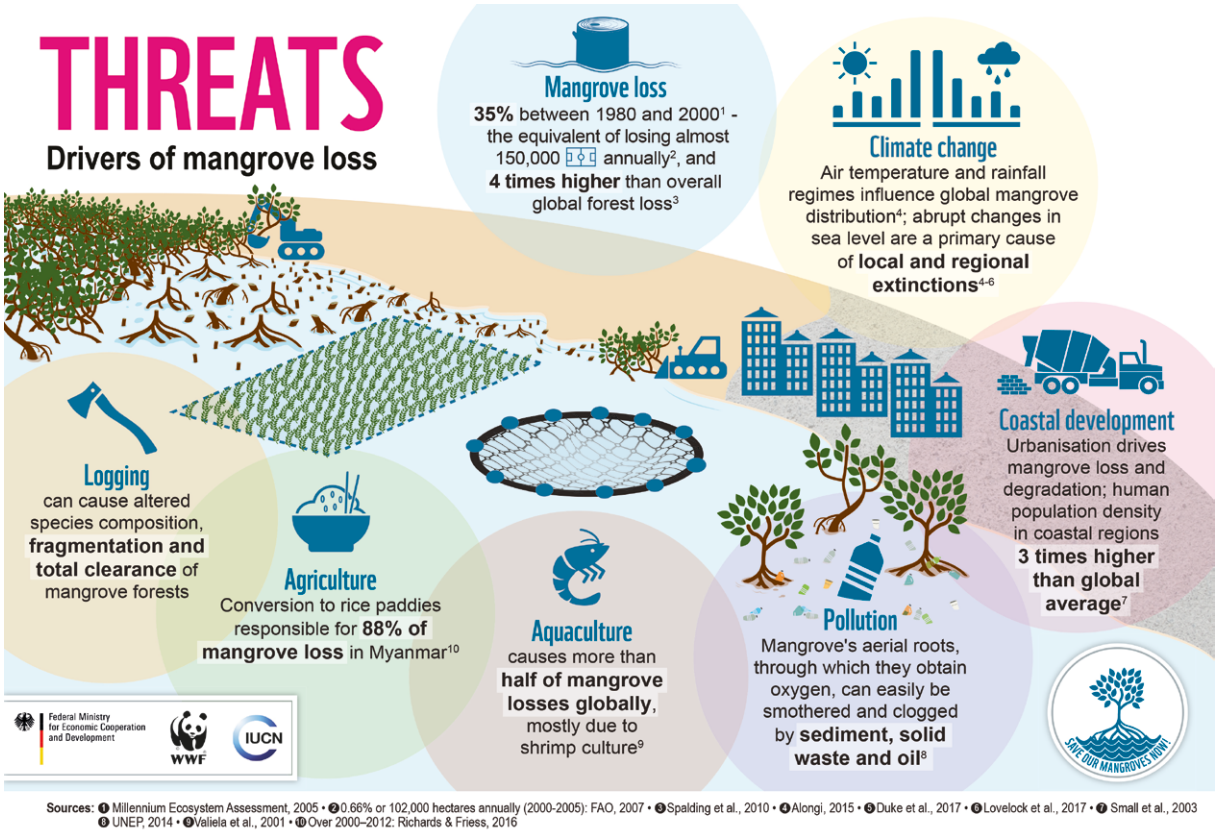

Figure 5. Threats to mangroves and the cost of this loss

poverty), SDG 2 (zero hunger), SDG 8 (economic growth) and SDGs 13-15 (climate action, life under water and life on land) (Blum *et al.*, 2017a).

Additionally, mangroves have been mentioned in over 90 voluntary commitments due to their vital role in local communities, prompting the UN to create a Community of Ocean Action dedicated to implementing mangrove-related commitments (United Nations, 2017). The GMA and SOMN! are some of these commitments (Global Mangrove Alliance, 2017). Any investor contributing to a mangrove project in the context of these internationally recognized goals and commitments would be able to measure impacts on a global stage.

2.6. Mangroves and their valuable assets are under threat

The loss of mangroves to the local and global community would not only mean loss of their many individual benefits, but also the exacerbated eroding of the collective value of these services.

The major threats to mangroves (see Figure 5) have direct impact on the valuable ecosystem services local and global communities derive from mangroves (see Figure 2). Beck et al (2017) have estimated that in the Philippines one hectare of mangroves covers more than US$3,200 per year of direct flood protection. While overall the rate of global mangrove loss has dropped from 2% in 2000 to 0.6% in 2007, in specific regions (e.g. in urban areas), the loss of mangroves continues to be severe (Valiela *et al.*, 2001; FAO, 2007; Giri *et al.*, 2015). From the point of view of non-profit government investors (e.g. government agencies) the continuing loss of mangroves is predicted to exaggerate the loss of the collective climate regulation services, potential revenue and cost-savings.

3

CASE STUDIES: PROVIDING SNAPSHOTS FROM THE FIELD

To determine whether an investment in a mangrove conservation project is effective – independent of whether it is a restoration or a protection project – one needs to look at both the costs of the project and the benefits the project generates.

distribution of costs and benefits among key stakeholders can be investigated. In this regard, an analysis of a project's costs and benefits can help to determine whether the investment in the project can be deemed a success, including in terms of community livelihoods and resilience.

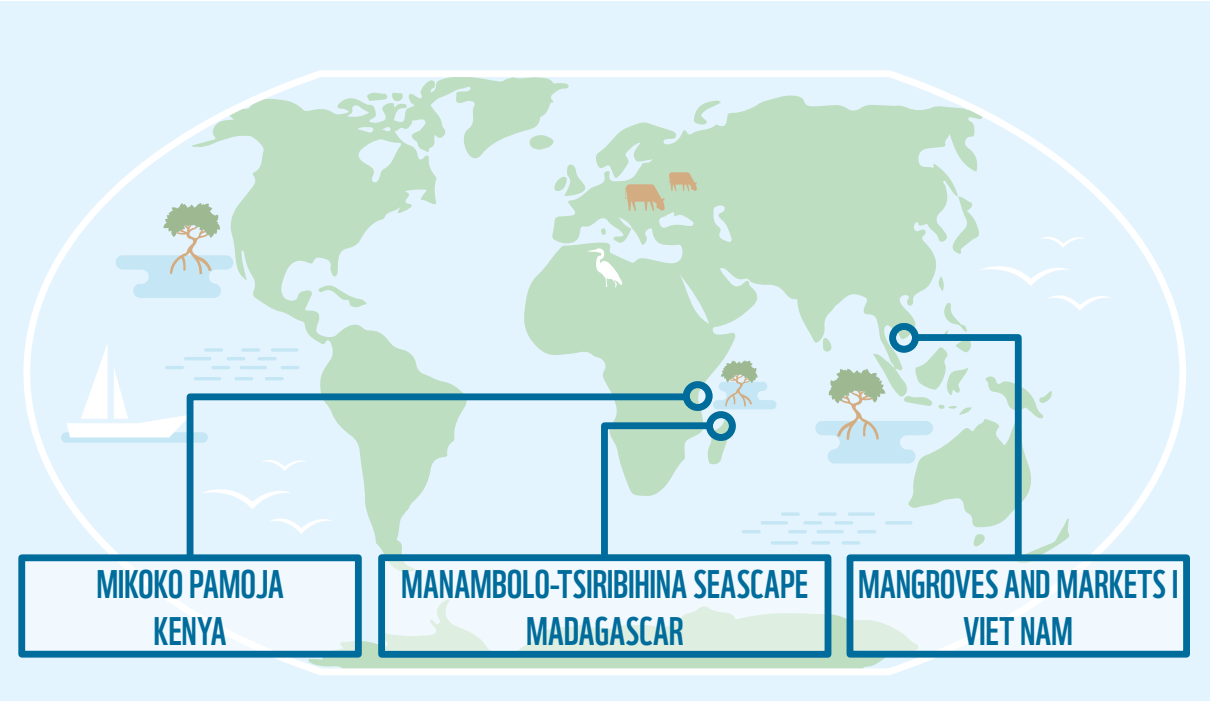

Figure 6. Distribution of case studies analysed for effectiveness and lessons learned

For most mangrove projects there are often insufficient data to undertake a thorough cost-benefit analysis (CBA) or insufficient information on alternative methods to undertake a quantitative cost-effectiveness analysis (CEA). As the environmental, social and economic conditions for each project vary considerably and are very site specific, it is generally difficult to compare projects to assess their relative cost-benefit or cost-effectiveness. Nevertheless, by assessing qualitatively what is known about specific cases from the perspective of costs and benefits (financial and non-financial), one can provide useful insights on the value of mangrove conservation project (read more on this in the supplementary documentation).

In an analysis of financial and non-financial costs vis-à-vis benefits, it may be possible to determine whether the project has a net positive financial return, i.e. benefits exceed costs. Further, the

This chapter investigates the costs and benefits associated with three mangrove projects:

For each of the case studies, we briefly present the project, review what is known about the costs and its financial, environment and social benefits, and then undertake a qualitative CBA (see supplementary documentation). The information on costs and benefits presented in these case studies originates from published documentation and interviews with project proponents as described in Chapter 1.3.

While the case studies are less quantitative in nature than originally expected, they do begin to tell an important story about the costs and benefits of mangrove projects. This prompted the following observations:

- Choice of site is critical and will make all the difference to the project outcome. Project

design and potential for success where the local community or revenue generation are concerned depend on a site carefully chosen.

- There can be significant preparatory costs before a mangrove project even begins. A typical mangrove project will include a myriad of upfront costs such as the set-up of legal agreements, technical assessments and capacity building, which are often, yet not exclusively, for getting the rights to the carbon credits, covered by grant financing.

- If the mangrove project can be aligned with a commercial mangrove-friendly good or service – e.g. carbon credits, fish and other seafood, timber or tourism – then the sale of these products may be able to generate ongoing revenues associated with preserving the mangroves. This can:

    - ◇ Ensure the sustainability of a mangrove restoration/protection project
    - ◇ Provide appropriate financial incentives/payments to local communities to encourage ongoing mangrove conservation and social development

- There is likely to be a site-specific array of benefits – environmental, social and economic – which together will drive local and political decisions to implement and sustain the mangrove project.

- More diligent efforts to track, monitor and evaluate the actual costs of various components of a mangrove investment project will help the project as well as similar projects be most cost-effective.

Detailed analysis of the costs and benefits is found in the supplementary documentation of this publication; however, a summary of the main points and findings are presented below.

Table 1. Summary of case studies evaluated for cost-effectiveness

	Mikoko Pamoja	Manambolo-Tsiribihina	Mangroves and Markets (MAMI)
Project type	Participatory research tourism followed by carbon credits generation to incentivize community-based conservation and activities	Development of community-based mangrove-friendly enterprises including aquaculture	Development of a mangrove-friendly, certified shrimp industry for exports to Germany
Project (conservation) activities	Replanting, protection and rehabilitation	Protection and rehabilitation	Replanting and rehabilitation
Location	Gazi Bay, South Coast, Kenya	Manambolo-Tsiribihina, Central-West Madagascar	Mekong Delta, Viet Nam
Start date	2012	2012	2012
Size	117 hectares; 498 households	133,544 hectares of which only some are forested; 9,349 people	12,680 hectares; 1,000 households
Time frame	20-year contract with Plan Vivo	8 years over two phases	4 years for phase 1; 4 years for phase 2
Budget	US$400,000	US$400,000	US$3 million
Financial costs	US$381,453 for development US$9,742-10,687/year for operations	50% of the budget was spent in year 1, 30% in year 2 and the remaining in year 3 US$101,121 for costs both development and operational Approx. US$40,000 for VCS certification	Details are unknown Approx. US$500,000 contributed by shrimp processing company Minh Phu in in-kind support

	Mikoko Pamoja	Manambolo-Tsiribihina	Mangroves and Markets (MAMI)
Other costs (non-financial)	Opportunity costs where communities cannot use the mangrove and fisheries areas as usual	Previous research on regional vulnerability assessment Opportunity costs where communities cannot use the mangrove and fisheries areas as usual	Opportunity costs where communities cannot use the mangrove and fisheries areas as usual
Financial value of benefits identified so far; direct and indirect[9]	Between US$11,984 and US$14,833/per year US$371,200 (research and capacity building support, awards)	No details	US$39,500 between 550 households (increase in income of 30-70% in 12-18 months
Other benefits (non-financial)	Knowledge generation for the WIO region using the research conducted here Alternative source of fuel wood Improved community health since the new water pump has been installed	Resilient coastline from 182.5ha of mangrove restored Capacity building and strengthened networks via community management mangrove and fisheries areas and more NGO and community organization networks in the region Community cohesion and youth empowerment Knowledge creation through surveys towards set-up of a blue carbon project, land tenure, crab value chain analysis	Hygiene training and toilets built for 1,000 households 2,000 farmers trained in organic shrimp farming 12,680ha of mangroves under protection 80ha mangrove replanted Provincial regulation on PES for aquaculture was developed
Funding strategy	Baseline research with paying volunteers – Earthwatch, UK Voluntary Carbon Credits – Plan Vivo, UK	Project grant – Helmsley Charitable Trust, USA Alternative sources of income	Project grant – International Climate Initiative (IKI), Germany Organic shrimp certification – Naturland, Germany
Major limitation	Significant grant financing and volunteer help needed to establish a carbon credit scheme, which provides a mangrove-friendly cash flow to the local community	Lack of well-articulated revenue streams based on mangrove-friendly activities to incentivize community-based conservation	Standard for mangrove conservation is set by an internal certification scheme, which in turn is dependent on the export price for the captive-bred shrimps
Projects outcome	Highly successful as a local project, but difficult to scale up or replicate as a model	The project is successful enough that it is being extended into a phase 2, which can build on the many assessments and research conducted by this first phase Transaction and interrelated costs were highest, indicating the need for large grants at the development phase especially	This project has been considered a success and is moving into a second phase, but there are questions remaining on the vulnerability of this model to market fluctuations and the improvement of biodiversity in the newly planted mangroves. This is, however, the only project that could be scalable

Kenya: Mikoko Pamoja

The Mikoko Pamoja project demonstrates that investing in a mangrove project can deliver a complex array of benefits, some of which may generate revenues, to cover an array of costs. The project is an excellent example of how a mangrove conservation project can include a number of activities and aims, including direct protection and restoration, scientific experimentation and research, capacity building and learning, community empowerment and support, and the sale of mangrove-related goods and services, in this case, carbon credits.

Currently, the project earns carbon credit revenue mostly from the mangrove biomass and a small portion of the soil carbon. In the coming five-

9 Information on the economic (and other) value of mangroves are continuously updated.

year review, project managers aim to include more of the soil carbon and expand to include seagrasses in the carbon calculations (Dr J. Kairo, M. Huxham, personal communication, April 2018). The project is also serving as a model to expand these efforts to a larger community in a neighbouring village.

The Mikoko Pamoja has already been deemed a success, primarily due to such site-specific factors as the close relationship between the project developers and community and the community's engagement in the design process. It has benefited from cost-savings linked to initial research undertaken with Earthwatch Institute volunteers and the volunteer work of the project designers and managers. The community benefits from the funds generated from mangrove carbon credits, which aligns their livelihood needs with conservation.

Key lessons learned from this case study include the need to look more systematically at the flow of revenues and costs across the project lifecycle, to have the flexibility to look for new sources of revenues such as the possibility of soil carbon credits, and to look carefully at whether the revenue streams will encourage the maintenance of diverse and resilient mangrove ecosystems. For Mikoko Pamoja, the upfront grant financed work – notably the Earthwatch field research – provides a solid foundation for putting in place a stream of revenue from the mangrove carbon credits, which incentives the local community to conserve the mangroves. However, this cash flow may not on its own provide the necessary incentives to continue to conserve the mangroves for years to come.

The long-term sustainability of this project depends on the continued alignment of the community benefits arising out of the carbon credits as these credits are based on the ongoing conservation of the mangroves. If the perceived cost of conservation – e.g. the opportunity cost of not utilizing the mangrove timber – becomes greater than the perceived benefit of the carbon credits to the local community, then the mangroves will be at risk. Thus, it is probably wise for the community to identify other forms of mangrove-friendly incomes such as sustainable harvesting of mangrove resources and ecotourism.

Madagascar: Manambolo-Tsiribihina

WWF's Manambolo-Tsiribihina seascape project aims to conserve and restore the mangrove ecosystem through ensuring and developing the sustainable use of mangrove-based goods and services. These include fish and crab harvesting and the sale of Plan Vivo carbon credits. All of the elements are in place regarding the restoration, conservation and sustainable use of mangrove ecosystem services. However, there is a need to more closely align the various uses with commitments and efforts to restore and maintain the mangroves. This includes establishing effective governance mechanisms and a robust financial mechanism that links costs and benefits. The project will also serve as an experiment in setting REDD+ considerations into the project design to be in place if and when REDD+ funds are available to the Madagascan mangroves.

By looking strategically at the opportunities to align feasible economic activities for the benefit of the local communities with the conservation of the mangroves, this project provides a useful insight into the components needed to ensure success and sustainability. As the various elements require a variety of inputs and deliver a variety of outcomes, it will be particularly useful to look more closely at the associated costs and benefits. Additionally, various aspects, as part of a large coherent strategy, may attract micro-grants or micro-credit delivering community-based blended financing for conservation and development outcomes.

As the WWF project (now in its second phase) has been underway for some time (7 years) and continues, its further development will provide insights into how grants and investments in such projects can deliver sustainable management.

Key lessons learned from this case include the importance of: having a long-term strategic view from the start of a project to maintain a focus on mangrove conservation; looking at a wide scope of

possible economic activities – from carbon credits to fisheries and tourism – which could be aligned to mangrove conservation; and securing adequate grant financing to enable the project to develop and mature over a longer time period.

The sustainability of this project depends on the capacity to implement an adaptive management system. This should incorporate insights from ongoing monitoring and evaluation and adjusting the mix of mangrove-friendly economic activities as needed to ensure that the mangroves are conserved. If the mix of economic activities does not incentivize the local communities to conserve, the mangroves will be at risk. Thus, it is critically important that the project looks carefully at the mix of economic activities, which will be mangrove friendly and incentivizes the local community to conserve the mangroves over time. Such attention to the nexus between conservation and enterprise at the local level will provide useful insights for other such projects elsewhere in the country and the region.

Viet Nam: Mekong Delta

The Mekong Delta Mangroves and Markets (MAMI) project aims to align the conservation of mangroves with the farming of premium-priced shrimp through incentivizing shrimp farmers to restore mangrove cover on their farms to over 50% (Brunner, 2016).

Phase 1 has been a success in that the project achieved many of its aims and was mostly effective in the financial returns it made. However, there are questions as to whether the increase in mangrove tree cover (planned as a climate change mitigation effort) will have made a difference to the integrity and diversity of the ecosystem. Improvement of the ecosystem was not in itself considered an indicator of success and thus the biodiversity impact of the tree planting is unknown.

Funding for the continuation of phase 1 into phase 2 has been provided with the aim to scale up this model in other provinces. If the incentive scheme – increased revenues from the sale of mangrove-friendly organic certified shrimp – works on a larger scale, then it will be a win-win outcome for nature and local livelihoods. Scaling up this initiative in Viet Nam and replicating it in other countries is a real possibility. However, doing so would benefit from a clearer assessment of the interrelated costs and benefit streams needed to get such a scheme up and running and to ensure its long-run sustainability. Because a significant amount of upfront grant financing is needed to align mangrove conservation and shrimp markets, the project and others will benefit from taking a closer look at the cost-effectiveness of the activities undertaken in phase 1.

Key lessons learned from this case study include the recognition that such market-based projects are likely to require significant upfront development costs in the form of grant funding. In addition, the risks of market fluctuations – such as a drop in the wholesale price of shrimp – are difficult to respond to once the scheme is established, and the quality of the mangrove conservation effort may not be strongly linked to the export of certified products.

The sustainability of this project depends on the continued alignment of export markets for shrimp with a mangrove conservation requirement. If the shrimp farmers, however, find that they can secure a better return – through increased volume and/or increased prices – in other markets which do not demand mangrove conservation, then the mangroves could be at risk. Further, the alignment of certified shrimp with active conservation management of the set-aside mangroves needs to be assured, or the project could become a conservation project in name only. With good governance, responsible management and secure markets for certified shrimp, this approach has the potential to be scalable and attract impact investors who are keen to invest in biodiversity-positive aquaculture.

Lessons learned could be exchanged between similar projects such as Conservation Coast in Guatemala (see Box 7).

4

SUCCESSES AND CHALLENGES: WHAT TIPPED THE BALANCE?

The goal of this chapter is to outline the key factors as to why mangrove conservation projects have failed or succeeded in the past. General guidance for successful mangrove, projects already exists (especially restoration/rehabilitation). In Table 2 below we attempt to summarize the key factors derived from our case studies as well as other examples from the literature.

CHAPTER SUMMARY

Successful mangrove projects have a few key factors in common:

- Extensive planning phase, including extended knowledge about the local conditions, i.e. hydrological context and drivers of mangrove loss, including likely impacts of climate change
- Comprehensive stakeholder engagement to ensure the project speaks to the needs of the local communities, including the creation of new income (livelihood) opportunities and awareness creation activities
- Effective implementation of the project, including strong management coordination and well-equipped, experienced trainers to ensure community development and quick proof of concept/ income generation
- Regular maintenance of a project area as part of a co-management set-up between local communities and local government(s)
- Effective monitoring of project activities
- Long-term programmes or arrangements

Widespread challenges across mangrove projects include:

- Inadequate planning without extended knowledge about the local conditions, both environmental and social, and lack of inclusion of predicted climate change impacts
- Difficulties in setting up projects so that they can maintain their activities and impacts without dedicated funding support, e.g. little evidence of generating long-term sustainability including through cash flow
- Inherent risks related to working with an unpredictable and complex natural system
- Focus primarily on (mass) replanting efforts to the detriment of a holistic approach
- Lack of long-term funding and partnerships to increase duration and sustainability
- Policy and legislation-based challenges linked to the legal status of mangroves, use of coastal and marine resources and land tenure

The key project activities needed for a successful mangrove project are summarized in Table 2 and available in an extended version in Annex 2. This can be used as a reference checklist by project developers and thus inform mangrove project proposals and programmes in a more targeted manner. Such an overview will hopefully also lead to a more in-depth understanding of public and philanthropic funders, as well as impact investors interested in mangrove conservation efforts and guiding their decisions towards investing in sustainable and impactful mangrove projects and programmes.

Table 2. Summary of key activities needed to ensure a successful mangrove project and corresponding guidance materials

Project activities	Guiding material (non-exhaustive)
Research and design	
Collection of adequate baseline data and assessments to select project site and objectives. This should include considerations on projected climate change impacts	• Community Based Ecological Mangrove Rehabilitation (CBEMR) in Indonesia (Brown *et al.*, 2014) • Forthcoming toolkit on baseline assessments for carbon and other ecosystem services by Crooks et al in Press • Mangrove management for climate change adaptation (Mcleod *et al.*, 2006; Simard, F., Laffoley, 2016; Chow, 2017) • Blue Carbon Policy Assessment Framework (Herr, Himes-Cornell, *et al.*, 2016) • Coastal Blue Carbon: Methods for assessing carbon stocks and emissions factors (Howard *et al.*, 2014) • Ecological mangrove restoration (ERM), Six steps to successful mangrove forest restoration (Mangrove Action Project, 2007)
Engagement and understanding of the local community	• Mangrove restoration guide; best practices and lessons learned from a community-based conservation project (Trump *et al.*, 2015) • Forthcoming restoration guide by the Western Indian Ocean Mangrove Network
Management activities	
Project management and coordination	• The cost and feasibility of marine coastal restoration (Bayraktarov *et al.*, 2016)
Community engagement in decision-making and implementation; co-management set-up	• Mangrove restoration guide; best practices and lessons learned from a community-based conservation project (Trump *et al.*, 2015) • Manual on community-based mangrove rehabilitation. Mangrove Manual Series no. 1 (Primavera *et al.*, 2012)
Community development (e.g. education, clinics etc.)	• See the relevant chapters in many of the guides in this table for e.g. Trump *et al.*, 2015 pages 38-40
Management of hydrology (to facilitate natural regeneration)	• Mangrove restoration: to plant or not to plant? (Wetlands International, 2016) • Ecological mangrove rehabilitation – A Field Manual (Lewis III *et al.*, 2014) • Manual on community-based mangrove rehabilitation. Mangrove Manual Series no. 1 (Primavera *et al.*, 2012)
Restoration and/or replanting of mangrove forest and seedlings	• Ecological mangrove rehabilitation – A Field Manual (Lewis III *et al.*, 2014) • Mangrove restoration: to plant or not to plant? (Wetlands International, 2016) • Ecological engineering for successful management and restoration of mangrove forests (Lewis III, 2005) • Manual on community-based mangrove rehabilitation. Mangrove Manual Series no. 1 (Primavera *et al.*, 2012) • Manual on Mangrove Reversion of Abandoned and Illegal Brackishwater Fishponds – Mangrove Manual Series No. 2. (Primavera *et al.*, 2014) • Best Practice Guidelines on Restoration of Mangroves in Tsunami Affected areas. (Green Coast, 2009)
Sustainable use of mangrove area, including for wood, food, physical area, etc.	• See the relevant chapters in many of the guides in this table for e.g. Trump *et al.*, 2015 pages 38-40

Management activities	
Improvement of current and sustainable livelihoods and diversification of income sources (potential here for innovative financing models)	• Guiding principles for delivering coastal wetland carbon projects (UNEP *et al.*, 2014) • Keys to successful blue carbon projects: Lessons learned from global case studies (Wylie *et al.*, 2016) • Conservation Investment Blueprints: A development guide (Stephenson *et al.*, 2018) • Forthcoming, Blue Carbon finance guidance (Herr et al. in Press)
Site protection and enforcement of objectives	• Legal frameworks for mangrove governance, conservation and use (Slobodian et al., 2018)
Project monitoring and reporting	• Included in reports like: Guiding principles for delivering coastal wetland carbon projects (UNEP *et al.*, 2014)

While the case study projects all cite climate change mitigation as a motivation or co-benefit of the project activities, none of them have been able to tap directly into UNFCCC-related financing mechanisms (see Chapter 5.1). For those using or planning to use climate finance to sustain their projects, the voluntary carbon market (see Box 2 in the supplementary documentation) seems the most reasonable option at present, as it has fewer transaction costs and softer regulations to meet, thus being more favourable for the implementation of smaller community-based projects.

Complementing efforts on the ground with legislation and policy

The legislative and policy conditions of each country form an important element within each case study. Policy relating to mangroves is a complex and challenging issue given that this is a marine intertidal forest – an area between forest and sea. In many countries, it is still unclear (in legislation or in practical implementation by government agencies) whether forest, fisheries and/or coastal departments have the responsibility for managing these important ecosystems. Mangroves are typically under the overlapping authority of different government ministries according to the function of the mangroves and related uses. This has caused projects to fail for not effectively addressing land-tenure rights (e.g. which government department has ownership and therefore authority to grant tenure), or engaging with local communities and other relevant stakeholders (Rotich *et al.*, 2016; Baruani *et al.*, 2017).

An integral activity for most of the case studies is engaging local, regional and national authorities to clarify the legal position on mangroves and to garner support from government and local authorities. For instance, the MAMI project in Viet Nam has been instrumental at incorporating mangroves into the legal basis for Payments for Forest Ecosystem Services (PFES) in the country (Conservation International *et al.*, 2016).

In some cases, lack of capacity and knowledge is a basic stumbling block, and there is a significant shortfall of technical mangrove expertise, nationally and internationally, compared to coral reef experts (H. Koldewey, personal communication, July 2018). Forestry trainees in some countries, for example, are still taught to plant the same species of mangrove in straight lines across all mangrove zones (D. Wodehouse, personal communication, October 2017). Much research and many manuals exist with advice against this type of management simply because success rates are so low and costs are high (see Table 2).

Getting all stakeholders, from community members to local, regional and national authorities, to agree on best practice is a major challenge in any conservation project. In the case of mangroves and the physical area occupied, there are potentially competing uses and constraints according to the needs of the stakeholder, which add another layer

Box 4. Good intentions, wrong execution

Despite some non-profit investors and donors having allocated substantial amounts of capital or funding to mangrove projects, these investments have not always been successful (see the Philippines example below). Any increase in funding and interest in mangroves have not improved the way funders impose inappropriate conditions and limits on projects. These can include funding periods that are too short, a focus on area targets and planting rather than survivorship and facilitating natural regeneration, a lack of flexibility concerning budget lines and limited long-term funding for protection and maintenance (Hinrichs, no date; Primavera *et al.*, 2008).

While these projects can generate good photo opportunities and attract global attention and awareness of mangrove issues – for example, Portuguese football star Christian Ronaldo's support of the Mangrove Care Forum Bali – they often fail to deliver long-term benefits and success to either mangroves or the dependent communities (Ellison, 2000; Alongi, 2002; Moberg *et al.*, 2003; Barbier, 2006; Aung *et al.*, 2011; Memon *et al.*, 2011; Absolute World Group, 2013).

Understandably, few project teams have documented project failures. However, the mangrove experts interviewed for this report agreed with the fact that many such examples exist, supported by several researchers (Field, 1996; Walters, 1997; Sanyal, 1998; Erftemeijer *et al.*, 2000; Lewis III, 2005; UNEP, 2007; Primavera *et al.*, 2008; Samson *et al.*, 2008; Samarakoon, 2012; Primavera, 2015; Elliott *et al.*, 2016; Blum *et al.*, 2017c). Despite these poor reviews, and the publication of some excellent mangrove rehabilitation guidebooks, activity on the ground appears not to have changed.

Figure 7. Thousands of locals plant 1 million mangrove seedlings at low tide in Ragay Gulf, the Philippines, 2012. © Provincial Government of Camarines Sur

For example, in one large-scale planting project in Ragay Gulf in the Philippines, local authorities and the NGO El Verde succeeded in planting 1 million propagules in an hour involving 7,000 people over a 60-hectare site (Alfredo P. Hernandez | Mambulaoans WorldWide Buzz, 2012; Camsur - Gov. Lray El Verde Movement, 2012; Escandor Jr., 2012).

Unfortunately, the site choice was not guided by published science. Not only was almost all the site mudflat – an area unsuitable for mangrove growth – but a seawall had been built on the landward side to protect the nearby village from erosion, clearly indicating that this exposed section of coast was subject to high wind and wave energy at certain times of the year; again, not suitable for mangrove growth.

Figure 8. Ragay Gulf in 2016. There was a less than 2% survival rate of the mangrove seedlings originally planted in 2012. © Dominic Wodehouse

In addition, Google Earth imagery would have shown project managers that villagers used at least part of this planting site for boat mooring and boat operators would naturally want to keep the site clear of vegetation.

Four years later, an independent assessment of the 1 million or more propagules planted found less than 20,000 plants remaining; an approximate 2% survival rate (Wodehouse and Rayment 2018, in review).

One key lesson from this predictable failure is that published science is not being applied to field decisions.

of complexity (Powell *et al.*, 2007). Women harvesting mud crabs in Viet Nam who know of the protective benefits of mangrove forests are understandably reluctant to stop their harvesting for an unknown alternative if their families depend on the additional income (Hinrichs, no date; Primavera *et al.*, 2008).

4.1. What activities need priority investment in order to produce a successful and cost-effective mangrove conservation project?

According to several experts, site choice through comprehensive background research on the environmental and social baselines is the foundation to setting a project on the path to success (Bayraktarov *et al.*, 2016; Wylie *et al.*, 2016). These are key for conservation activities in the form of protected areas, PES, restoration, avoided deforestation and investments (e.g. in the case of markets and insurance). In the case study from Madagascar, WWF Madagascar spent two years prior to the start of the current project conducting baseline research and assessments. This allowed the cause(s) and drivers of mangrove loss to be identified, so that the project could be designed to meet the needs of the environmental and social conditions.

Primavera and Esteban (2008) relate the success of a mangrove project back to the initial developer as well as the drivers and the needs for mangrove conservation. Community-initiated efforts borne out of a shared need (e.g. for coastal protection) entail a greater level of success than heavily funded and donor-driven international development assistance projects costing millions of dollars.

On the technical side, research indicated that mangrove conservation projects have shifted from focusing only on one activity, such as mass replanting, to combining several activities in a holistic manner. For example, in the Manambolo-Tsiribihina seascape project, planting is mixed with protection, research, community management, coordination agreements between implementation agencies, and aquaculture and carbon credits for revenue generation (WWF, 2016).

While communities might have a long-term interest in mangrove service restoration, quick financial benefits and development for the community maintain interest in the project aims early in the implementation phase (Bayraktarov *et al.*, 2016). This last point was especially noted in the Mikoko Pamoja project. Here, revenue from carbon credits afforded the community a clean water source, and there is evidence

Box 5. Benefits of blue carbon conservation

In terms of climate change mitigation, evidence suggests that maintaining carbon pools and preventing the release of emissions through the avoidance of habitat conversion and drainage are more effective as blue carbon storage than rebuilding stocks (Crooks *et al.*, 2011; Murray *et al.*, 2011; Siikamäki *et al.*, 2013; Baig *et al.*, 2015). This is due to the fact that if restoration does occur, sequestration rates are generally thought to be lower than the emissions released during the degradation/drainage process (Crooks *et al.*, 2011; UNEP *et al.*, 2014).

In the short term, the potential for climate change mitigation is reduced and any recovery can be a highly complex process depending on the changes in biological and physical conditions (UNEP *et al.*, 2014). While the rehabilitation of coastal carbon habitats such as mangroves rebuilds carbon stocks, the protection of existing, intact blue carbon ecosystems is the simplest method technically and maintains the high co-benefits that these ecosystems provide (Ellison, 2000).

of health impacts with cases of waterborne disease dropping by 60% (S. Abdulla, personal communication, April 2018). The link made here between the improved health and easy access to water (for the women who previously walked far for it) and the mangroves is measurable.

Experts also recommend a natural regeneration approach and protection of existing stands through community engagement for mangrove rehabilitation projects (see Table 2). However, in some cases where mangroves have been destroyed, more active management might be needed to supplement natural regeneration. To coincide as much as possible with the natural recovery timeline of mangrove forests, projects should be between 15-20 years rather than 1-5 years (Bayraktarov *et al.*, 2016). Indeed, depending on the degree of disturbance, mangroves need decades to recover, but climate change mitigation and adaptation ecosystem services can be provided on shorter timelines (Clewell *et al.*, 2013; Duncan *et al.*, 2016).

In terms of project effectiveness, the case studies brought to light that well-planned projects can generate more non-financial benefits than the project costs (see supplementary documents). Bayraktarov et al., in their 2016 review of coastal ecosystem conservation projects focused on restoration, noticed that neither budget nor project scale increased chances of success. Significantly, the study found that there was no relationship between restored mangrove plant survival and project cost (Bayraktarov *et al.*, 2016). Success depended on site selection and techniques applied rather than funds available. In fact, costs were even lowered when projects were based on community input (Bayraktarov *et al.*, 2016). This corroborates the report's research in general and other findings that activities linked to effective planning and implementation of project activities are key to project success (Wylie *et al.*, 2016).

From a financial point of view, the costs of restoring mangroves are generally considered to be many times higher than the costs for protecting and avoiding deforestation of mangroves (see Box 5) (Dr Salvam, R. Lewis, personal communication, March 2018). Ultimately, true cost-effectiveness of any mangrove project is linked to preventing the loss of any remaining mangrove habitat, and on the long-term conservation and restoration of the mangroves (Anonymous and R. Lewis, personal communication, October 2017 and Crooks et al., 2011).

5

INVESTMENTS IN MANGROVE CONSERVATION – OUTLINING THE PLAYING FIELD

This chapter provides a historical perspective to previous mangrove conservation projects and their business models in order to provide context to current and future mangrove investments. The chapter also highlights the actors involved in mangrove conservation investments and offers examples from the field to illustrate different approaches currently in use.

CHAPTER SUMMARY

While mangroves have been the source of goods and services throughout history, it is only since the 1970s that their loss has been recognized by the international community. By the 1990s, NGOs around the world had engaged in conservation efforts to ensure they were being either protected or restored. Such efforts increased even further after the Indian Ocean tsunami in 2004, which triggered the launch of large-scale mangrove conservation initiatives like Mangroves for the Future.

Grants from government agencies and NGOs were the main source of funds at that point. Since 2015, mangrove conservation has been mainly driven by the need to mitigate and adapt to climate change and the recently adopted Sustainable Development Goals. The more successful conservation projects tend to be designed in a holistic way with a range of benefits to a variety of stakeholders. This has increasingly raised the awareness of for-profit investors that impact investments are a valuable addition to their clients' portfolios.

5.1. Mangrove investments and their focus through history

Mangroves have long been recognized as important sources of fuel, materials, food and protection to coastal communities (Primavera, 2005a; Das *et al.*, 2009; Donato *et al.*, 2011). Traditional management has involved small-scale aquaculture, silviculture, protection of cultural heritage and coastal fisheries. Intense aquaculture started in the mid-1970s, increasing from 8% to over 33% in 2005 as a source of global fish production with a value of US$67 billion (Primavera, 2005). Much of the area needed for this expansion came from land where mangroves had grown as it was most suitable for farming fish and shrimp (Ellison, 2000; Aksornkoae *et al.*, 2004). However, recognition of the subsequent rate of rapid mangrove loss globally was brought to international attention only in the 1980s and early 1990s, which led to a surge of interest in mangrove conservation (Ellison, 2000; Salem *et al.*, 2012).

At this point, the initial sources of funding for mangrove conservation were public funds from government agencies followed by private donations; both focused on addressing the damage to mangroves from rapid changes in land use (Hinrichs, no date; Credit Suisse *et al.*, 2014). From the 1980s, the goals of such projects began to include the benefits that functioning mangroves provide, including maintaining ecosystem function. With this shift, investment values started to reflect the full worth of these ecosystems as contributors to human well-being (Barbier, 2017).

The 2004 Indian Ocean tsunami catalysed a palpable shift in the intensity of mangrove investments (Danielsen *et al.*, 2005; Alongi, 2008). Much research following the devastating tsunami showed that while over 280,000 lives were lost in South and Southeast Asia, communities sheltered behind mangroves suffered considerably less damage (Mangroves for the Future Secretariat, 2017).

An example of the boom in post-tsunami efforts is the creation of Mangroves for the Future (MFF). Co-managed by IUCN and UNDP, MFF was set up after the tsunami to fund selected projects linked to post-disaster recovery (Mangroves for the Future Secretariat, 2017). It then moved into a phase (2007-2010) of investing in mangroves as green infrastructure to be integrated into coastal development. This matched a global trend of mangroves being seen as natural infrastructure with potential to contribute to international environmental and development goals like the Millennium Development Goals (MDGs). From 2011 to 2013, ecosystem-based adaptation received global recognition and MFF focused on sustainable development within this context. Projects during this period gave attention to the many dimensions of poverty and its causes, with additional emphasis on gender equality. These efforts linked to the MDGs and the Convention on Biological Diversity's (CBD) Aichi targets, as projects were designed to share governance between communities and local authorities (Baird *et al.*, 2009; Mangroves for the Future Secretariat, 2017).

Since 2014 and continuing into the present, transformational adaptation action creating long-term resilience has been central, with MFF incorporating area-based assessments and planning towards long-term community goals (Mangroves for the Future Secretariat, 2017). The SDGs have become a regular feature in mangrove conservation by now (Vierros *et al.*, 2017; United Nations, 2018) with a cluster approach to more targeted project planning. This more holistic approach engages a range of stakeholders across ecosystems and landscapes and is transboundary across national borders.

Climate change is increasingly a cross-cutting issue and, because of their many benefits, mangroves are gaining in international significance. New global efforts have emerged to ensure mangroves stay high on the international political climate and conservation agenda. They generally intend to address the increasing urgency in reducing the loss of mangroves and place great focus on improving the impact of their work. The GMA[10] and SOMN! aim to

10 See http://www.mangrovealliance.org/about.

improve the effectiveness of global conservation organizations by contributing to communications and filling important gaps in current efforts.

The role of mangroves in climate mitigation – and thus their potential to be monetized in the context of national emissions reductions efforts as a blue carbon ecosystem – has gained the interest of the private sector (see Box 9). Mangroves, as long as countries consider them as forest – which most, but not all do,[11] – can be included in REDD+ programmes. There are ongoing efforts, including by MFF, to provide guidance and support to countries on how this can be done.

Non-profit investors

Non-profit investors are typically public donors, philanthropic institutions or NGOs supporting mangrove conservation work with (non-reimbursable) grant funding. They target positive outcomes in environmental and social terms, for nature and the local communities. While grant-based projects need to underline the longevity of their impacts beyond the duration of the grant (e.g. proposal submission forms by the International Climate Initiative, Global Environment Facility or Global Climate Fund), the projects themselves do no seek a financial return. They do, however, often work on identifying new local livelihoods to support project survival after funding has ceased.

Grants by non-profit investors (also referred to as donors), and in particular public funds, have made up the vast majority of contributions (about US$52 billion per year in 2016) spent on conservation (UN Environment *et al.*, 2018). It is estimated that just 60 non-profit investors funded projects in coral and associated coastal ecosystem conservation, totalling about US$1.9 billion in project costs (Hinricks, no date). These funds were provided by a wide range of institutions, foundations and organizations for individual projects and tended to be of relatively short duration with little follow-up; there was (Hamrick, 2016).

Box 6. Livelihoods Fund: Senegal

Senegalese NGO Oceanium brought to the attention of DANONE, a French multinational cooperation, the scale of mangrove deforestation along sections of the West African nation's coast. DANONE, had been looking into carbon offsetting of its greenhouse gas emissions and started investing in reforestation efforts starting in 2008 through 2012. Renamed the Livelihoods Fund, the programme opened its carbon investment fund to other companies, including Hermes and Michelin. Estimates put the financial contribution of DANONE at over US$4 million (Cormier-Salem *et al.*, 2016). There is some controversy that in its efforts to keep blue carbon in the ground the needs of locals have been side-lined (Cormier-Salem, 2017). This has led to calls for future projects to be more receptive to community-based management (Credit Suisse *et al.*, 2014).

5.2. Agents for change: An overview of funding and finance in and around mangrove conservation

This report differentiates between two broad categories of investors – non-profit and for-profit impact investors – who provide funding and finance in and around mangrove areas. For the purpose of this report, the term "investor" also includes the traditional grant provider, typically known as the funder. Three types of investment returns are referred to throughout the document: environmental, social and financial (as outlined in Figure 9).

11 For example, Brazil considers a tree only starting five-meters tall; many mangrove trees are below this height.

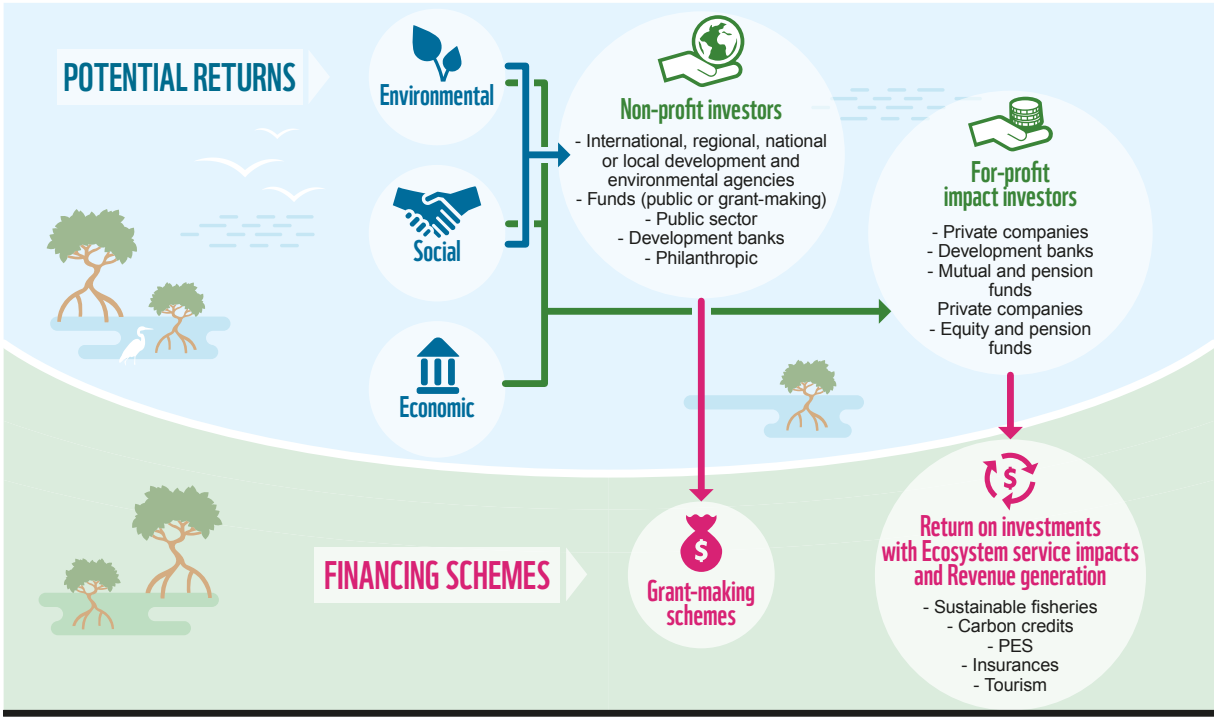

Figure 9. Different types of investors (non-profit and for-profit impact investors) are typically interested in different types of investment returns environmental, social and economic; the boxes with red-text outline the typical finance schemes the investors are using

The largest non-profit investors include multinational and national development agencies, particularly those focused on sustainable development. Through their agencies, the United States, Germany and France have all invested substantially in mangrove projects, with a combined value of over US$400 million in the mid-2000s (Hinrichs, no date; Mccreless *et al.*, 2016). Similarly, multinational institutions, including the World Bank, Global Environment Facility (GEF) and African Development Bank (ADB), have invested nearly US$500 million in mangroves also since around the mid-2000s (Hinrichs, no date; Mccreless *et al.*, 2016). This value likely dwarfs that of investments in mangroves from impact investors. If investment in conservation in general is used as a rough indicator, the public sector committed over US$31 billion from 2009-2015 compared to US$8.2 billion committed by the private sector between 2004 and 2015 (The GIIN, 2018). Investments by non-profits have also been the source of most funds to the case study countries outlined in this report, with the majority being allocated to South Asia, typically in large programmes with budgets in the tens of millions of dollars (Hinricks, no date). German agencies and organizations have invested in Viet Nam to an estimated US$30 million in five projects or programmes. At a national level, Viet Nam receives the sixth highest investment in mangroves; Kenya and Madagascar fall outside of the top 12 countries receiving non-profit mangrove investment (Hinricks, no date).

Impact investors

Balancing the aims between non-profit and traditional for-profit investors, impact investors are a recent addition to the investment landscape (see examples in Boxes 10 and 11). What characterizes impact investments is the "intentionality and positive intention" of the investment. Impact investments are carried out with a specific outcome in mind. In true impact investments, impacts are not merely considered a side effect, but are part of the investment objective (natureVest *et al.*, 2014).

Box 7. Blue Solutions: Examples of revenue generation or grant funding in mangrove projects

Blue Solutions serves as a repository of marine-related projects used for knowledge sharing and includes mangrove projects that have managed to generate some capital/revenue. The following are relevant examples from around the world:

1. Sustainable aquaculture in southern India and Viet Nam

These projects by the M S Swaminathan Research foundation and GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) have developed sustainable solutions to the communities dependent on aquaculture for their livelihoods. In one case, this is done by integrating mangrove plantations within an aquaculture system. In the second, GIZ promotes best practice and training in ecological techniques.

2. Co-management in the Philippines

Along with the local community, the Zoological Society of London has established an eco-park managed by the local community groups to build awareness among visitors and fellow villagers on the importance of mangroves. Additionally, the revenue generated by the park entrance fees is used for and by the community groups.

3. Carbon credits in Costa Rica

Similar to the Mangroves and Markets project, conservation credits under the Global Conservation Standard fund are bought by private companies and revenue generated is used to develop conservation projects like organic shrimp aquaculture. The organic shrimp is then sold to certified retailers in Germany with the generated capital being reinvested into the fund.

4. Ecotourism in Thailand

In this project, dolphins and dolphin watching are the source of revenue for the ecotourism industry on either side of the border of a transboundary marine sanctuary between Cambodia and Thailand. The project has included awareness raising and the development of best practices for the dolphins' benefit and conservation as well.

5. Corporate social responsibility in India

CSR is now mandatory for companies in India with a net worth over US$73 million or earn over US$146 million annually, and where applicable, at least 2% of the net profits are given over to CSR. While documentation is not available, mangrove projects in India are already benefiting from these funds and interest in mangroves by companies is growing (Dr. V Salvan, personal communication, March 2018).

Next to intentionality, the measurability of impacts (ex-ante and ex-post) and financial profitability are also key elements of impact investments, in varying degrees. Here, impact investors will invest money into efforts by companies, organizations or funds that generate social and environmental impact alongside a financial return. In the context of mangrove investment, the conservation impacts must be the intended motivation for making the investment; they cannot be simply a by-product of an investment made solely for financial return (McCreless and Beck, 2016).

Box 8. Insurance interest in ecosystem restoration

Reinsurance companies such as Swiss Re support early investment in climate resilience, citing that protecting mangroves and coral reefs can considerably reduce damage from strong winds and storm surge. In Barbados, for example, Swiss Re has supported the restoration of reef and mangrove habitats. It estimates that such an investment will avoid a third of the expected losses compared to post-disaster relief from extreme weather events (Havemann *et al.*, 2016). Other companies are also seeing opportunities to use similar "natural capital" risk mitigation measures (e.g. Catastrophe (Cat) Bonds and Cat Bond Swaps) (Credit Suisse *et al.*, 2014; Hamrick, 2016). Such models and strategies are not without controversy and still highly specific in their application.

The value of assets managed as a sustainable investment has grown rapidly since the mid-1990s and remains the fastest-growing asset class of the investment industry (Credit Suisse *et al.*, 2014; natureVest *et al.*, 2014). Impact investors in this nascent industry target opportunities promoting a triple bottom line and the "sale" of positive emotions. Areas of focus for this asset class have included such sectors as ecotourism, sustainable aquaculture, forest management and increasingly, conservation park co-management. A number of mangrove conservation projects have tapped into these markets as a way to finance their activities and generate a financial return for all stakeholders.

There are important considerations where impact investors relate to mangroves, especially when getting to the edge of the impact investor spectrum and financial returns are more sought after. Previously, the typical mangrove project did not fit the risk return profile, nor were they seen as a valuable addition to the portfolio (unless they added value in correlation with other projects). Today, however, all mainstream for-profit investors, such as insurance companies (see Box 9), tend to take environmental and social risks into account as a mitigating measure to reduce investment risk and to protect their corporate brand (Green investments, 2016).

New funding mechanisms such as the Blue Action Fund bring new sources of public money to coastal and marine conservation projects; in this case for marine protected areas (MPAs), which will in several cases likely include mangroves. However, other typical "donor countries" are dealing with fiscal constraints (Japan 2014, Denmark and Italy[12]), or changing their investment interest and focus (like in the US) (Credit Suisse *et al.*, 2014; UN Environment *et al.*, 2018).

Even with a general increase in public grant spending, the funding gap for nature conservation still needs to be bridged by private sector investments (Shahbudin *et al.*, 2012; Swiss Re, 2015). Many analysts estimate that there is considerable room for impact investors to fill when it comes to a shortfall in conservation capital needs (US$300 billion), if obstacles (see Chapter 6.2) to conservation finance can be overcome (Credit Suisse *et al.*, 2014).

Surveys analysing a range of investors have showed a large amount of unrealized potential to fill the funding gap, particularly in products or projects that offer wealth preservation (Credit Suisse *et al.*, 2014; Hamrick, 2016). A key conclusion from such surveys is that interest in conservation investment continues to grow and that investors want investment opportunities (Credit Suisse *et al.*, 2014). In some cases, for-profit investors considered conservation to be the more important objective (Credit Suisse *et al.*, 2014). Among impact investors, conservation finance, and specifically mangrove investments, would provide the coming generation of high-net-worth individuals with a choice of customized projects to include in their socially responsible portfolios. A growing number of young, wealthy and ethically prone individuals will soon be in position to make decisions worth trillions (The Economist, 2017). They have grown up in a world where doing good and investing are compatible and can demand impact options with their investments (Davies *et al.*, 2016; Baumann *et al.*, 2017).

12 See https://public.tableau.com/views/RioMarkers/ByProvider?:embed=y&:display_count=no&%3AshowVizHome=no%20#3.

6

POTENTIAL, RISKS AND NEEDS: MANGROVE INVESTMENTS IN RAPIDLY CHANGING ENVIRONMENTS

The goal of this chapter is to help develop more innovative business models that have positive impacts on mangrove conservation, and ensure longer-term, sustainable mangrove management. It also aims to help overcome some of the risks and inefficiencies associated with conservation finance that have so far proved a substantial barrier to impact investors. The chapter then proposes financial partnerships, where appropriate, to reduce the risks of mangrove conservation investments for impact investors.

CHAPTER SUMMARY

The ongoing conservation finance gap needs to be overcome with an increase in available public and philanthropic funds, alongside a joint sharp increase in private sector involvement. Larger consortiums between NGOs and development agencies have developed a wealth of experience implementing effective coastal and marine conservation projects, also specifically related to mangroves. Examples like the Livelihoods Fund show that private companies team up to invest in mangrove conservation and restoration projects. However, the joint execution of projects with the private sector is still an exception.

New research suggests that blended financing could fast-track investments into mangrove conservation and substantially contribute to de-risking such projects. The development of new partnerships through existing platforms where non-profit partners can work closely with impact investors should be further explored. By doing so, non-profit partners would be shielding the impact investors from many of the start-up risks while being the gatekeeper of international environmental and social impact standards.

6.1. Engaging in innovative partnerships and new business models

Most investors engaged in mangrove conservation come from the non-profit sector, generating mixed results of successes and challenges. Some of these challenges (e.g. funding limits, project duration and scale) will likely remain a hurdle in the near future. Impact investors could contribute to filling some of those recognized gaps, and with some guidance, play a significant role towards mangrove conservation. Conservation finance experts estimate that scaling up and mainstreaming conservation projects is the key to utilising the available finance from the private sector (Hamrick, 2016).

The average per annum commitment to conservation investment from private individuals has doubled (similarly to the doubling of public funds) from US$0.8 billion (2009-2013) to US$1.6 billion (2014-2015) (Porras *et al.*, 2013). While not easy to trace, it is likely that mangrove projects have already partially benefited from these efforts.

The same report states that limitations to conservation investments generally comprise of:

- Lack of attractive risk level to return deals
- Small transaction sizes
- Lack of management track records

The report further states that in order to increase private investments in conservation, there is a need:

- For more government support to absorb risks
- To create enabling market conditions through pricing environmental externalities

Revenue sharing with impact investors

As the valuation of ecosystem services and experiences with PES becomes more evident (e.g. in Costa Rica PES have helped increase terrestrial forest cover by 1 million hectares), investors and project managers can generate opportunities that turn the economic benefits from mangroves into appropriate financial returns, while maintaining, or even increasing environmental and social impacts (The World Bank, 2017; Himes-Cornell *et al.*, 2018).

Box 9. Green bonds

Popularity in green bonds used to generate funds for green projects has rapidly increased since 2007, attracting impact investors with a lucrative proposition and the opportunity to support sound environmental projects. The Government of Fiji, for example, launched the first green bond from a developing country in October 2017 to finance projects improving resilience to the increasing impacts of climate change (International Finance Corperation, 2017). The Fiji green bond has already raised US$50 million and while mangroves are not specifically mentioned, reforestation is and may well include mangroves given the Environment Ministry of Fiji's interest in their benefits (The World Bank, 2017; Anonymous the Environment Ministry of Fiji's, personal communication, March 2018).

The global green bond market was expected to reach US$134.9 billion in 2017 – whether these funds reach mangrove conservation projects and programmes remains to be seen with time and continued research (The Economist, 2017).

Despite private sector capital committed for conservation spiking at about US$8.2 billion in 2015, of that amount US$3.1 billion could not be spent due to a lack of appropriate deals (Hamrick, 2016).

Large insurance businesses, international development agencies and other for-profit entities are highly interested in the cost-avoidance potential of mangroves (see Chapter 2.2). There is a shift towards tapping into these opportunities among non-profit and impact investors.

Another promising partnership to attract more funds and investors into mangrove conservation is blended financing. This emerging field makes strategic use of public funds to mobilize the greater capital value of private investments and substantially reduce risks to the latter while increasing the impact for the former. Essentially, it will package different financial mechanisms to finance a project or programme and reduce risks that currently scare away many impact investors (discussed in more detail in Chapter 6.2) (Hamrick, 2016).

Box 10. Blended finance in practice

Watershed conservation and carbon credits

One example of blended finance benefiting habitat conservation and local communities while providing a for-profit company with a source and market for carbon credits comes from the US West Coast. In 2011, the Yurok Tribe of northern California bought (for US$18.75 million) and restored a watershed area on ancestral land using a loan from the US Environmental Protection Agency's Clean Water State Revolving Fund loan programme. While the tribe and a non-profit partner manage the land sustainably, ensuring clean water and healthy forests, it will also provide carbon credits to be sold into the state's cap-and-trade system. In this case, the New Forests company is buying and selling the credits generated, and the tribe has repaid its loan using these revenues. To cover the project costs (US$55.8 million), the non-profit partner (Western Rivers Conservancy) is using a combination of private and public sector funding. These include state grants, tax credits, carbon credit sales , and funds from foundations and individual donors (Cornish, 2018).

Debt-for-nature-swap

In 2018, the African island nation of Seychelles designated coastal areas for protection in return for a debt restructuring. In this transaction, the Government of Seychelles used a mixture of loans and grants received from The Nature Conservancy to buy back US$21.6 million from European creditors at preferential terms. In exchange, the government has pledged to invest a total of US$5.6 million into marine and coastal conservation over the next 20 years (natureVest, 2018). A local public-private trust fund called the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) will hold and manage the repayment of the new debt that is characterized by a longer repayment period than usually granted (13 vs 8 years). The ultimate aim is to implement sustainable coastal management, including mangroves, to reduce risks from climate change (Environmental Defence Fund *et al.*, 2018).

The finance and conservation community are jointly developing new tools to divert and attract new finance into conservation efforts. Green bonds, for example, are used to make investments with an environmental purpose (see Box 10). Social bonds are used to fund social investments, whereas sustainable bonds mobilize debt funding for a mix of environmental and social impacts. Blue bonds (like the ones invested in the Seychelles (see Box 11) are still a very novel concept, but generally refer to bonds, whose proceeds are used to finance sustainable activities in the blue economy.

In terms of mangrove conservation, blended finance would provide a framework for non-profit and impact investors to create partnerships where each focuses on different sections of a project, and/or potentially a larger programme. While for-profit investors have historically

been a major contributor to mangrove loss (e.g. financing intensive aquaculture ponds), they have an opportunity now to change trajectory. Such changes have been witnessed in the parts of the fisheries industry which is increasingly investing in sustainably sourced fish (natureVest *et al.*, 2014; Hamrick, 2016; Environmental Defense Fund *et al.*, 2018).

- Without the right incentives allowed under a regulatory framework, environmental benefits are outside the interest of investors
- Focus on return and impact maximization (Credit Suisse *et al.*, 2014), to maintain stable, and continued investment and income opportunities

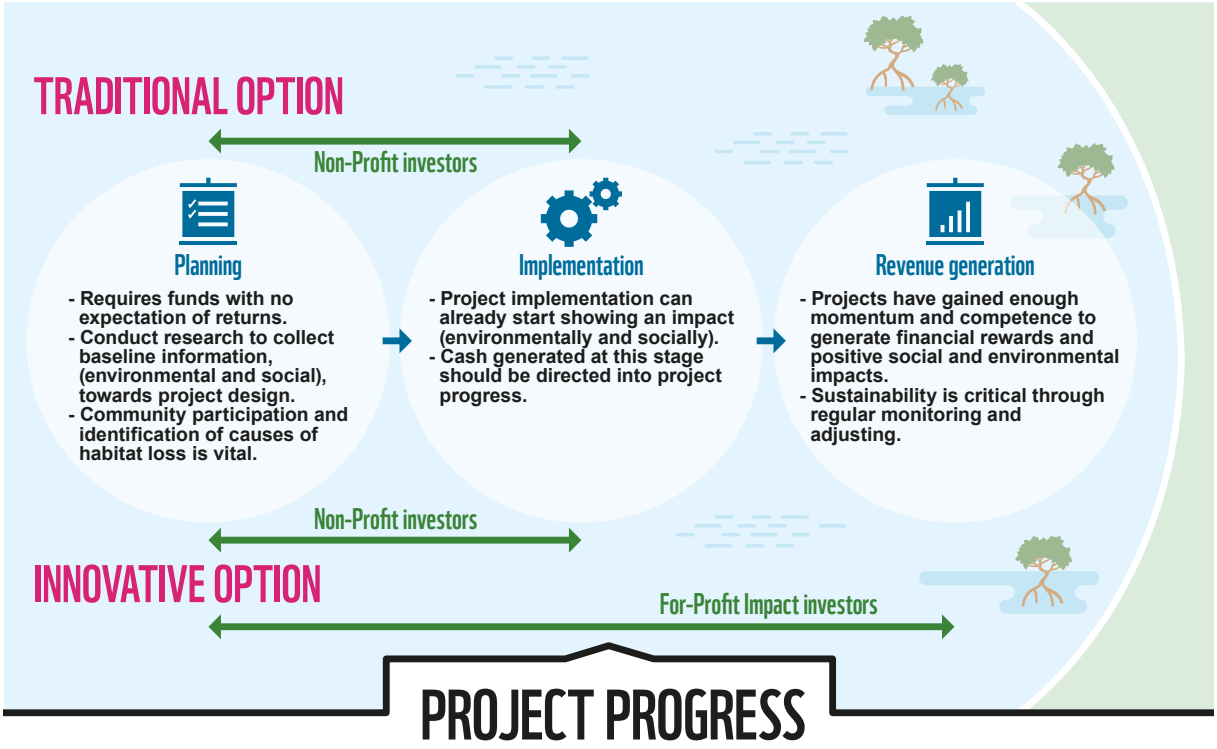

Figure 10. The traditional option describes the traditional method, which has been the most common so far; innovative option illustrates a method where stages of the project are organized within a public-private partnership

Funding provided by the non-profit sector in Figure 10 (Traditional Option) will remain a popular method and, in some cases, remain the only funding vehicle for managing a mangrove project. However, there are also typically intrinsic weaknesses in non-profit-only projects when considering the project results themselves and the needs of impact investors.

The long-term sustainability of the project after the end of a funding period can be jeopardized by a lack of:

- Standardization or identification of monetary and conservation benefits of conservation projects (see Box 1 in supplementary documentation) to sustain local communities

As highlighted in Chapter 4, incorporating evidence-based methodologies and best practice guidelines into the mangrove project selection process will help non-profit investments to have greater impacts and deliver improved performance. This would facilitate the second, Innovative Option presented in Figure 10, based on a public-private partnership like, but not limited to, blended finance. Here, non-profit investors cover the early-stage costs through grants to de-risk projects to a point at which they pass the risk threshold acceptable to for-profit partners. Impact investors would be able to follow these efforts to increase project size, increase profitability and strengthen governance structures.

Box 11. Development of investment models for conservation finance

The **Coalition for Private Investment in Conservation (CPIC)**, launched in 2016, works towards an increase in return-seeking investments by the private sector in conservation. The drivers behind this are a group of civil society organizations, private and public sector financial institutions and academia.

The CPIC is developing new investment models and funding pipelines that will help close the current conservation funding gap and contribute to the global goals for biodiversity conservation and sustainable development. CPIC has recently published a blueprint development guide to conservation investments aimed at guiding impact investors through the key criteria for running a successful conservation finance project (Stephenson *et al.*, 2018).

The coalition is currently focused on several priority investment sectors:

- Coastal resilience
- Forest landscape conservation and restoration
- Green infrastructure for watershed management
- Sustainable agriculture intensification
- Sustainable coastal fisheries

The **Blue Natural Capital Financing Facility (BNCFF)** was launched in 2017 to close a gap in the current market by helping make coastal (including mangroves) nature-based projects accessible to investor portfolios. BNCFF:

- Supports the preparation of bankable projects in natural coastal ecosystems
- Provides support to project developers to fine-tune their business model
- Helps build investment components supporting nature-based solutions
- Advises on good practice for the implementation of nature-based solutions
- Offers guidance for readiness to access sustainable financing
- Ensures a sound environmental and social vetting of project proposals
- Provides a robust, yet practical impact framework to visualize, value and monetize climate and sustainable development benefits

There are encouraging signs that this option is being seen as viable and its inherent flexibility is slowly gaining examples of proof of concept in some areas of conservation (see Box 11 and Primavera, 2005). The recently established Coalition for Private Investment in Conservation (CPIC)[13] and Blue Natural Capital Financing Facility (BNCFF)[14] are two such examples of public-private partnership platforms developing investment "blueprints" and project pipelines (see Box 12). Whichever option is taken and throughout the preferred process, the relevant mangrove experts should be engaged as a source of ecological-based advice. The IUCN's Mangrove Specialist Group[15] is already a viable and functioning group of experts who could conceivability become a source of this expertise. The CPIC and BNCFF are working to create blueprints or models that will help current projects in mangrove and other conservation scale up their efforts.

13 See http://cpicfinance.com/about.

14 See https://bluenaturalcapital.org/wp.

15 See https://www.zsl.org/iucn-ssc-mangrove-specialist-group.

6.2. Reducing investment, environmental and social risks of mangrove projects – Recognizing key requirements

Based on this report's case studies and the available literature, the following risks have been identified as hampering return on investment efforts in mangrove conservation projects:

1. Traditional mangrove projects are often incompatible with classic business models in that:
   - Mechanisms designed to generate cash flow and direct beneficiaries are difficult to identify (in cases where the aim of a project is to create a cash flow)
   - Mangrove investments are highly illiquid with few to no options for formal exit strategies available to investors

Box 12. Environmental and Social Management System (ESMS)

The ESMS is a systemic procedure against which all IUCN project proposals (and increasingly those from other organizations) are measured against to minimize potentially negative environmental or social impacts. If negative impacts are unavoidable, the system provides guidance on how to compensate for these. There are eight overarching principles and four standards that make up the system, which are specific to conservation projects and yet flexible enough for conservation activities.

All projects adhering to this standard conform to the following principles: taking a rights-based approach; protecting the needs of vulnerable groups; gender equality and women empowerment; stakeholder engagement; free, prior and informed consent; accountability; precautionary principle; and precedence of the most stringent standards.

The four standards which make up the bedrock of this system include:

1. *Indigenous peoples* – As some of the most marginalized and vulnerable people any project active in the area of these groups must avoid and if needed minimize any negative impacts, take their specific needs and rights into account and optimize opportunities for appropriate cultural and inclusive benefits.
2. *Biodiversity conservation and Sustainable Use of Natural Resources* – This standard follows the IUCN mission statement on protecting, maintaining and restoring biodiversity at all scales, and ensuring that its use is sustainable and equitable. The standard itself ensures that projects do not negatively impact biodiversity, natural resources or ecosystem services. Projects should approach their activities using an integrated ecosystem approach, incorporating the rights of the people and their dependence on the natural resources for livelihoods.
3. *Cultural heritage* – Given the importance of cultural heritage to human society and future generations, this standard refers to the continued access and conservation of that heritage in relation to its projects. Negative impacts here should be anticipated and minimized while allowing continued access to the site and any benefits arising from the cultural resource in an equitable way.
4. *Involuntary resettlement and access restrictions* – All projects fulfilling this standard must promote positive measures to humanize nature conservation activities. This means that where access restrictions or resettlement is unavoidable for the benefit of nature, negative impacts will be mitigated. Any activities potentially resulting in access restrictions or resettlement engage with the communities concerned during the planning process to support appropriate alternatives with benefits to the communities affected.

- Conservation projects are often too small to be attractive for international investors (at the lower end they might invest US$2 million (H. Koldewey, personal communication, July 2018)
- Opportunity costs (lost or forgone profits from other uses of the mangroves) are high (Thompson *et al.*, 2014)

2. A lack of tested models to tackle the known risks to impact investors regarding economic, social and environmental activities
3. Limited examples of investable projects and successful partnerships between the profit and non-profit sectors in the context of mangrove conservation
4. Lack of knowledge exchange about, for example, mangroves' role in healthy and sustainable fisheries, or shoreline protection and best practice in mangrove conservation
5. The inherent complexity and unpredictability of natural systems, which impose variability and uncertainty on business activities and revenues and the risk to investments from external and uncontrollable stresses (Friess *et al.*, 2015)
6. Past high rate of failure in mangrove conservation projects reducing confidence for future success from potential investors

Many of these risks can be addressed or reduced through a combination of already tested mechanisms in the social development sphere (OECD, 2015). Additionally, the use of industry-wide standards to anticipate risks and address them in the planning phase would be of great advantage.

Impact investments commonly use standards like the International Finance Corporation's performance standards and the Global Impact Investment Network's IRIS to measure and standardize social, environmental and financial measures. In the conservation community, standards like IUCN's ESMS guidelines (see Box 13) and WWF's Environmental and Social Safeguards have only recently gained in importance where previously, projects were designed at best according to the recognized best practices. These standards will continue to gain in importance and should be used in designing future mangrove projects.

Addressing investment risks by blending financing mechanisms through private-public partnerships

The recent development of innovative finance approaches has the potential to address many of these identified risks and improve the risk-return profiles of mangrove conservation. While some of these could be seen as a subsidy for the for-profit sector, it should, more importantly, also encourage the sector's engagement in conservation and contribute to closing the current financial gap in conservation needs. There are three main ways for this to be achieved:

1. Early-stage grant-making (done by non-profit actors to shield the for-profit investor from early risks)
2. Donor guarantees (e.g. for a government agency to guarantee 50% loss of coverage or coverage up to a certain amount)
3. Subordination of NGO and government investments relative to for-profit investments (e.g. junior, and equity)

Credit Suisse et al., in their 2016 report, has identified some additional strategies linked to reducing the impact of risks (see Figure 11).

This model, which has already shown signs of successful implementation in conservation projects so far (see Box 11), requires effective partnerships between the different sectors. While these projects have not focused on mangroves so far, they are a valuable example for future mangrove projects. As such, public-private partnerships have a promising potential to address the identified risks noted above (except risk 6) and given time, set the scene for future project successes to increase investor confidence (and address risk 6).

Risks directly related to high-opportunity costs and the natural market fluctuations also need to be addressed (Thompson *et al.*, 2014). The former are caused by a lack of standards and the currently underappreciated value of mangroves as a provider and regulator (Locatelli *et al.*, 2014). However, research is improving

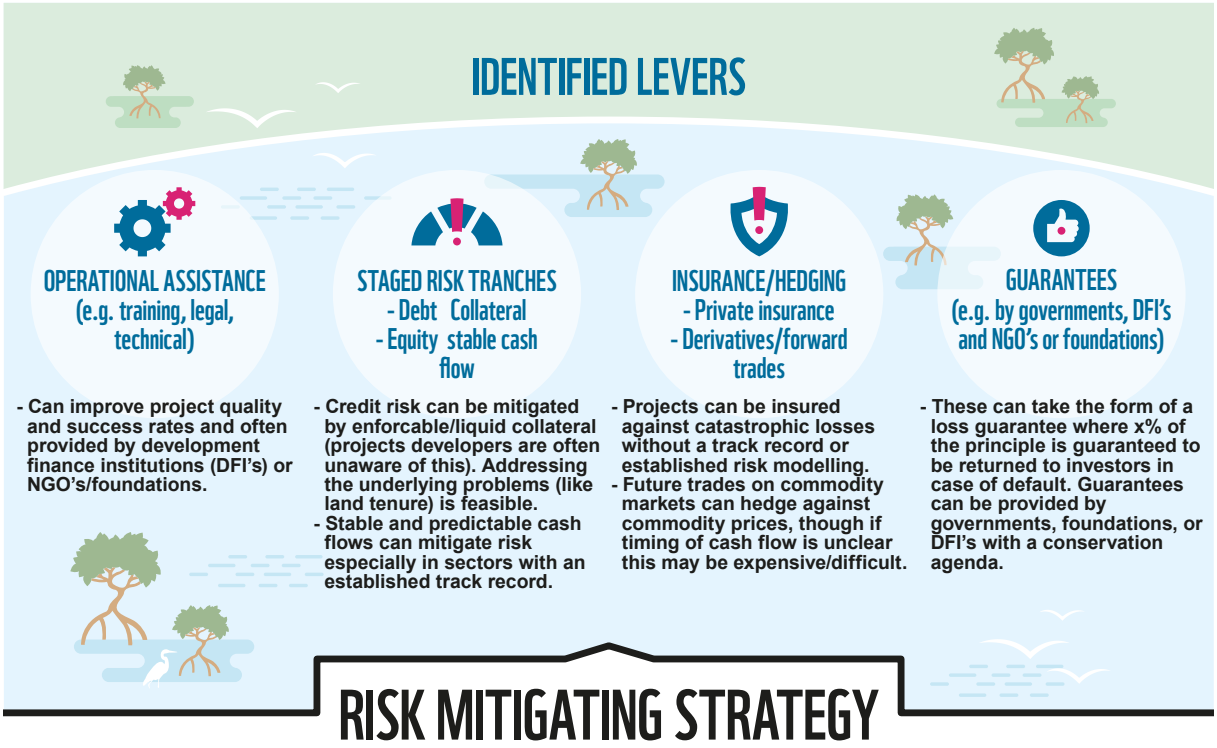

Figure 11. Risk-mitigating strategies and their levers identified by members of the for-profit sector as potentially available to conservation finance

and protocols are being developed to address this, for example, in the aquaculture sector (see MAMI case study in supplementary documents) (Thompson *et al.*, 2014).

The latter risks (market fluctuations of products derived from a mangrove project) are an expected vulnerability but manageable. Using the MAMI case study as an example again, shrimp sold to a consumer-driven market (German supermarkets) will be subject to the consumers' dining and ethical trends. However, this vulnerability should reduce in importance in the long term given the expected increase in conservation investments (see Chapters 5 and 6).

Increasing scale of projects and investments

Innovative models and strategies such as blended finance provide another opportunity to adapt, where appropriate, mangrove conservation to the business models of impact investors. One of these is through the bundling of multiple and diverse mangrove ecosystem services into investment funds (Credit Suisse *et al.*, 2014; Porras *et al.*, 2014). These bundles can be organized according to the thematic or geographical needs of the investor to increase the overall scale of investments, thus addressing risks one to three (incompatibility with classic business models and limited examples of investable projects and partnerships). This has the benefit of creating larger investment products, spreading out the cost of marketing and distribution of a grouped but diversified portfolio.

Another option to organize the bundles would be to create and invest in products through a familiar and established structure, for example, grants managed by MFF or BNCFF. Facilities like these could direct funds to projects linked to established markets like aquaculture, ecotourism and carbon. Either of the above options would help with generating cash flow to projects by providing interested investors with direction, thus overcoming to some degree the prospective illiquidity and uncertainty of mangrove investments. In addition, opportunities to scale up would be increased and the potential risk of a

single investment failing would be buffered by a portfolio of projects.

Environmental and social risks linked to key project requirements

As highlighted earlier, one of the major risks perceived by potential investors in mangrove projects, particularly impact investors, is the past high failure rate of many conservation and restoration projects across many ecosystem types (Credit Suisse *et al.*, 2014). As outlined in Chapter 4 and Annex 2, these risks have their origin in the planning phase as projects face challenges for not taking into consideration such essential elements as hydrology or socio-economic conditions. While this challenge is being increasingly recognized as an issue to address, the engagement of impact investors will add further impetus to taking the planning stage seriously.

For a project to have positive social and environmental impacts, it is clear that the underlying ecosystem function and ecology needs to be understood. This was one of the main success factors in the Mikoko Pamoja and Manambolo-Tsiribihina projects, which has allowed them to design their projects to remain adaptable to changes. Furthermore, if a system has failed, the reason for this should also be investigated and rectified to encourage natural regeneration. With climate change inevitable (e.g. sea level rise), mangrove distribution and range will be subject to many changes and must be allowed the opportunity to adapt naturally (moving inland if needed) (Locatelli *et al.*, 2014).

Projects would further reduce risks with stakeholder involvement in the decision-making process from the start of the planning phase to improve the long-term sustainability of the project. Additionally, greater emphasis should be placed on training, monitoring and transparency of projects and financial planning to incorporate future change where needed. Investors would be more confident in project managers with proof of relevant conservation and financial track records (Monty *et al.*, 2017). Increased transparency reduces the risk profile of an individual project or programme to an acceptable level according to the investors' risk appetite. The research found accessibility to basic information, such as complete financial reporting, to be a large and noticeable gap, preventing researchers and investors from assessing the effectiveness of projects with greater accuracy. A good example of the stringent certification needed to issue carbon credits is the Verified Carbon Standards (VCS).

A last risk factor influencing the effectiveness of projects of non-profit actors is linked to communication between three groups of key stakeholders. As indicated in Table 2, various guidelines have been developed integrating the ecological, hydrological and social elements necessary for success, yet this guidance is frequently unknown and infrequently followed (anonymous expert and Panorama, personal communication, 2016). This highlights a desperate need for greater dialogue between project managers and scientific experts, and these experts and investors, before any of the financing mechanisms described above can be implemented. Additionally, more dialogue is needed on how to increase the potential for financial returns in specific cases like mangrove conservation and other coastal ecosystems.

7

CONCLUSIONS

CHAPTER SUMMARY

Stopping mangrove loss and providing full protection to what remains is the most effective method for people to benefit from this ecosystem – socially, environmentally and economically. Building up technical capacity where it is underdeveloped and using established knowledge materials will make a noticeable contribution to mangrove conservation worldwide. To sustain mangrove management from a financial point of view, an increasingly promising option are emerging collaborations between non-profit and impact investors using approaches such as blended finance.

Investors and project managers will need to understand the underlying ecosystem functions and causes of mangrove failure before planning a project. Greater emphasis should be placed on training, record keeping, monitoring and transparency to ensure long-term environmental and social success as well as attractiveness to investors. Relevant stakeholders also need to be engaged in the decision-making process from the start of a project to improve chances of long-term success.

In terms of next steps, new finance mechanisms and approaches, alongside new partnerships have to be set up and strengthened, so to provide proof of concept. Global standards for mangrove conservation have to be improved, implemented and monitored in the field.

As explained in Box 6, the most cost-effective way to conserve mangroves is to put a stop to mangrove deforestation and preserve as much as possible of what remains. The next step is then to make current mangrove restoration efforts more effective and scalable.

For this to happen at the scale required:

- Traditional grant-financed projects should follow the recognized best practices whose project activities are summarized in Annex 2.

- Where financial returns are possible, public-private partnerships have great potential to add finance, scale and time to a project or programme; blended finance for mangrove conservation projects provides an example of an innovative framework around which such partnerships can be created.

Informing project developers and investors

There is a need to further encourage knowledge sharing of current best practices so that existing projects can improve on their effectiveness and success rates, including standards, monitoring and reduction of investment risks.

It is also important to start incorporating elements of public-private finance mechanisms into mangrove conservation projects. Potential investors and mangrove experts need to engage with each other more so that investors can get access to best practice in a manner that facilitates the funding of well-designed mangrove projects. The GMA, CPIC and BNCFF and initiatives such as SOMN! and MFF have a role to play here, acting as intermediaries between investors and developers and as platforms to build these relationships. Time and resources should be dedicated to collecting the basic data needed to evaluate impacts and effectiveness of investments. Information like this is essential for impact investors to assess the attractiveness of a project and alter project plans if needed from the investment point of view.

Focus will need to expand to include other coastal ecosystems and the interactions between them all. While mangroves are increasingly found to show a niche business case in terms of investment prospects, there is scope that other coastal habitats will eventually enter a similar state of attractiveness, if for other reasons. Eventually, the combination of investment and conservation of these complementary habitats will improve the effectiveness of mangrove conservation and the development of local livelihoods.

In all cases, technical capacity and science-based knowledge needs to be improved on, adopted and implemented so that current efforts are more effective and efficient. Project success has been proven to depend more on site selection and techniques applied and costs were lower with greater community input.

Lastly, more finance is needed for mangrove conservation globally to reverse current declines, protect and restore forests, and secure mangrove ecosystem services for coastal communities. This is a gap impact investors could very likely start helping to fill. While non-profits are generally limited to grant-making schemes from public funds, there will be competing demands on these funds and thus a limit to their reach for mangroves specifically.

The potential is there for a combination of public and private finance to fund mangrove conservation projects and build on each other's complementarities of abilities and goals. With the greater range of financing schemes available to impact investors, new partnerships between the non- and for-profit sectors would open up options for long-term, well-researched and effective projects.

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ANNEX 1. GUIDING QUESTIONS AND TOPICS IN CASE STUDY INTERVIEWS

Can you tell us about your project?

What challenges did you face?

How did the project change from inception compared to the plans at the start of the project?

What were the biggest contributing success factors?

What would you do differently if you could start now?

Were there any controversies linked to the project?

What were the driving motivations for the project – benefits to mangroves or the local communities or both?

(Authors asked specific questions originating from the available reading material)

How do you measure your success?

How has the standard of living changed for the local community?

What was the level of women engagement and was there an environmental education element to the project?

ANNEX 2. FACTORS LEADING TO SUCCESSES AND CHALLENGES IN MANGROVE CONSERVATION

MANGROVE CONSERVATION-RELATED ACTIVITIES	COMMON SUCCESS FACTORS
Research and design	
Collection of adequate baseline data and assessments. This should include considerations on projected climate change impacts	**Assessing proper baseline to monitor impacts** Well-conducted and collected baseline data allow for monitoring of success indicators during and at the end of the project. This will also help inform project managers and investors of the project's progress. Example: Before designing the Manambolo-Tsiribihina Land and Seascape project, WWF conducted a region-wide vulnerability assessment. This provided project managers the biodiversity characteristics of these specific mangroves, their use and value to the locals, and potential vulnerabilities or points of resilience. Much of the success of the project is due to the well-considered design, using data from these initial studies.
Engagement and understanding the local community and its potential to develop socially and financially	**Understanding community needs** Projects like Mikoko Pamoja would not be the success they are without an engaged and motivated community. To encourage both motivation and engagement, the needs of the community in question need to be assessed and addressed towards their eventual development for the direct benefit of community members. Example: In the case of Mikoko Pamoja, locals were mostly using the mangroves for fuel and to meet that basic need while preserving the mangroves, the project designers made the decision to set up a plantation of fast-growing trees as a fuel source replacement.
Management activities	
Project management and coordination	**Capitalizing on coordination and training** Effective coordination of multiple stakeholders in a given mangrove project or programme has provided long-term positive impacts for both mangroves and dependent communities. Implementing agencies and community organizers could also contribute to greater success rates if well-trained and equipped by the appropriate environmental specialists. Success factors in the Philippines noted that monitoring and field visits increased under guidance of better trained project managers (Primavera and Esteban 2008). Example: The New Buswang Mangrove Project was a noted success in the Philippines, partially due to the coordination between national and local government agencies, NGOs' livelihood options and legal instruments (Primavera and Esteban 2008).
Community engagement in decision-making and implementation; co-management set-up	**Quick returns** The support seems linked to a quick turnover of financial rewards that have a direct and positive impact on communities, along with the understanding that these rewards will continue for the duration of the project. Example: Mangroves and Markets (MAMI) farmers received premiums for their organic, certified produce as soon as they committed to increasing mangrove coverage.

COMMON CHALLENGES	COMMENTS
Project design Some of the successful carbon payment projects did not include soil carbon in their calculations, which means that when they are paid for carbon sequestration, the majority of the carbon actually stored is not taken into account. Example: Mikoko Pamoja does not take its soil carbon into account and since the majority of mangrove carbon is stored below ground, this could be considered a missed opportunity (Alongi 2012).	Long-term projects will have to take the projected landscape changes from climate change into account for their project design. Mangroves, growing on the boundary between land and sea, will and already are especially vulnerable to rising sea levels. Some references looking into this include Mcleod et al., 2006; Simard, F., Laffoley, 2016; and Chow, 2017.
Generating cash flow Since mangrove benefits are often hard to monetize, project managers tend to find generating cash flow (from impact or for-profit investors) at the start of a project a substantial challenge. Cash flow can be fostered by trails and boardwalks for ecotourism or solar panels for energy generation, but will often depend on regulatory requirements and industry certifications to show real economic value and premium pricing (Crooks et al. 2017).	Traditional activities and crafts, such as bee keeping, harvesting of medical resources and mud crab harvesting, can be taken into account when developing alternative or improving current livelihoods.
Management skills and knowledge Incomplete or lack of training of project managers and designers has resulted in poor choice of location and species selection for replanting projects. Uncoordinated efforts to conserve and restore mangroves can often result in competition between users and agencies and redundancy of conservation and social development efforts. Example: A review of Sri Lankan projects found that lack of coordination between implementation institutions of mangrove projects was a major factor in failed projects (Kodikara et al 2017).	
Lack of community involvement Lack of community involvement is one common factor for project failure. In some cases, locals were found to damage restoration sites (Bayraktarov *et al.*, 2016). This could be due to both lack ownership and/or frustration over feelings of disempowerment. Example: Local stakeholders, when involved in management, were often not adequately trained to maintain and build upon project successes. In Kodikara et al. 2017, post-care of planted mangroves was correlated to survival rate – one study shows that out of 23 projects, one in three showed survival over 50% due to incorrect planting methods and post care.	The MAMI project found a gap in hygiene education and has contributed to improved health in the farmers they work with. This is also of interest to impact investors and brings good will for the project from farmers, thus contributing to long-term success.

Management activities	
Community development (e.g. education, hospitals, etc.)	**Community development** Offsetting the transition costs for the communities by providing alternative timber sources, for example, provides community members with a better chance of seeing fast, positive results (The Blue Carbon Initiative, 2015). Example: MAMI provided additional training on farm waste management and co-financed the installation of 1,000 sanitary toilets (required for Naturland certification).
Management of hydrology (to facilitate natural regeneration)	**Facilitation of natural recovery** Research show that projects were successful and mangroves more resilient when natural recovery was facilitated (Wetlands International 2016; Bayraktarov et al. 2016 and personal communications). Example: Wetland International's Building with Nature project in Indonesia has built permeable barriers along the coast to trap sediment and provide shelter for mangrove seedlings originating from nearby mangroves to settle into naturally.
Restoration and/or replanting of mangrove forest and seedlings	**Natural regeneration over replanting** For investors interested in carbon credits and payments for ecosystem services, this is much more successful than mass planting. Example: For Mikoko Pamoja, replanting has been outpaced by natural regeneration in seedling recruitment effectiveness. Managers for the project found that replanting was much less effective than reducing forest degradation (Abdalla et al., 2015, 2017).
Sustainable use of mangrove area, including wood, food items, physical area, etc.	**Sustainably used mangroves** All case studies showed a move by local communities towards sustainable use of their mangrove resources to produce a success. Example: The implementation of conservation activities in Mikoko Pamoja had a measurable and positive impact. The reduced number of mangrove stumps shows that extractive pressures on the mangroves have reduced since the community was able to source their timber and fuel from the community woodlot.
Improvement of current and alternative livelihoods and diversification of income sources	**Income and livelihoods** Alternate sources of resources and income to mangrove-based livelihoods will take pressure off exploitation of mangroves and allow them to recover (Pimavera and Esteban, 2008). Example: Reports from MAMI showed that enrolled farmers increased their annual income by 20-26% through premiums for their organic shrimp (Brunner, 2016).

Lack of motivation Care must be maintained to ensure that any of these advantages are clearly linked of the health of mangroves rather than finding a situation where mangroves again become another resource freely available for the sake of development.	
Managing competing needs Managing upstream infrastructure to restore mangrove hydrology can be a complex undertaking since it can involve elaborate infrastructure like roads and dams; both of which once built take political will and effort to remove. **Managing projects risks** Investors are weary of the inherent risks attached to the unpredictable and complex nature of natural systems, introducing too many unknowns into business activities and potential revenue. Example: Hydrology can take some time to understand and in some cases could imply change in infrastructure (e.g. a road in the way of water flow) which authorities and investors might not be willing to engage in.	Several technical guidelines exist to help plan a well-designed and site-specific project; see box 7 for some examples.
Replanting over natural regeneration Studies (Bayraktarov et al., 2016, Kodikara et al. 2017) found that a major factor for project failure was due to the planting of mangroves in habitats unsuitable to their natural requirements. Example: An analysis of capital invested in mangroves in Sri Lanka following the 2004 tsunami revealed that nine out of 23 mangrove conservation sites – to the cost of US$13 million – resulted in complete failure due to mortality of planted seedlings (Kodikara et al. 2017).	Studies like this confirm that evidence-based assessments on the effectiveness of mangrove investments are sorely lacking and that non-profit investors must improve the planning and evaluation of mangrove projects. Note though, that in engineered environments like the aquaculture shrimp ponds of MAMI, analysis of satellite imagery after replanting shows that mangrove area in the project locality increased from 39% to 44% between 2013 and 2015 (Brunner, 2016). However, this imagery does not take increase of biodiversity into account.
Maintaining motivation Success here seems to be linked to an increase in short-term income or other success indicators. The challenge is to plan for some form of return benefiting local users to keep them motivated into the future of the project.	If it has not been forgotten, mangrove use in traditional knowledge might contribute to an increase in motivation to use mangroves sustainably. Anecdotes here indicate that medical uses were an important part of mangrove management. For example, in Thailand, locals would randomly collect and drop mangrove seeds during daily activities as a way to encourage natural dispersal and regrowth (personal communication). As an activity of interest to the three types of investors and to show impact, this would be one to focus a project around.
Finding the right fit Managers have struggled when attempting to replicate alternative sources of income in neighbouring communities (pers. comm. J. Enright). Example: Even when in close vicinity, the small differences in traditional culture between two villages in Thailand made the difference between success and failure (pers. comm.).	Research post-Asian tsunami shows that communities around mangroves want to improve income from current livelihoods rather than adopt alternative livelihoods (Danielsen et al., 2005). In a survey by Tim Daw of a range of people in the Kenyan and Madagascan greater region, the biggest reason for dissatisfaction was the lack of money. With the potential to alleviate this dissatisfaction, mangrove projects have a role in encouraging a willingness to pay for ecosystem services from the point of view of communities.

Management activities	
Site protection and enforcement of objectives	**Protecting the investment** Enforcement of the project objectives (i.e. sustainable resource use) is highly important to ensure the community reaps the benefit of their management strategies rather than a rival community. This includes regular maintenance of the site (Primavera and Esteban 2008).. Example: In the case of Mikoko Pamoja, enforcement of the management plan is under the control of community patrols, which have generally been successful. Illegal harvesting of mangroves by community members has been reduced.
Project monitoring and reporting	**Transparency** Investors would be attracted by transparent reporting and independent evaluation as well as appreciative of the good public relations, resulting from this transparent and rigorous reporting. Example: Mikoko Pamoja's transparency in its reporting and its accessibility to researchers and policy-makers have brought this small project into the global focus. The project's technical steering committee is made up of local scientists. Both Mikoko Pamoja and MAMI have been using satellite images as one method to monitor changes and progress over the course of the projects.

External forces Migrant fishers and users may cause difficulties here if the protective measures of a project are not strong. Example: In Mikoko Pamoja, for example, there are only two villagers patrolling the mangroves which, as word of the success grows, will not be enough.	
Training and capacity building Lack of appropriate training and capacity building for locals has also been a factor identified as resulting in project failure (Kodikara *et al.*, 2017). Locals are needed to continue monitoring and implementation after the end of projects. From the point of view of investors, this has been a failing of the conservation sector and one preventing investors from showing greater interest (Credit Suisse, WWF and McKinsey&Company, 2014).	Linked to protection and enforcement, monitoring and reporting, high standards here increase the attractiveness of a project to knowledgeable investors since there is transparency. Additionally, regular monitoring and evaluation of a project will indicate the need to adjust the project plan throughout its lifespan and beyond if locals are well trained.

SUPPLEMENTARY DOCUMENTATION. CASE STUDIES OF MANGROVE PROJECTS FROM KENYA, MADAGASCAR AND VIET NAM

Supporting documentation to *Increasing success and effectiveness of mangrove conservation investments: A guide for project developers, donors and investors*

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INTRODUCTION TO COST-BENEFIT AND COST-EFFECTIVENESS

So many of the benefits to people and wildlife from healthy mangrove ecosystems are of a non-monetary nature and are difficult to ascribe a monetary value to (Shwiff *et al.*, 2013). Thus, due to the lack of available data and mangrove specific methodology, we chose to examine the following case studies using a *qualitative* cost-benefit analysis (CBA) approach (Baltic Sea Challenge, no date).

Ideally, a *quantitative* CBA is of greater interest when evaluating the effectiveness of a project, since it is more easily comparable and subjective. Both investors and project developers would find this of benefit. However, given the many variables and unpredictability of working around mangroves, there are some intrinsic limitations to a quantitative approach to be aware of (Tosihiro, 2003).

Information and project designs wishing to consider important questions that would allow an analyst to conduct a more thorough analysis can be found in Box 1 of this document.

Challenges

The standard quantitative CBA process (see Box 1) that aggregates costs and benefits face at least four challenges that make it difficult to fully account for environmental projects such as restoring or preserving mangroves:

1. Many direct or indirect environmental and social benefits often cannot be easily monetized. Because most such benefits are not easily monetized, they may not be included in a standard CBA and this could lead to an undervaluation of benefits vis-à-vis costs.

2. Many benefits may continue to be delivered beyond the life of the actual mangrove project, such as ongoing sustainable landscape management. Even if such benefits could be monetized, the values generated in the future will be discounted significantly by any rate of interest chosen for an aggregate economic assessment. In present value terms, these benefits will then be relatively undervalued compared to more immediate costs of the project. Once again, this would result in benefits being undervalued when compared to costs.

3. The likelihood of a natural or human-induced disaster occurring is, of course, uncertain, as is the timing of its occurrence. With both the likelihood and the timing of disaster damaging or ruining the mangrove project being uncertain, it makes it difficult to determine whether or not to undertake the project.

4. Particularly important for community-based mangrove projects, the standard CBA process does not account for distributional aspects (Loomis, 2010). The CBA makes an aggregate assessment; for example, if aggregate benefits exceed aggregate costs, then the project should be undertaken. Various direct and indirect benefits, however, may relate to specific environmental and socio-economic issues and the distributional impacts of such benefits cannot be assessed with the CBA process.

Qualitative cost-benefit analysis

For many ecosystem conservation projects, it may be useful to adopt a more qualitative approach to CBA. A qualitative CBA starts with a complete listing of costs and benefits. Then, rather than attempting to monetize all of these costs and benefits and to discount more distant flows of benefits or discount for disaster risk, the various costs and benefits can be ranked or prioritized. This approach can help project

managers recognize the range of costs and benefits, the relative importance of these for the project and the distribution impacts on key stakeholder groups.

In the case studies prepared for this report, a qualitative CBA approach was adopted. Where financial data was available it has been presented. However, the overall analysis is on the types of costs, the types of benefits and their implications with respect to livelihoods of local communities, and the likelihood that the mangrove projects will be sustainable

Cost-effectiveness analysis

Ideally, for projects such as mangrove restoration or preservation (and where data are available), it may be more useful to undertake a cost-effectiveness analysis (CEA) rather than a CBA (qualitative or otherwise) (Hummel-Rossi and Ashdown, 2002). For a given set of benefits, a CEA compares the relative costs of at least two alternative ways to deliver these benefits. For example, this could be a comparison of the costs of replanting mangroves to the costs of rewetting a mangrove ecosystem.

In theory, a CEA is especially useful when it is not possible to easily monetize the environmental and social costs of a project. In such cases, the actual net value or profitability of a project may not be calculated, but at least the most cost-effective method for delivering the benefits can be identified. Also, as a CEA would start with a listing of costs, these could be ranked or prioritized to enable a better understanding of the distributional impacts of these costs.

There is rarely the opportunity or funds for project managers to conduct research of this kind; let alone do the large amount of baseline research ideally needed for mangrove projects. In the case studies prepared for this report, there was insufficient information on alternative methods to implement the projects to undertake a proper CEA. Nevertheless, the qualitative assessment of costs presented in the case studies provides some insights into the type of cost issues that would need to be considered in undertaking a CEA (see Box 1).

Box 1. Cost-benefit analysis guidance

Cost-benefit analysis (CBA) is a way to determine the economic value of a project (OECD, 2018). To undertake such an analysis, one needs to follow a step-by-step procedure such as the one outlined here. Undertaking such an analysis before a project begins will help to clarify the likely net benefits from the project outcomes. It will also help to identify areas where the project design could be improved or where a more detailed assessment of the project's benefits and costs are needed to support a decision on whether the project should be funded and implemented. Guiding references on how to complete these steps can be found at the end of the box.

Step 1 – Specify the desired outcome(s)

Outcomes need to be clear. For example, is the outcome to protect or restore X hectares of mangroves, sustainably use Y hectares, or a combination of these? Is the outcome the improvement of local livelihoods? Does the project aim for both conservation and development outcomes and if so, how are these outcomes linked?

To achieve a specific outcome or outcomes requires developing a strategic project with a specific set of actions.

Step 2 – Compare business-as-usual to the project

What will happen in the business-as-usual scenario, i.e. if the project does not take place? This is the baseline situation. What outcome(s) are likely – e.g. in terms of conservation or development – if no new actions are undertaken and how does business-as-usual compare to the proposed alternative set of actions? Will the costs of the actions be justified by the benefits of the outcome(s) delivered?

Step 3 – Identify costs and benefits

Once the business-as-usual and an alternative project have been specified, the costs and benefits of the project vis-à-vis business-as-usual need to be identified.

Costs need to be identified for each action that will be undertaken to achieve the outcome(s). For example, a mangrove restoration project may require labour for planning, stakeholder consultation, legal advice and permitting, planting new mangroves, or rehydrating the area. It may require materials and equipment such as plants, soil, pumps, electricity, petrol vehicles, computers, fencing, work clothes, housing and food. It may even require the purchase of the land. For other actions, like certifying mangrove carbon for sale or establishing a regime for sustainably harvesting mangrove resources, there will be other specific costs that will need to be identified.

For the outcome(s) envisioned, the various benefits also need to be identified. For example, for a mangrove restoration project, the benefits could include increased sustainable harvesting of wild species from the mangroves – fish, crustaceans, shrimp, crabs, timber and so on. Other benefits could include waste management, coastline protection, or carbon sequestration. If there are other outcomes such as community development outcomes, then the associated benefits from these outcomes will also need to be identified.

Step 4 – Quantify the costs and benefits

For each of the identified costs and benefits for the project, monetary values need to be calculated and quantified in common currency, e.g. the local currency and/or the currency of the main investor or donor. To enable a comparison, the present values of the various costs and benefits need to be calculated through the use of a discount rate that is acceptable to the stakeholders, notably to the investors or the donors.

Where market prices exist, these can be used to value various costs and benefits. However, where market prices do not exist, such as the existence value of a protected mangrove or its disaster risk reduction value, then these will need to be estimated using valuation techniques such as willingness-to-pay surveys or hedonic pricing modelling.

Step 5 – Identify qualitative cost and benefits and distributional impacts

In many cases, quantification of a cost or a benefit may not be possible or even appropriate. For example, if one of the desired outcomes is a decrease in mortality rates through improved hygiene, it is most likely not at all appropriate to put an economic value on the lives saved. Or it may be very difficult to estimate certain values such as the economic value of enhancing the ecological resilience of a mangrove ecosystem. Impacts that cannot be quantified should be identified and assessed qualitatively.

Also, the distribution of costs and benefits, particularly to local stakeholders and with respect to how these impact on the desired outcomes, needs to be identified. For example, will funding from a mangrove carbon credit for a community water pump incentivize the community to protect the mangroves? Or will the financing of an alternative wood lot to avoid mangrove deforestation generate additional environmental costs such as the degradation of another habitat which need to be considered?

Stakeholders, including investors and donors, will most likely be interested in key costs and benefits which cannot be quantified and in the distribution of these costs and benefits. This information should be presented alongside the quantified costs and benefits to make a final assessment of the project or the alternatives.

Step 6 – Assess net benefits

The aim of a CBA is to estimate the net economic impact of a project vis-à-vis business-as-usual. This is done by comparing the present value of the costs to the present value of the benefits in order to determine the net present value (NPV) of the project. If the NPV is positive, then the project makes economic sense in terms of quantified costs and benefits.

The role of a CBA is to provide quantitative information which will enable a more informed decision. The CBA on its own, however, cannot determine whether a project should proceed. The non-quantified costs and benefits as well as the distributional impacts of all costs and benefits also need to be considered in making a final decision on whether the overall benefits of the project outweigh the costs. In the final analysis, a qualitative judgment on outcomes, costs, benefits and distribution impacts is needed to determine whether a project should be implemented, or should continue with business as usual.

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1. KENYA: MIKOKO PAMOJA

Location	Gazi Bay, South Coast, Kenya
Size	117 hectares and 498 households
Budget	US$400,000
Start date	2012
Time frame	20-year contract with Plan Vivo
Funding strategy	Baseline research with paying volunteers – Earthwatch, UK Voluntary Carbon Credits – Plan Vivo, UK
Distinctive feature	Participatory research tourism followed by REDD+-like carbon credits to incentivize community-based conservation
Major limitation	Significant grant financing needed to establish a carbon credit scheme which provides a mangrove-friendly cash flow to the local community

1.1. The project

"*Mikoko Pamoja is a community-led mangrove conservation and restoration project in Gazi Bay, Kenya. It involves community-based policing of illegal mangrove harvesting, as well as the application of local expertise in mangrove planting*" (Plan Vivo, 2017).

Mikoko Pamoja is featured here because it is accredited under the Plan Vivo Standard and is supplying Plan Vivo Certificates (PVCs) to offset carbon emissions. This is a key benefit of the project and one that is generating revenue. The project is also featured on the Earthwatch Institute website because it has a participatory research tourism component, which generates revenue and contributes to scientific research.

Mikoko Pamoja, Swahili for "*mangroves together*", is likely the first community carbon project in the world to conserve mangroves through the sale of carbon credits. The aim of the project is to provide long-term incentives for mangrove protection and restoration through community involvement and benefit. The project conserves 117 hectares of mangroves and plants an additional 0.4 hectares annually. Mikoko Pamoja is accredited by Plan Vivo systems and standards to sell 3000tCO_2 per annum for the next 20 years starting from 2013 (Plan Vivo, 2017).

In June 2017, the project was announced as a winner of the UNDP Equator Prize and awarded a US$10,000 cash prize at the UN General Assembly in New York in September 2017. The press release reads: "*Mikoko Pamoja's global recognition as one of the Equator Prize winners is attributed to unprecedented willingness and support from the Gazi Bay community and project partners towards promoting mangrove ecosystem services.*"

The initiative is a culmination of long-term mangrove research spearheaded by the Kenya Marine and Fisheries Research Institute (KMFRI) together with Bangor University and Edinburgh Napier University in the UK, Earthwatch Institute, the Kenya Forest Service (KFS) and the World Wide Fund for Nature (WWF). Mikoko Pamoja hopes to capitalize on this unique recognition to advance and promote mangrove payments for ecosystem services (PES) across the world.[1]

The project has had, and continues to have, a number of activities which enhance the

1 See: https://drive.google.com/file/d/0B-hFNoGnaJHEMzE2enVTdThqRlE/view

conservation status of the mangroves. As discussed below, these activities have associated costs and benefits.

mangrove conservation (Lewis III, 2001). As this is a community-driven project, costs relating to mangrove conservation and to the community support are often intertwined.

Box 2. A quick introduction to the carbon market

The carbon market has made "bad" – i.e. greenhouse gas emissions – into a tradable "good". Greenhouse gases are traded in sequestered carbon-equivalent tons, i.e. gases not released into the atmosphere.

Sequestered carbon can either be produced (e.g. through planting mangrove forests) or preserved (e.g. by not degrading or cutting down existing mangrove forests) (Beresnev and Broadhead, 2016). In the case of Mikoko Pamoja, it is mostly the latter – sequestered carbon by reducing mangrove degradation and deforestation.

There is both a compliance carbon market and a voluntary carbon market (Markit, 2009). In both markets, the suppliers offer tons of sequestered carbon for sale. What can be sold, however, may vary between various markets. For example, the compliance market in Europe has its own rules regarding forest-based carbon (Climate Focus, 2008).

In the compliance carbon market, the buyers are mandated by government, such as heavy industries in the European market, to buy carbon credits to offset their emissions. In the voluntary carbon market, on the other hand, anyone – companies, NGOs, churches, universities, families, etc. – who would like to reduce greenhouse gas emissions can purchase carbon credits. To make these credits attractive to voluntary buyers, the carbon credit is often linked with other social and environmental amenities. The Plan Vivo credits for Mikoko Pamoja, for example, support mangrove conservation and local livelihoods.

For most mangrove conservation projects, it is probably more practical to look for opportunities to sell carbon in voluntary markets that are interested in associated conservation or development outcomes. These markets include the following schemes:

- Plan Vivo Foundation
- Verra Climate, Community and Biodiversity Program
- Gold Standard Foundation

In the case of Mikoko Pamoja, the carbon was sold through the Plan Vivo Foundation, which certifies carbon projects that "truly benefit people's livelihoods and sustain vital ecosystems" (planvivo.org, 2018). Other schemes, however, may be more appropriate for other projects and thus project developers should explore various options to see which are most relevant to their circumstances and which can deliver an acceptable price for their carbon vis-à-vis the costs of certifying and maintaining the carbon stocks

1.2 Costs

Identifying the costs of the Mikoko Pamoja mangrove project requires an understanding of which activities directly or indirectly contribute to the protection and restoration of the mangroves and which activities are tangential to

Activities

A number of activities have been implemented by the core project partners, including the:

- Mikoko Pamoja Community Organization (MPCO)

- Earthwatch Institute
- Association for Coastal Ecosystem Services (ACES)
- Mikoko Pamoja Steering Group (MPSG)

Some of the main activities, and an indication of their relevance to mangrove conservation, are presented in the following table:

the desire to secure PVCs for the carbon stored or sequestered, which provides a source of funding over time for the project.

Other activities, such as mangrove research or community support, are indirectly or tangentially related to the project and, as such, may not be considered as direct costs of mangrove

Project activities	Relevance to mangrove conservation
MPCO – Establishment of a mangrove nursery	Direct
MPCO – Planting	Direct
MPCO – Formal education	Indirect
MPCO – Informal education	Tangential
MPCO – Use of the carbon funds	Tangential
Earthwatch – Tree planting as part of experimental studies and/or for general conservation and restoration purposes	Indirect
Earthwatch – Monitoring to measure how the trees are growing and surviving, and how the restored habitat patches are developing	Indirect
Earthwatch – Experiments including measuring the amounts of carbon deposited below ground by different species of trees	Indirect
Earthwatch – Work related to social development and community involvement	Tangential
ACES – Educational and fundraising activities	Indirect
ACES – Sale of Plan Vivo Credits	Direct
ACES – Reporting to Plan Vivo Foundation	Indirect
MPSG – Mapping and marking of perimeters of agreed protected areas	Direct
MPSG – Preparation of planting area	Direct
MPSG – Establish and manage a 3,000 Casuarina tree woodlot as mitigation against leakage	Indirect
MPSG – Technical advice	Direct
MPSG – Weekly perimeter patrols and policing	Direct
MPSG – Monthly monitoring reporting	Direct
MPSG – Annual indicator monitoring	Direct

As the main focus of the project has been to protect existing mangroves, the costs directly associated with protection activities are the core/direct costs of the project. Closely related, however, are the costs of restoring a small area of mangroves within the project area. The focus on protection and restoration are closely linked to conservation. To the extent, however, that such activities are critical to ensuring that the long-term conservation of the mangroves and to determining the technical information required to achieve accreditation for the sale of mangrove carbon credits, they may be considered as relevant to a calculation of overall project costs.

For example, community support provides tangible economic benefits from the project, which encourages community members not to degrade the mangrove ecosystem (Fennell, 2014).

Various costs

With such a variety of project-related activities being implemented by a number of different actors over several years, it is not possible to fully quantify project costs. Nevertheless, through available reports and consultations, it is possible to provide some indication of the costs involved with this project.

Through personal communication with a project manager, we can report the following project development costs:

Project development expenses	Notes	Costs (US$)
Plan Vivo Validation visit and report	Plan Vivo fee	5,676
Crucial research for project establishment	PhD students	129,000
Plan Vivo registration and fees		1,935
Technical specifications for registration	In-kind expert advice	2,838
Technical specifications for registration	Earthwatch research	77,400
Community coordinator		3,225
Production of project design document	In-kind expert advice	3,870
Capacity-building grant	From CESEA ESPA	154,800
Materials		774
Markit website listing		258
Casual labour	Nurseries, etc.	774
Launch and initial monitoring	KMFRI staff	645
Help with registration process	Consultant	258
Total development costs		**381,453**

The development costs include costs for direct, indirect and tangential activities. For example, the Earthwatch-related costs provide baseline and monitoring information to support mangrove conservation, but they also include the costs of the research tourism programme, which is tangential to the actual conservation of mangroves.

The costs associated with Plan Vivo certification (e.g. production of the project design document and the Markit website listing) may be considered direct or indirect (Merger and Williams, 2008). If the revenues from the carbon credits are used for mangrove conservation, then they are direct costs. Alternatively, if they are used for community development projects, they might be better classified as indirect costs.

Once the project has been designed and implemented, there may well be on-going operational activities with associated operational costs. In this case, these have been reported in the annual Plan Vivo reports, which provide the following costs over a three-year period:

		2013-14	2014-15	2015-16
Project operations expenses	**Notes**	**Costs (US$)**	**Costs (US$)**	**Costs (US$)**
Community development projects	Various projects	3,436	4,270	3,977
Labour	Planting and monitoring	3,161	3,603	2,100
Project workers salary		2,627	2,139	2,095
Committee and office		518	675	1,794
Total operations costs		9,742	10,687	9,966

The operations costs include both the direct costs of planting and monitoring and indirect community project costs. Associated costs of staff, office and committee could be allocated partly to direct and partly to indirect costs. The Association for Coastal Ecosystem Services (ACES) is a charity registered in Scotland that is responsible for marketing the carbon credits and administering the annual and five-year accounting of Mikoko Pamoja. All charity trustees are volunteers so the associated labour costs are met for free.

1.3 Benefits

A project such as Mikoko Pamoja generates an array of environmental, economic and social benefits to multiple stakeholders including the local community, academic community, and national and international policy-makers. Some of these benefits, but not all, may also generate revenues which can used to cover projects costs.

Various benefits

Using an ecosystem services framework (Turner and Daily, 2008), the various benefits generated from the project can be grouped as follows:

Supporting services

- Earthwatch research – Research on three tree species growing in mixed and monospecific stands; experimental test of intercropping in mangroves examining the effects of mixing species on the soil and fauna, including crabs and fish, present in the stands
- Area-based conservation – Protection benefiting resident mangrove fauna and flora and allowing natural successional processes to occur
- Area-based conservation – Restoration benefiting all the resident mangrove fauna and flora and rehabilitating an eroding beach to a forested area

Provisioning services

- Earthmind support – Help to sustain the supply of mangrove goods and services by involving the local community in the replanting campaign
- Community – Some project employment opportunities
- Community – Probable increase in fish catches, though not documented
- Community – Casuarina woodlots providing fuelwood, timber and income

Regulating services

- Earthwatch research – Collecting data on all aspects of the carbon cycle in mangrove forests, with the aim of demonstrating the potential importance of mangroves as carbon sinks
- Earthmind support – Pioneering the use of carbon credits as a new way to fund mangrove conservation and social development in the area
- Plan Vivo – Changes in above-ground and below-ground carbon stocks

Cultural services

- Earthwatch research – PhD student research which provided the science that underpinned the project
- Earthwatch research – Production of peer-reviewed scientific publications
- Earthwatch research – Tourism
- Communities – Funding for various community projects
- Communities – Capacity building and training, including enhanced community-based governance and management
- National – Data used by the Kenyan Ministry of Forestry and Wildlife to inform the national REDD+ plan
- International – Used by UNEP Blue Carbon group as an international best practice case
- International – Equator Initiative prize raises awareness of the project, enabling a dissemination of lessons learned

This list of benefits arising from the project includes benefits directly resulting from the protection and restoration of the mangroves. These notably include the supporting services related to enhancing the habitat for wildlife, provisioning services related to the use of mangrove species for fuel and food, regulating services with a clear emphasis on mitigating climate change through carbon storage and sequestration, and cultural services related to mangrove research tourism.

The list of benefits also includes several indirect or tangential benefits such as fuelwood from the project's Casuarina woodlot, the academic research and the sharing of lessons learned internationally. Most importantly, these indirect benefits include an array of projects for the community financed by revenues from the carbon credits.

Various revenues

The project secured donor funding and now also generates funding from the provision of carbon credits and perhaps also from tourism services and the sale of various project-related products such as fuelwood and fish. The documented information on these revenues includes the following information:

		Before 2013	2013-14	2014-15	2015-16	2017
Project revenues	**Notes**	**Revenue (US$)**	**Revenue (US$)**	**Revenue (US$)**	**Revenue (US$)**	**Revenue (US$)**
PVC sales net income to community	Net issuance fees		11,984	12,510	14,833	13,401
Capacity-building grant	From CESEA ESPA	154,800				
Crucial research for report	PhD students	129,000				
Technical specifications for registration	Earthwatch research	77,400				
Equator Initiative prize						10,000

The sale of PVCs provides a transparent and accountable stream of revenues. The revenues from the sale of other project-related goods and services (e.g. fish, fuelwood and ecotourism) are not documented.

In addition, the project secured donor income as well as tourism-related income from the Earthwatch research project. The revenue amounts provided in the above table are actually the same as those provided in the costs table in the previous section. This is because the numbers provided for donor project costs also reflect the amount of donor revenues generated to cover these costs. Further analysis of how these funds were actually used could be useful to understand the levels of support for mangrove conservation vis-à-vis community support and other non-direct benefits.

Further, regarding the relationship between these revenues and the main objective of mangrove restoration, most of these revenues are either directly related or, in the case of community support, indirectly related. Hence, there appears to be a direct and positive link between the flow of income to the project and the improved conservation status of the mangroves.

1.4 Analysis and lessons learned

The Mikoko Pamoja project demonstrates that investing in a mangrove project can deliver a complex array of benefits, some of which may generate revenues, to cover an equally complex array of costs (Emerton, 2014).

Given the little information available on benefits and costs, and indeed even with a further quantification of the benefits and costs, it would be very difficult to undertake a thorough cost-benefit analysis to determine in financial terms whether the project is generating a net positive return. One possibility could be to single out the benefits and costs directly related to mangrove conservation and compare these, but then the other important aims and ambitions of the project would be missed, particularly those related to community support.

The project is an excellent example of how a mangrove conservation project can include a number of activities and aims, including direct protection and restoration, scientific experimentation and research, capacity building and learning, community empowerment and support, and the sale of mangrove-related goods and services, notably carbon credits. It is also

a good example of how a project can combine donor and other sources of funding for a project development phase with revenues generated from the sales of carbon credits and other products for the operations phase. Importantly, however, the use of the revenues generated has often been for community activities, which are not directly related to maintaining the mangrove asset that is generating the revenues. Hence, the mangroves are acting essentially as a payment for community support and, in such circumstances, it will be important to ensure that sufficient payments are made available for direct conservation activities to maintain the mangroves.

In this regard, it could be useful to undertake a cost-effectiveness assessment to determine whether the funds used were used effectively and efficiently to deliver the desired outcomes. This project also demonstrates that this is not terribly easy to do. For example, the scientific outputs of the Earthwatch field research were seen as critical to project development, but the costs of a participatory research tourism approach to field research also involves a mix of awareness raising, hands-on contributions and ecotourism benefits for the participating Earthwatch volunteers. Thus, all of the Earthwatch costs are directly related to actual research needed. There may well have been other more cost effective, but less participatory ways to have undertaken this research.

Donor funding for the project has emphasized community elements which were not directly related to mangrove conservation, but may be providing needed incentives to reduce the level of mangrove degradation over time. Without a community component, it probably would not have been possible to raise donor funds. Most donor funding prioritizes poverty alleviation rather than biodiversity conservation. Again, it is not so easy to ascertain whether the significant community component in the project has been cost effective in terms of what is actually needed to be done to protect and restore the mangroves. Without community buy-in, however, it is unlikely that mangroves would have been conserved.

Finally, even the decision to secure longer-term funding through the sale of PVC credits may in itself have unintended impacts on the integrity of the mangrove conservation efforts. A focus on managing the habitat for delivering a tangible and financially lucrative service such as carbon storage possibly could result in less attention to other critical biodiversity values or mangrove ecosystem services such as the protection of other wild species of fauna and flora and the mitigation of disaster risk. However, without the PVC credits, the mangrove forest would most likely have continued to degrade.

In the future, the project may want to look into quantifying the total revenues now being generated from mangrove conservation, including revenues from the sales of fish, firewood, carbon credits and ecotourism services. At the same time, it could look more carefully at what activities actually need to be undertaken, including patrols and monitoring, to protect the mangrove ecosystem and what these activities actually cost then, and most importantly, in consultation with communities, a decision could be made as to what percentage of what flows of revenues should be allocated to finance the conservation of mangroves, i.e. to protect the community's natural capital.

Key lessons learned from this case study include the need to look more systematically at the flow of revenues and costs across the project lifecycle, to have the flexibility to look for new sources of revenues such as the possibility of soil carbon credits, and to look carefully at whether the revenue streams will encourage the maintenance of diverse and resilient mangrove ecosystems. For Mikoko Pamoja, the upfront grant financed work – notably the Earthwatch field research – provides a solid foundation for putting in place a stream of revenue from the mangrove carbon credits which incentives the local community to conserve the mangroves. However, this cash flow may not on its own provide the necessary incentives to continue to conserve the mangroves for years to come.

The long-run sustainability of this project depends on the continued alignment of the community benefits arising out of the carbon credits as these credits are based on the ongoing conservation of the mangroves (Albert *et al.*, 2012). If the perceived cost of conservation –

e.g. the opportunity cost of not utilizing the mangrove timber – becomes greater than the perceived benefit of the carbon credits to the local community, then the mangroves will be at risk. Thus, it is probably wise for the community to identify other forms of mangrove-friendly incomes such as sustainable harvesting of mangrove resources and ecotourism.

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2. MADAGASCAR: MANAMBOLO-TSIRIBIHINA

Location	Manambolo-Tsiribihina, Central West, Madagascar
Size	133,544 hectares, of which only some are forested; 9,349 people impacted
Budget	US$400,000
Start date	2010
Time frame	8 years over two phases, one of which is at an end and under review below
Funding strategy	Project grant – Helmsley Charitable Trust, USA Alternative sources of income
Distinctive feature	Development of community-based mangrove-friendly enterprises including aquaculture
Major limitation	Lack of well-articulated revenue streams based on mangrove-friendly activities to incentivize community-based conservation

2.1. The project

WWF describes the Manambolo-Tsiribihina Land and Seascape as the largest, most intact stretches of mangroves in western Madagascar (WWF, 2016). WWF has been working in the area since 2010 with the vision that by 2020, the ecological functions of the landscape are preserved to ensure their integrity and contribution to the economic and social welfare of local communities.

The aim of the project is to preserve the ecological function of the landscape to ensure its integrity and contribution to the economic and social welfare of local communities by addressing the underlying causes of mangrove loss and degradation. The main driver of mangrove loss in this area is conversion of mangrove to rice fields due to limited availability of arable land and livelihood opportunities, informal systems of land tenure and a lack of governance. Climate change also threatens mangrove resources and is likely to affect the productivity and conservation values (IUCN and Blue Ventures, 2016).

The project will continue until at least 2020.

2.2. Costs

Before the project began in 2009-2010, WWF financed a regional vulnerability assessment to:

- Gain an understanding of the historic and existing biodiversity characteristics of mangroves
- Gain an understanding of the value of and dependency of local people on mangroves
- Assess the vulnerability and potential resiliency of the Manambolo and Tsiribihina mangroves

This assessment compiled scientific knowledge on mangroves in Madagascar, gathered biological and ecological data on Manambolo and Tsiribihina mangroves, and undertook socio-economic surveys on the dependency of local people on mangrove ecosystem. With this data, WWF was able to develop climate change adaptation strategies (WWF, 2011) and set up a new project to enhance the resilience of local communities and that the mangroves continue to provide ecosystem goods and services to local communities.

Relevant to mangrove conservation in Manambolo-Tsiribihina, the WWF project invested in the following outcomes:

- Delegated management to local communities for seven mangrove and fisheries areas
- Restored 182.5 hectares of mangroves
- Established collaboration agreements with the following NGOs/CSOs: CNFEREF, Fanoitra and DWCT NGOs, FIVE Menabe, Lalanda and Mahery Consortiums
- Completed surveys on setting up a blue carbon project, land tenure, water bird monitoring, a climate witness study, a crab value chain analysis for Melaky and Menabe, and a crab market assessment

The project has placed an emphasis on investing in the local community management as this has been identified as an effective way to protect the mangroves. The management of mangroves by local communities is one of the most effective ways to ensure sustainable protection of these ecosystems and the important resources they contain (Amri, 2005). With the support of WWF, local communities are managing seven sites covering a total of 31,834ha of mangroves in the Menabe and Melaky regions.

WWF's project from 2012-2015 was financed by grants. A US$400,000 grant[2] was used over three years to finance the following activities:

Objective 1 – Consolidating community-based mangrove management

Years 1 & 2

- Raising community awareness of sustainable management principles
- Strengthening capacity and organization of local users
- Initiating mangrove management transfer processes
- Designing management tools
- Implementing participatory monitoring

Year 3

- Exploring blue carbon as a sustainable financing mechanism
- Finalizing the management transfer process
- Community-based organizations (CBOs) training on management tool use
- Support to updating Menabe's overarching regional development plan
- Began the process of setting up a federation of CBOs

Objective 2 – Improving livelihoods through improved sustainable crab fishing practices and product marketing

Year 1

- Baseline studies conducted to better understand Menabe's crab fishery sector
- Follow-up studies conducted to better understand the sector's production and markets
- Meetings were held to bring together all actors involved in the crab value chain

Years 2 & 3

- Implementing the crab value chain plan at the regional level
- Strengthening enabling external conditions
- Systematic local monitoring and technical guidance
- Capacity building sessions

Objective 3 – Exploring blue carbon as a sustainable financing mechanism

Years 1 & 2 (in collaboration with Blue Ventures)

- Mapping to refine mangrove classification and field surveys guided by the Kauffman protocol
- Project Idea Notes developed according to international standards
- Blue carbon feasibility report summarized

2 Copy of a 30 October 2015 report to the donor.

- Preliminary additionality analysis
- Refined land use-land cover classification of the Tsiribihina Delta
- Next steps planned for the blue carbon project
- At the regional level, WWF organized a training on payment of ecosystem services and climate compatible development

Year 3

- Contribution to defining a national REDD+ strategy
- Promoted experiences gained through various blue carbon initiatives, including Manambolo-Tsiribihina
- Improved local stakeholder understanding around the blue carbon process
- Consultation of local communities following the UN-REDD FPIC guidelines
- Additional studies related to land tenure
- Capitalizing local expertise on socio-anthropological land tenure analysis to strengthen blue carbon work
- Dissemination of information and lessons learned

The financial reporting on the grant indicates that roughly 50% of the US$400,000 was spent in year 1, with a 30% spent in year 2, and the remaining 20% in year 3. This allocation of funding indicates that a significant amount of grant financing is required to conceptualize and initialize a comprehensive mangrove conservation project encompassing issues of governance and capacity building, sustainable use for enhanced livelihoods, and securing additional funding through certifying blue carbon credits.

Unfortunately, the financial reporting for the project is mostly on functional lines such as personnel, travel and supplies. There was, however, some reporting on costs per activity. These include the following expenditures:

Activity	Costs (US$)
Land and juridical patterns assessment	6,750
Data collection on endemic bird species	9,000
Updated CBRM management plans	2,784
Community financial needs assessment	5,625
Evaluation/training sessions	7,500
Crab value/market chain assessment	11,252
Crab/fishing production capacity building	5,710
Blue Ventures grant for blue carbon work	45,000
Potential carbon market assessment	7,500

These costs provide insights from this project regarding cost-effectiveness. For such a project, there are a large number of interrelated activities (e.g. research, assessment, capacity building, institution building) which need to be financed. The experience of this project could be used to outline a set of needed activities to implement a community-based mangrove conservation project.

Financial model for a REDD+ project

In the 2014 report – Tsiribihina Delta Mangrove REDD+ Project: Description of Financial Model[3] – various costs with respect to securing mangrove carbon credits were identified and assessed, including transaction costs, implementation costs, certification costs and opportunity costs.

Transaction costs are for the most part the costs of gathering the necessary information to establish and execute the project; costs are incurred in the process of identifying the REDD programme, negotiating the transaction, establishing a baseline and monitoring, reporting, and verifying the tons of emission reductions.

Implementation costs are those costs required to actually implement REDD+ activities, such as expenses associated with the resources, training, research, and the political, legal and regulatory

3 Franklin R, et al, May 2014. "Tsiribihina Delta Mangrove REDD+ Project: Description of Financial Model." Blue Ventures WWF Madagascar and Western Indian Ocean Programme Office.

processes involved. They also include recurring costs such as the costs of forestry protection and enforcement, benefit sharing such as intensified crop production and job training, and administration.

Certification costs are an important component of transaction costs directly related to securing carbon credits under a certification. In this case, the focus was on securing Community, Climate and Biodiversity (CCB) standards and compliance Verified Carbon Standards (VCS). Total validation and verification costs for both CCB and VCS can be as high as US$100,000. In this case, these costs were estimated at US$40,000.

Opportunity costs for REDD+ projects may be particularly important. Reducing deforestation requires the local communities to change their current behaviour, which results in the lost benefits arising from deforestation-related activities. In this case, opportunity costs included the reduction in revenues from the conversion of land to rice farms and from unsustainable timber harvesting.

2.3. Benefits

As summarized in an WWF Madagascar annual report, the mangrove conservation benefits of the Manambolo-Tsiribihina include (WWF Madagascar, 2016):

- Serving as a buffer against cyclones and rising sea levels
- Serving as a breeding ground for crabs, fish and shrimp
- Playing an important role in the fight against climate change because mangroves capture carbon more effectively than most other forest types

Mangrove conservation has also become a way to bring the community closer together, particularly be engaging and empowering the youth (Benson *et al.*, 2017). Between October and November 2016, nearly 80,000 seedlings were planted at 14 restoration sites covering a total area of 45.4 hectares in the town of Morondava and the district of Belo Sur Tsiribihina. Conducted by the Mahery Youth Consortium, it is the largest mangrove restoration project led by young people in the Menage Region.

A short video on the project released in October 2010, highlights the following core benefits (WWF Madagascar, 2017):

- Restore ecosystems – mangrove reforestation and climate change adaptation
- Ensure the necessary natural resources for people survival and well-being – sustainable fish and crab harvesting and new sources of income

WWF intends to capture and enhance these benefits with donor funding for a new phase of work from 2016 to 2020. In this phase, WWF will deepen support to the five original project sites, while expanding the project to seven new sites. Together, these 12 sites represent the entire landscape and contribute to WWF-MDCO's broader vision – functional and replicable models of landscape approaches contribute to the conservation of natural capital and the well-being of the Malagasy people, while also laying the foundation for equitable governance of natural resources in Madagascar.[4]

Importantly, the US$300,000 grant will include operationalizing a sustainable financing mechanism for community-managed areas. The mechanism will include developing a demonstration carbon project based on the Plan Vivo Standard. Such a mechanism will play a key role in aligning costs and benefits.

Financial model for a REDD+ project

The report on a financial model for a REDD+ project identified a number of financial benefits which could arise from such a project, including the direct returns from selling CCB and VCS carbon credits and the opportunity benefits for developing REDD+-friendly economic activities.

4 Copy of the project proposal dated 6 January 2016.

Regarding the direct returns from the sale of carbon credits, the amount of revenues will depend on both the volume of credits that the project is able to generate and the price these credits fetch in the market (Hamrick and Gallant, 2017). The latter, of course, will depend on external factors over which the project has no control. Thus, any estimates of the likely market price for the carbon should be conservative to minimise the risk of overestimating the value of these credits to the local communities.

Regarding the sale of carbon credits, a further issue is how these revenues will be distributed among the various stakeholders – local communities, government authorities and project developers. If the local communities do not secure a significant share of the revenues, they may be less motivated to forego tangible benefits from deforestation such as rice farming and timber harvesting.

So-called opportunity benefits would include the various economic activities that could be enhanced by a REDD+ management regime for the mangroves. These include enhanced productivity of the mud crab fisheries, scaled-up beekeeping providing honey and wax, and the possibility of developing an ecotourism industry in the area.

The potential for improving the returns for mud crab fisheries was discussed in a 2013 multi-stakeholder workshop.[5] The workshop highlighted the interrelationships between the production of crabs and that of mangrove cover and agreed that the production potential is mainly dependent on the abundance of mangrove cover. If mangrove conservation policies are not applied, this production could be declining.

2.4. Analysis and lessons learned

WWF's Manambolo-Tsiribihina project aims to conserve and restore the mangrove ecosystem through ensuring and developing the sustainable use of mangrove-based goods and services. These include fish and crab harvesting and the sale of Plan Vivo carbon credits.

All of the elements are in place regarding the restoration, conservation and sustainable use of mangrove ecosystem services. However, there is a need to align more closely the various uses with commitments and efforts to restore and maintain the mangroves. This includes establishing effective governance mechanisms and a robust financial mechanism that links costs and benefits (Chevallier, 2013).

The financial mechanism needs to generate sufficient revenues for mangrove conservation (e.g. from blue carbon credits) (Dey and Kar, 2013). It also needs to generate sufficient revenues for the communities to ensure that there are financial incentives to encourage the communities to manage their mangrove sustainably and responsibly. In this respect, establishing a cash flow linked to conservation is critical. Blue carbon is one opportunity; fish and crab harvesting may be another opportunity.

The calculations undertaken for securing REDD+ credits through CCB and VCS credits indicate that over a 30-year period significant donor funding is required to make the project viable.[6] Without upfront donor funding, the total loss would be roughly US$1 million. With donor funding, on the other hand, the project could generate a total profit of roughly US$320,000. This assessment affirms the importance of blending donor finance with revenues from the sale of carbon credits and mangrove-friendly goods and services from mud crab fisheries, beekeeping and ecotourism. A 2014 feasibility assessment prepared by Blue Ventures explains this situation as follows:

"*Over a 30-year project period, a total of 936,928 $MtCO_2e$ emissions can be avoided through the implementation of a REDD project in the Tsiribihina Delta. This equates to a total of 26,606 tradable VCUs per annum. According to*

5 Rencontre professionnelle de la pêche de la Région du Menabe (RPPM). 2013. "Workshop report : Exploitation responsable des crabes Scylla serrata: moyende gestion durable des mangroves, et de l'amélioration des moyens d'existences et de la sécurité alimentaire."

6 Tsiribihina Delta REDD Financial Model, August 2014, an Excel file.

the financial analysis undertaken by this study, the volume of offsets would provide adequate carbon income in the long term to significantly support the project activities. However, in the short term, significant funding will be required to cover the project start up and carbon transaction costs until an adequate flow of VCUs allows the project to breakeven. In this period, local people will also have to be compensated for the loss of livelihoods that they would otherwise have earned through deforestation."[7]

As the WWF project has been underway for some time and will continue at least until 2020, its further development will provide insights into how grants and investments in such projects can deliver the sustainable management of a mangrove ecosystem which delivers tangible livelihood outcomes.

Key lessons learned from this case include the importance of having a long-term strategic view from the start of a project to maintain a focus on mangrove conservation, of looking at a wide scope of possible economic activities from carbon credits to fisheries to tourism which could be aligned to mangrove conservation, and of securing adequate grant financing to enable the project to develop and mature over a longer time period.

The sustainability of this project depends on the capacity to implement an adaptive management system incorporating insights from ongoing monitoring and evaluation and adjusting the mix of mangrove-friendly economic activities as needed to ensure that the mangroves are conserved (Mcleod and Salm, 2006). If the mix of economic activities to do not incentivize the local communities to conserve, the mangroves will be at risk. Thus, it is critically important that the project looks carefully at the mix of economic activities which will both be mangrove friendly and also encourages the local community to conserve the mangroves over time. Such attention to the nexus between conservation and enterprise at the local level will provide useful insights for other such projects elsewhere in the country and the region.

7 Blue Ventures, 2014. "Mangrove REDD & Conservation of Intact Wetlands in the Tsiribihina & Manambolo Deltas: Madagascar Feasibility Assessment."

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3. VIET NAM: MANGROVES AND MARKETS

Location	Mekong Delta, Viet Nam
Size	12,680 hectares and 1,000 households
Budget	US$3 million
Start date	2012
Time frame	8 years over two phases
Funding strategy	Project grant – International Climate Initiative (IKI), Germany Organic shrimp certification – Naturland, Germany
Distinctive feature	Development of a mangrove-friendly, certified shrimp industry for exports to Germany
Major limitation	Standard for mangrove conservation is set by an internal certification scheme which in turn is dependent on the export price for the captive-bred shrimps

3.1. The project

The Mekong Delta Mangroves and Markets pilot project ran from 2012 to 2016. It was implemented by IUCN in partnership with Mangroves for the Future (MFF) and the SNV Netherlands Development Organisation, with funding from the International Climate Initiative (IKI) of the Government of Germany (Federal Ministry for the Environment, 2018).

Formally known as MAMI: Promoting Ecosystem-Based Adaptation through Reforestation and Sustainable Use of Mangroves in Thailand and Viet Nam, the project's final report lists its key achievements as follows (SNV Netherlands, 2018):

- Nearly 800 shrimp households obtained Naturland organic certification during 2014-2016 and received price premiums from the world's leading seafood exporter Minh Phu
- Payments for forest ecosystem services (PFES) have been made to more than 550 certified households, with a total amount of nearly VND900 million (US$39,500)
- 2,000 farmer households trained on mangrove ecosystem, international organic shrimp certification standards, and organic shrimp farming practices
- 80 hectares of mangrove replanted within the shrimp farms of 402 households to meet Naturland's 50% mangrove coverage requirements
- 12,600 hectares of mangrove forest effectively protected from clearance
- 1,000 households supported in building sanitary toilets that meet certification standards
- A provincial regulation on PFES for the aquaculture sector was developed with project support

The core goal of the pilot project was to incentivize shrimp farmers to restore and conserve mangroves in exchange for access to more lucrative and sustainable shrimp farming markets. That was done in accordance with the Naturland certification standard for aquaculture, which requires that 50% of the area of a shrimp farm is covered in mangroves; the former mangrove area in property of the farm shall be reforested to at least 50% during a period of maximum five years. The harvest of this area is not permitted to be labelled and marketed as an organic product according to Naturland standards, until Naturland's certification committee has confirmed the successful completion of reforestation (Naturland, 2017).

As reported in the final project report, the project was considered an overall success:

> *"In Viet Nam, the project has been acknowledged by the provincial government and donors as a major success. This is reflected by the provincial certificates of appreciation that IUCN and SNV staff were awarded; by the strong cooperation of government and business on the preparation of a provincial decision regulating certified organic shrimp payments; by invitations to present the proje ct at international conferences; and by the incorporation of the project approach in the new World Bank loan. In Viet Nam, there is a growing realization that the delta's ability to withstand climate change and sea level rise requires a new strategy based on 'zone of defense' that includes an extensive mangrove-shrimp landscape rather than the traditional 'line of defense' that limits mangrove recovery to a narrow belt outside the sea dike."*[8]

A follow-on project – Mangroves and Markets: Scaling up Ecosystem-Based Adaptation in the Mekong Delta (MAMII) – is now underway with the same partners and donor (Federal Ministry for the Environment, 2017). This project started in 2016 and will run to 2020. In this second phase, SNV is leading the upscaling in Ca Mau and IUCN is introducing organic certification to other processing companies in Ben Tre and Tra Vinh, two other provinces north of Ca Mau.

The project aims to replicate and scale up the sustainable integrated mangrove-shrimp farming model through the following set of objectives:

- Train an additional 3,600 farmer households in applying integrated mangrove-shrimp farming practices
- Ensure at least two more processing companies commit to providing incentives for integrated mangrove-shrimp farming
- Mainstream sustainable mangrove-shrimp aquaculture into national and provincial development plans as an EbA strategy

The Mekong Delta Mangroves and Markets project demonstrates that investment in the commercial farming of a native species, in this case shrimp, can be linked to the restoration and conservation of the ecosystem in which the farming takes place (Luat and Thuy, 2016).

3.2. Costs

MAMI and MAMII are sizeable projects with grants from Germany's International Climate Initiative of €1.56 million (US$1.8 million) and €1.5 million (US$1.75 million), respectively, or roughly €3 million (US$3.5 million) in total. For MAMI, IUCN and SNV also contributed an additional €177,550 (US$207,000) in co-financing.

As the pilot project, MAMI had to spend considerable funds on conceptualizing, legitimizing and operationalizing the mangrove-shrimp farming scheme. This included the following set of outputs and activities:

- **Output 1:** By 6/15, to have successfully demonstrated the economic and environmental benefits of EbA in mangrove ecosystems
  - *Activity 1.1:* Develop an EbA business plan for mangrove conservation, identify 3-4 pilot sites and conduct baseline studies
  - *Activity 1.2:* Organize participating farmers into groups to test innovative financing and MRV
  - *Activity 1.3:* Test mangrove restoration techniques and costed models for assisted regeneration in selected pilot sites
  - *Activity 1.4:* Work with major shrimp exporters and processors to promote compliance with ASC and/or organic standards
  - *Activity 1.5:* Work with local governments to replicate EbA in two other provinces in Viet Nam and one in Thailand

8 From a hard copy of the final report for BMUB project number 12_II_091_Asia_A_EbA Mangrove Restoration.

- **Output 2:** By 12/15, to have successfully introduced innovative financing mechanisms that promote EbA and mitigation in mangrove ecosystems.
  - ◇ *Activity 2.1:* Carry out economic valuation of ecological services of mangroves (storm protection, nurseries, carbon, etc.)
  - ◇ *Activity 2.2*: Seek investors to pay for the bundled environmental services provided by EbA pilot sites
  - ◇ *Activity 2.3:* Establish MRV system against carbon, biodiversity and social baselines using CCBA criteria
  - ◇ *Activity 2.4*: Establish REDD-compliant benefit distribution system (BDS) for participating households

- **Output 3:** By 12/15, to have successfully integrated EbA in mangrove ecosystems into national and provincial laws and regulations.
  - ◇ *Activity 3.1*: Support mangrove PES policy development and advocacy at national levels
  - ◇ *Activity 3.2:* Disseminate project results and lessons learned nationally and regionally
  - ◇ *Activity 3.3:* Disseminate the project results and lessons learned through international forums

Unfortunately, the final financial report for MAMI[9] provides only summary information on personnel and administrative expenditure. It does not report on the costs of undertaking the various activities in the project. To understand better the cost-benefit of MAMII, a more in-depth review of the actual costs of the various activities undertaken in MAMI would be useful.

In addition to the costs of getting the scheme up and running with the grant funding under MAMI, there are the additional potential or perceived costs to the shrimp farmers of getting involved in the scheme. These costs could include the following:

- Capacity building on mangrove restoration and conservation
- Compliance with the Naturland certification system
- Conversion of farmed areas to mangroves
- Compliance with new provincial regulations

Such costs to the shrimp farmer, however, may be offset by support from the Mekong Delta Mangroves and Markets project as well as by increased prices for the sale of certified organic shrimp. Such revenues, in fact, are core benefits of the project and critical to its long-term success.

The reported project cost also does not cover funding from processing company as Minh Phu has paid for and Internal Control System (ICS) and other costs of establishing and supporting organic farming area. In an unofficial estimation in 2016, Minh Phu said that it had contributed $200,000 for this project, which included:

- Cost of ICS staffing
- Incentive for shrimp collectors and collecting station (middleman)
- Supplementation for organic shrimp larvae that the company sold to farmer below production price

Such cost reflects the commitment and vision of the processing company as this is a viable business scheme.

3.3. Benefits

The pilot project, MAMI, as noted above, delivered a number of key benefits directly related to the conservation of mangrove ecosystems and the maintenance of this conservation going forward. These included:

- 12,600 hectares of mangrove forest protected
- 80 hectares of mangrove replanted within the shrimp farms of 402 households
- 2,000 farmer households trained in the mangrove-shrimp farming scheme
- Nearly 800 shrimp households certified by Naturland

9 Excel spreadsheet of the financial report for BMUB project number 12_II_091_Asia_A_EbA Mangrove Restoration.

- Payments made to more than 550 certified households totalling VND900 million (€37,150)
- 1,000 households supported in building sanitary toilets

The aim of MAMII is to now scale up the initiative and associated benefits by training additional 3,600 shrimp farmer households and engaging at least three more shrimp processing companies in the mangrove-shrimp farming scheme. This project will test the scalability of the approach.

Regarding quantifying the benefits, the most tangible information relates to the rising incomes of the shrimp farmers adopting the new scheme. It is paying farmers VND500,000 (US$25.33) per hectare of mangrove for providing ecosystem services.[10] In a telephone interview with the project leaders, they indicated that following the initiative, small-holders have been observed to increase their incomes by between 30-70% in 12-18 months. This result is critical as the project leaders explained that key to the success of MAMI is maintaining the economic incentives.

Regarding the mangrove restoration and conservation benefits, quantification in financial terms is not easy. One possibility could be to measure the carbon value of the mangroves, but as the project managers noted the carbon storage (in biomass) per unit area is low and there are no domestic customers or legislation to take REDD+ products to market. So the value of conserving the mangrove system needs to be considered in the context of its relationship to establishing a sustainable shrimp farming industry in the Mekong Delta.

The important and positive nexus between healthy mangroves and sustainable shrimp farming is highlighted by local famers and stakeholders in a video produced by the pilot project (SNV World, no date). The video includes the following observations:

- The mangrove forest provides protection from erosion
- Deforestation leads to shrimp farm failures due to disease
- Securing organic certification is desirable
- Sustainable farming practices increase income

3.4. Analysis and lessons learned

The Mekong Delta Mangroves and Markets project aims to align the conservation of mangroves with the farming of shrimp through incentivizing shrimp farmers to restore and conserve mangroves on their farms (World Bank, 1998). If the incentive scheme – increased revenues from the sale of mangrove-friendly certified shrimp – works, then it will be a win-win outcome for nature and local livelihoods.

The costs of setting up such as incentive system, however, are high and include a significant amount of engagement with local shrimp farmers and their associations, local government authorities, shrimp processors and exporters, certification schemes such as Naturland, and other interested and affected stakeholders. A more thorough analysis of the costs by activity in the pilot project, MAMI, would help to better manage such costs in the scaling up efforts of MAMII and other mangrove-shrimp farming projects.

The interrelated benefits of mangrove conservation and organic shrimp farming – beyond the price premium for the organic shrimp – also need to be more carefully articulated and assessed. Understanding these linkages is needed to reinforce the commitment of shrimp farmers to conserve mangroves. If the price premium declines, as the project managers have indicated is likely, then the financial incentive to set aside farm areas for mangroves is also likely to decline. However, better awareness and understanding of the importance of a healthy ecosystem for a productive shrimp farm could help to mitigate the disincentive of any decline in market prices.

10 See: https://thefishsite.com/articles/shrimping-horizons-how-farmers-are-saving-thousands-of-miles-of-mangrove-in-vietnam

It is also important to identify the market for certified shrimp in developed countries, as the price of exported shrimp is a direct driver to financial incentive that farmers would receive for their natural-responsible product (FAO, 2018). Minh Phu reports of some difficulties in exporting organic shrimp and also importing price decline force them to drop some of their commitments.

In the final report on the pilot project, the critical importance of understanding the non-financial benefits of mangrove conservation was highlighted:

> *"Project sustainability has been enhanced by changes in farmer attitude. Many farmers used to see mangroves as 'the enemy' but their value as part of a sustainable farming system is now much more widely understood. Changing attitudes is complicated by the low levels of educational attainment in the delta: only 20% of the farmers have a high school education and many of the elder generation are illiterate. This required a heavy investment in training and retraining, particularly for the farmer group leaders who were retrained every year. While there is the inevitable focus on financial incentives, the project has also emphasized the non-financial benefits of being part of a global supply chain to meet the growing demand for environmentally sustainable seafood in terms of refresher training, greater social cohesion, access to technical assistance, a more hygienic environment, and improved relations with the local authorities."* (Brunner, 2016)

Scaling up this initiative in Viet Nam and replicating it in other countries will benefit from a clearer assessment of the interrelated costs and benefit streams needed to get such a scheme up and running and to ensure its long-run sustainability. Because a significant amount of up-front grant financing is needed to align mangrove conservation and shrimp markets, MAMII and other such projects will benefit from a closer look at the cost-effectiveness of the activities undertaken in the pilot phase.

Although it is difficult to measure, the financial benefit of shrimp farms through increased productivity from avoiding disease outbreak, extreme weather should be analysed as a tool of long-term planning and management for an EbA strategy in coastal areas.

Key lessons learned from this case study include the recognition that such market-based projects are likely to require significant upfront development costs requiring grant funding. In addition, the risks of market fluctuations – such as a drop in the wholesale price – are difficult to respond to once the scheme is established, and the quality of the mangrove conservation effort may not be strongly linked to the export of certified products.

The sustainability of this project depends on the continued alignment of export markets for shrimp with a mangrove conservation requirement. If the shrimp farmers, however, find that they can secure a better return – through increased volume and/or increased prices – in other markets which do not demand mangrove conservation, then the mangroves could be at risk. Further, the alignment of certified shrimp with active conservation management of the set-aside mangroves needs to be assured or the project could become a conservation project in name only. With good governance, responsible management and secure markets for certified shrimp, this approach has the potential to be scalable and attract impact investors who are keen to invest in biodiversity-positive aquaculture.

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Legal frameworks on governance linked to mangrove conservation have been explored in our sister publication produced under the same project. For detailed information and further reading see: Slobodian, L. N., Rodriguez Chaves, M., Nguyen, L. T. P., Rakotoson, L. N. (2018). *Legal frameworks for mangrove governance, conservation and use: Assessment summary*. IUCN, Geneva, Switzerland, and WWF Germany, Berlin, Germany. (74) pp.


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