Nature-based Solutions in the Ganges Brahmaputra Meghna (GBM) river basin

Case studies and lessons learned

Editors: Vishwa Ranjan Sinha, Kathryn Bimson

Building River Dialogue and Governance (BRIDGE)

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Executive summary

This report explores the scope and application of Nature-based Solutions (NbS) in addressing water and river basin management issues. NbS are actions to protect, sustainably manage, and restore natural or modified ecosystems to simultaneously providing human well-being and biodiversity benefits. NbS is an umbrella term that encompasses several nature-based approaches like Ecosystem-based Adaptation (EbA), Forest Landscape Restoration (FLR) and Ecosystem based Disaster Risk Reduction (Eco-DRR).

Globally NbS is finding resonance with government policies, and is increasingly seen as a strategy to address the most pressing societal challenges such as climate change and food security. At least 66% of Paris Agreement signatories included NbS in some form to help achieve their climate change mitigation and/or adaptation goals. Speaking of the countries sharing the Ganges-Brahmaputra-Meghna River Basin, India aims to increase its carbon sink from 2.5 to 3 billion tonnes CO_2 equivalent by increasing forest cover, whereas, Nepal aims to enhance forest carbon stock by at least 5% by 2025 compared to 2015 level.

Also, a large number of Civil Society Organizations in countries sharing the GBM basin are applying nature based and traditional strategies to address community water security and reduce community vulnerability to floods and riverbank erosion.

As NbS enters into policy and is adopted by projects on the ground, there is a need for greater clarity on what the concept entails and what is required for it to be deployed successfully and avoid green washing. To address this, IUCN launched the Global Standard for NbS in July 2020, after a two year long consultation process, which engaged more than 10,000 people from across the globe, The Global Standard consists of eight criteria and 28 indicators, which address the pillars of sustainable development (biodiversity, economy and society) and resilient project management. These criteria respond directly to existing gaps including scale, policy and complementarity to other interventions.

This report presents seven case studies based on initiatives led by Civil Society Organisations (CSO) and IUCN partners in the GBM river basin, in Bangladesh, India and Nepal. These case studies are analysed to highlight NbS strategies that could be harnessed by natural resource managers and CSOs to address community challenges linked to food security, poverty and water related disasters (floods and riverbank erosion).

Since 2017, IUCN has worked with the *BRIDGE GBM CSO Network,* a network of more than 25 CSOs from the five GBM countries, on the cooperative governance of shared water resources in the GBM river basin. Discussions between IUCN and members of the GBM CSO Network have revealed that a large number of CSO, government and private sector led initiatives are applying NbS, although the results of these interventions are often not adequately documented or widely shared – thus limiting their potential of being replicated or in triggering a transformative change.

In 2018, IUCN initiated a series of regional capacity building workshops, CSO interviews, and webinars on NbS. These activities were designed to simultaneously build the capacity of the GBM CSO Network on NbS and also engage them in the documentation of case studies based on their own work. All the members of the GBM CSO Network and some IUCN partners (ICIMOD, ITC Limited) were requested to provide documentation of at least one case in a

suggested format (Annex 1). These activities were funded by Swedish International Development Cooperation Agency (SIDA) through the Oxfam TROSA Programme.

Seven NbS case studies were selected for inclusion in this report and are discussed in detail in Chapter 4. These case studies were selected as they applied nature based strategies and had a very strong community engagement component. One of the most important criteria for selection of these case studies was their application in the management of river basins and focus on solving problems of the most vulnerable groups of societies, such as poor farmers and fishermen or communities living along the river bank and severely impacting by erosion.

In terms of addressing societal challenges, more than 50% of the interventions discussed in this report (Case Studies 1 to 4) simultaneously targeted water and food security issues as their primary motivation for the application of Nature-based Solutions. These strategies included: improving the availability of water for irrigation and household use through restoration of wetlands and watersheds and the introduction of efficient irrigation management strategies. The interventions discussed in Case Studies 5, 6 and 7 focused on the application of NbS in disaster risk reduction, and demonstrated the effectiveness of ecological engineering approaches in controlling landslides and river bank erosion.

Among the seven cases studies discussed, four studies integrate landscape approaches in project design (Hail Haor, Datia Watershed, Asarganj Agriscape and Teplejung District). Other three interventions are site specific, aiming to address local challenges faced by communities, such as control of landslides along hill roads (eco-safe roads in Nepal) and river bank erosion (Jinjiram and Teesta river basin).

Chapter 5 presents learnings from the seven case studies. The learnings are associated with the eight criteria identified in the IUCN Global Standard for NbS. The analysis provides a basis for revising and strengthening the case studies. Each case study clearly identified the societal challenge to be addressed and the activities were designed to benefit the most vulnerable communities, such as poor fishermen and farmers. To improve the economic feasibility of the intervention, in most cases, activities were designed to create additional income generating opportunities for local communities, through concepts like spice garden tourism, and trainings for women's self-help groups in organic farming and enterprise development. In some cases, a watershed development fund was established, as a revolving fund to provide micro-credit services to the local communities to support the diversification of their income.

In every case study, efforts were made to create an institutional mechanism for the engagement of local communities in the design of activities and their implementation, however, it is not clear how external stakeholders were engaged in the decision-making processes. Also, there is little to no documentation of the strategies used to reconcile different views of stakeholders during the design of the intervention. In most cases there is documentation of who received the benefits, but there seem to be no discussion about any negative impact on particular stakeholder group. A monitoring and evaluation framework was developed in most cases, although it is more focused on human benefits. The biodiversity outcomes are not integrated in regular monitoring of the project, with the exception of fisheries and water provisioning services.

Based on the analysis of case studies, Chapter 6 provides the following recommendations to better align these initiatives with the IUCN Global Standard on NbS and facilitate their replication and upscaling:

- *Strengthen documentation of biodiversity gains*: A well-founded understanding of the current state of the ecosystems will help strengthen future interventions. The baseline assessment needs to be broad enough to characterise the ecological state, drivers of ecosystem degradation and options for net improvements, making use of both local knowledge and scientific understanding;
- *Improve mapping of the roles and influences of external stakeholders*: There is a need to document the rights and responsibilities of different stakeholder groups with reference to the proposed NbS. This will ensure that the responsibilities of different stakeholder groups are acknowledged and respected and do not jeopardize the NbS intervention.
- *Promote private sector and youth engagement*: In most case studies, the youth and private sector engagement is weak, and needs to be strengthened. Engaging the private sector will help in building its capacity in NbS and support for upscaling the learnings from demonstration projects. Since, NbS requires working across generations, and moving away from a site-based to a systems-based approach, youth engagement is necessary for the sustainability of any NbS intervention.
- *Strengthen project adaptive management*: A monitoring and evaluation framework was developed in most of the projects discussed in this paper, however, they tend to analyse human benefits from a donor reporting perspective. None of the case studies clearly demonstrate how the learnings from the project were used in adaptive management, to limit risks and unexpected impacts of the activities on stakeholders. Strengthening the documentation of both the positive and negative impacts of a particular NbS intervention, as well as the trade-offs necessary for the sustainability of NbS, will support the designing of a robust adaptive management process.

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Please see annex 1 for contact details of case study contributors.

Any errors or oversights in the report are the responsibility of the editors alone.

Glossary

Ahar pynes system. Traditional practice of irrigation and flood management in South Bihar. Under the system a network of water channels (pyne) are dug into the soil and connected to small retention ponds. This network of channels helps to transfer river water to nearby agricultural fields to irrigate kharif (mostly paddy) and rabi (wheat or gram) in winter season. The ponds (ahar) help reduce the impacts of floods during the monsoon by absorbing extra water, and provide opportunities for additional income generation through provisions of fisheries.

Ecosystem-based Adaptation (EbA). The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change (CBD, 2009). Examples of EbA applications include the renaturation of rivers or canals to attenuate flooding, or the replanting of forests with more future climate-tolerant species to adapt to climate change (Doswald & Osti, 2011).

Ecosystem-based disaster risk reduction (Eco-DRR). The sustainable management, conservation and restoration of ecosystems to provide services that reduce disaster risk by mitigating hazards and by increasing livelihood resilience (Pedrr 2010).

Ecosystem benefits. Ecosystems provide benefits to communities that have economic value, including protection, food security, shelter and income.

Ecological engineering. Management of systems of human and environmental self-design or light management that joins human design and environmental self-design, so that they are mutually symbiotic (Odum, 1996).

Ecosystem function. The process through which the constituent living and non-living elements of ecosystems change and interact (ForestERA, 2005).

Ecosystem restoration. Recovery of the structure, function and processes of the original ecosystem.

Environmental valuation. Estimate about the magnitude or quality of the natural environment (air, water, soil) or investigation about the effects that a certain function or activity has on another function or activity.

Erosion. The wearing away of the land surface by natural forces, such as water, ice or wind (Crofts et al., 2020).

Haor. Wetlands of considerable areal extent located in the Surma-Kushiyara River Basin in north-eastern Bangladesh. During monsoon season, haors receive surface water from rivers and canals and become vast stretches of water body spreading over hundreds of hectares, whereas, in dry season, the water is restricted to deeper pockets called the beels. More than 350 Haors of varying sizes have been recorded in Bangladesh, including Tanguar Haor, a Ramsar site.

Indigenous Peoples. “The existing descendants of the peoples who inhabited the present territory of a country wholly or partially at the time when persons of a different culture or ethnic origin arrived there from other parts of the world, overcame them and, by conquest, settlement, or other means reduced them to a non-dominant or colonial situation; who today live more in conformity with their particular social, economic and cultural customs and traditions than with

the institutions of the country of which they now form a part, under State structure which incorporates mainly the national, social and cultural characteristics of other segments of the population which are predominant." (Working definition adopted by the UN Working Group on Indigenous Peoples).

Indirect-use value. The benefits derives from the goods and services provided by an ecosystem that are used indirectly by an economic agent. For example, the purification of drinking water filtered by soils.

Kharif crop. Agriculture crops that are cultivated in Monsoon and harvested before the winter (June to November) in India, Pakistan and Bangladesh. Examples of kharif corps include, rice, maize, sorghum, pearl millet/bajra, finger millet/ragi (cereals), arhar (pulses), soyabean, groundnut (oilseeds) and cotton.

Institutions. Institutions can refer, narrowly, to specific organizations – or, more broadly, to the policies, rules, incentives, customs and practices that govern social relations.

Integral management. Management activities involving biological, social, economic and cultural aspects linked to wildlife and its habitat.

Nature-based Solutions (NbS). Actions to protect manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human wellbeing and biodiversity benefits (IUCN 2016).

Nature-based tourism. Forms of tourism that use natural resources in a wild or undeveloped form. Nature-based tourism is travel for the purpose of enjoying undeveloped natural areas or wildlife (Leung et al., 2018).

Rabi crops or rabi harvest. Agricultural crops that are sown in winter season and harvested in the spring (November to April) in India, Pakistan and Bangladesh. Some of the important rabi crops are wheat, barley, peas, gram and mustard.

Resilience (of ecosystems). Their ability to function and provide critical ecosystem services under changing conditions.

Ridge to valley approach. Approach to restore degraded watersheds commonly practiced in India and promoted by the National government policies. In this approach the treatment of watershed starts at the ridge and progresses downwards into valley. It generally involves planting of tree and development of water absorption trenches on the ridge and water storage structures in the valley. This strategy reduces flow velocity, minimize soil erosion and increase ground water recharge capacity of the water shed. By reduced soil erosion in ridge, there is less silting in water conservation structures downstream.

Rhizotron. Various techniques for measurement of root system parameters, such as growth rate, soil penetration as well as interaction of roots with the soil flora and fauna using non-destructive and repeated observations. The technique is used for monitoring the survival rate of newly established plantation during implementation of NbS for erosion control and habitat restoration.

Acronyms

BRIDGE	Building River Dialogue and Governance
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CDKN	Climate and Development Knowledge Network
CRA	Climate Resilient Agriculture
CNRS	Center for Natural Resource Studies
CSO	Civil Society Organisation
DA	Development Alternatives
EbA	Ecosystem-based Adaptation
Eco- DRR	Ecosystem-based Disaster Risk Reduction
EPIC	Ecosystems Protecting Infrastructure and Communities
EPCO	Environment Planning and Coordination Organisation
FMCG	Fast-moving consumer goods
GCF	Green Climate Fund
GUK	Gana Unnayan Kendra
GIS	Geographic Information System
Himalica	Rural Livelihoods and Climate Change Adaptation in the Himalayas
ICIMOD	International Centre for Integrated Mountain Development
IUCN	International Union for Conservation of Nature
IKI	International Climate Initiative
KHAI	Kangchenjunga Himalica Agriculture Industry
LGCs	Local Government Committees
LULC	Land Use Land Cover
MAUSAM	Movement for Advancing Understanding of Sustainability & Mutuality
MACH	Management of Aquatic Ecosystems through Community Husbandry
MoL	Ministry of Land
MNREGA	Mahatma Gandhi Employment Guarantee Act
NEEDS	National Environment and Equity Development Society
NESPON	North Eastern Society for Protection Of Nature
NbS	Nature-based Solutions
RMOs	Resource Management Organisation
SIDA	Swedish International Development Cooperation Agency
SABAH	SAARC Association for Home-based Workers
SHGs	Self-Help Groups
TROSA	Transboundary Rivers of South Asia
UIL	University of Lausanne
WUGs	Water User Groups

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1 Increasing global recognition of nature's role in addressing societal challenges

1.1 NbS in global and national discourse

For most of the 20th century, decision-makers treated the conservation of nature as peripheral to national and global agendas. At best, it was considered a worthy interest, at worst, an obstacle to development. However, growing scientific consensus indicates that such views were misplaced and that "nature is essential for human existence and good quality of life." Failure to recognise this fact not only results in a model of economic growth that significantly contributes to the loss of biodiversity, it also misses the opportunity to effectively deploy nature in helping resolve major societal challenges such as climate change, food security and disaster risk reduction. For decades, conservation oriented organisations, including IUCN, as well as a number of CSOs and Indigenous communities have carried out both traditional and innovative conservation initiatives, which have simultaneously helped protect, manage and restore the environment, while delivering tangible and sustainable benefits for people.

From 2001 to 2005, the Millennium Ecosystem Assessment analysed the work of more than 1,360 experts worldwide, to assess the consequences of ecosystem change for human well-being. Its findings provided a state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them sustainably. The assessment defines ecosystem services as the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, which maintain the conditions for life on Earth.

Figure 1. NbS approach and components

It also represents a milestone in the evolution and understanding of ecosystem services, reinforcing the idea that the conservation approach doesn't only benefit biodiversity, rather it is a long-term strategy to secure critical benefits (e.g. food and water security, disaster risks reduction, human health) for human societies at scale.

In 2010, at the UN CBD COP 10 (Nagoya-Aichi, Japan), members adopted the Strategic Plan for Biodiversity (2011-2020) which also includes a 2050 Vision for biodiversity conservation with the tag line, "Living in Harmony with Nature," where "By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people." In 2018, the Sharm El-Sheikh to Beijing Action Agenda for Nature and People was launched jointly by the UN CBD Secretariat and the Chinese Government to support the implementation of the 2050 Vision. In 2020, the UN Leader's Summit on Biodiversity in New York voiced strong support for Nature-based Solutions.

In 2016, during the World Conservation Congress in Hawaii, USA, IUCN Members adopted a resolution (WCC-2016-Res-069) on defining Nature-based Solutions. The resolution adopted a framework on NbS, including the first official definition as "actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits." This definition has been commonly used since then by IUCN members, including a large number of governments and within the UN system.

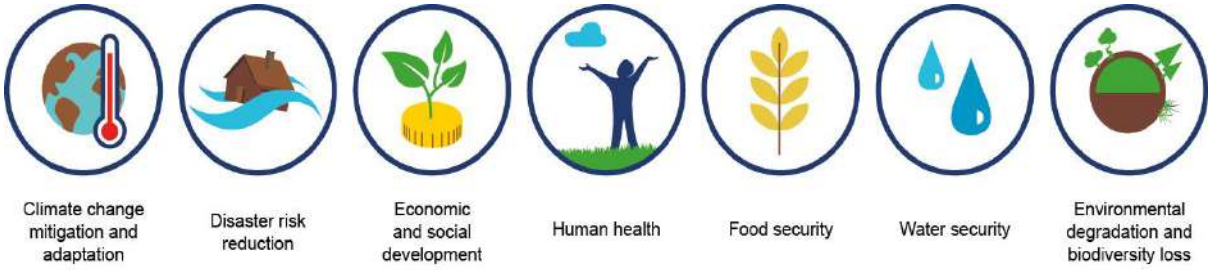


Figure 2. Major societal challenges addressed by NbS (Source: IUCN Global Standards for NbS)

Research highlights that NbS could provide around 30% of the cost-effective mitigation needed by 2030[1] to stabilise warming to below 2°C. They can also provide a powerful defence against the impacts and long-term hazards of climate change, which is the biggest threat to biodiversity. Finding ways to work with ecosystems, rather than relying solely on conventional engineered solutions, can help communities adapt to climate change impacts. Using nature to green cities can also result in significant energy savings and health benefits.

More than two-thirds of the governments supporting the Paris Climate Agreement included Nature-based Solutions (NbS) in some form to help achieve their climate change mitigation and/or adaptation goals. At the same time, scientists agree that to get on track to limit global

[1] Nature-based Solutions in Nationally Determined Contributions @2019 IUCN and University of Oxford

temperature rise to 1.5°C, emissions must drop rapidly to 25 gigatons (Gt) by 2030[2] from current level of 33 Gt in 2019. This is only possible with large-scale ecosystem restoration efforts.

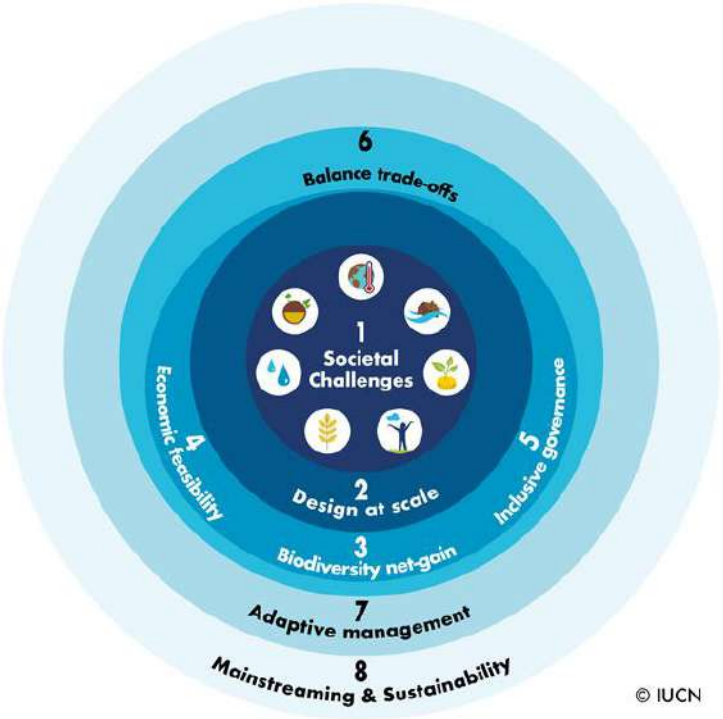


Figure 3. Nature-based solutions criteria from the global standard

1.2 Need for a global standard for NbS

As NbS enters into policy and is adopted by projects on the ground, there is a pressing need for greater clarity and precision of what the concept entails and what is required for it to be deployed successfully. Without this, the application of NbS could result in inconsistent and ungrounded applications.

To address this, IUCN launched the Global Standard for NbS in July 2020, after a two-year consultation process, which engaged more than 10,000 people from across the globe. The Standard consists of eight criteria (Figure 3) and their associated indicators, which address the pillars of sustainable development (biodiversity, economy and society) and resilient project management. These criteria respond directly to existing gaps including scale, policy and complementarity to other interventions.

The standard aims to equip users with a robust framework for designing and verifying NbS that yield the desired outcomes, by solving one or several societal challenges. Based on the feedback of actual and potential NbS users, it has been developed as a facilitative Standard, purposefully avoiding a rigid normative framing with fixed, definitive thresholds of what NbS ought to achieve. Rather, the Standard is designed to support users to apply, learn and continuously strengthen and improve the effectiveness, sustainability and adaptability of their

[2] UNEP Emissions Gap Report 2019

NbS interventions. It also serves as a mechanism for developing a consistent approach to designing and verifying concrete solutions-orientated outcomes.

Criteria overview:

1. NbS effectively address societal challenges
2. Design of NbS is informed by scale
3. NbS result in net gain to biodiversity and ecosystem integrity
4. NbS are economically viable
5. NbS are based on inclusive, transparent and empowering governance processes
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits
7. NbS are managed adaptively, based on evidence
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context

The application of the standard allows project implementers to systematically deploy NbS, accounting for the intervention's design and execution and enabling the results to be tracked and linked to global goals and research narratives. For individual interventions on the ground, applying the standard gives tangible added value. First, the results can give credibility to the intervention when speaking to investors, donors and other stakeholders. Second, the use of the standard provides individual interventions with recommendations for improvement, using the results as a way to identify gaps and solutions. Finally, the standard can be used as a means of engagement and communication across sectors, starting conversations and providing a common framework and language to discuss trade-offs.

The standard provides an opportunity to create a global user community that helps to guide implementation on the ground, accelerate policy development, and create conservation science on NbS. Through the Standard, NbS will be based on a common understanding and a shared vision for a just and sustainable world.

1.3 GBM river basin and NbS

The Ganges-Brahmaputra-Meghna (GBM) river basin is shared by Bangladesh, Bhutan, China, India and Nepal. More than 630 million people live in the basin, making it one of the largest and most populated river basins in the world.

The GBM river basin is also one of the world's most biologically diverse river basins, after the Amazon and the Congo. For example, the stretch of the Ganges between Narora and Brijghat was declared a Ramsar Site or "wetland of international importance" in 2005. This 85-kilometre stretch provides habitat for several species of turtles and game fish like the Mahseer (*Tor tor*), as well as a number of other threatened species, including the Gangetic river dolphin (*Platanista gangetica*) and the gharial (*Gavialis gangeticus*). Similarly, the floodplains of Brahmaputra basin is home to many endangered and threatened species of mammals such as the great one-horned rhinoceros (*Rhinoceros unicornis*), wild water buffalo (*Bubalus arnee*), royal Bengal tiger (*Panthera tigris tigris*), and Indian elephant (*Elephas maximus indicus*). The Meghna basin can be defined as a "biogeographical gateway," as it is located in the transition zone between the Indian, Indo-Malayan and Indo-Chinese biogeographical regions. The basin is rich in biodiversity, indicated by the presence of internationally

recognised wetlands, such as Tanguar Haor, and many hilsa (*Tenualosa ilisha*) fish conservation sanctuaries that protect the breeding sites of the most economically important fish in the region.

Numerous infrastructure projects threaten the unique and fragile balance of the GBM's ecosystems by changing the structure and natural flow of water bodies, impacting their capacity to hold water and intensifying water scarcity. Deforestation and unregulated mining are changing the basin morphology by increasing erosion and landslides and impacting the delta development processes in the Bay of Bengal. Exacerbated by increasing pollution, these anthropogenic impacts degrade the GBM's ecosystem services, leading to impoverishment, migration, social unrest, and decreased resilience.

Climate change is further compounding these pressures within the GBM river basin. The basin has been identified as one of the most vulnerable regions in the world to the impacts of climate change. Within the first few weeks of the monsoon in 2020, hundreds died and many more individuals were displaced due to flooding. In Nepal, landslides killed more than 120 people in first six months of 2020.

In the GBM countries, government policies demonstrate a recognition of the role of Nature-based Solutions in supporting climate adaptation and mitigation targets as well as conservation of economically important fish species. . In Nepal, the policies on watershed management and climate change include Ecosystem-based Adaptation (EbA) as an important strategy. India's nationally determined contribution to the 2015 Paris Climate Agreement commits to achieving an additional cumulative carbon sink of 2.5–3 gigatonnes of carbon dioxide equivalent (GtCO2e) by 2030 (UNFCCC 2015), and its National Mission for Green India aims to restore forests and enhance tree cover over 10 million hectares. In Bangladesh, the government has been promoting area-based conservation strategies for the protection of the hilsa fish breeding sites and the use of bandals (bamboo fencing) as a river bank erosion control strategy.

2 About the report and methodology

2.1 The GBM CSO Network

Since 2017, IUCN has been working with the BRIDGE GBM CSO Network, group of more than 25 CSOs from the five GBM countries, on capacity building and the documentation of Nature-based Solutions. The network was created to strengthen the role of CSOs in promoting cooperative governance of the shared water resources in the GBM river basin.

Through regional dialogues and consensus building activities, the network has developed a joint vision[3] for the cooperative management of the GBM basin. The vision identifies 21 cross-cutting action points under five themes: capacity-building; transboundary cooperation; communication, outreach, and advocacy; research and knowledge; and policy and legislation. The crosscutting actions promote the mainstreaming of NbS in current river management planning and practices, through:

1) Application of **ecosystem-based approaches** to scientifically assess current ecological conditions and their linkages with water and land-use regulations and the adequacy of current conservation and management frameworks (Action 5).
2) Developing **regional guidelines based on the best practices in ecosystem services conservation**, management, natural-resource use, disaster risk reduction, and climate change to integrate into policies. Using the guidelines to improve existing legal frameworks and policies at all levels to build the resilience and adaptive capacity of local communities (Action 12);
3) Promoting **ecologically and culturally sustainable activities** that benefit local communities and support the conservation of riverine ecosystems (Action 13);

Dialogues with the network has indicated that a lot of ongoing initiatives implemented by CSOs on water resource management apply Nature-based Solutions. However, these are poorly documented and the framework for NbS is often misunderstood. This limits the capacity of CSOs to systematically promote and upscale NbS, and to use the results to influence governance dialogues on shared basin management. The documentation of NbS initiatives and strategies from the GBM basin was identified by the Network as one of the priority areas of work in 2018.

2.2 Report aim and methodology

This report explores application of Nature-based Solutions to address water and river basin management issues. To do this, the report analyses seven case studies from CSO-led initiatives in the GBM river basin in Bangladesh, India and Nepal. Based on these analysis, the report provides an overview on NbS strategies that can be implemented by natural resource managers, private sector companies, and CSOs working for the wellbeing of local communities.

This report is the result of a consultation process (June 2018 to August 2020) involving a series of regional capacity building workshops, CSO interviews, and webinars on NbS

[3] GBM CSO Vision

facilitated by the BRIDGE GBM Project, and funded by Swedish International Development Cooperation Agency (SIDA) through Oxfam TROSA Programme.

The first CSO capacity building workshop on NbS and its application in river basin management (June 2018, Kathmandu)[4] initiated a dialogue on the definition of NbS, its scope and potential application in the management of shared river basins. One of the recommendations of the workshop was to document the implementation of Nature-based Solutions from the GBM region.

After the 2018 workshop, criteria for inclusion in the report, along with the format for documenting NbS were developed by IUCN and shared with the GBM CSO Network (Annex 1). The criteria included:

1. Reduce social and environmental vulnerabilities;
2. Generate multiple social benefits;
3. Maintain, restore or improve ecosystem health;
4. Is supported by policies at multiple levels;
5. Supports equitable governance and enhances capacities;

In addition to above criteria, additional guidance to support case study selection included the following:

6. Solutions strongly linked to water and basin issues (vs. broader NbS in the basin but with no real connection to the river/basin theme);
7. Solutions with a potential for replication;
8. Solutions presenting evidence of results (quantitative and qualitative) and references;

It is important to note that at this time (2018-2019), the IUCN Global Standard for NbS was under development. The criteria and guidance provided above were inspired by preliminary versions of the Standard and are similar to the eight criteria in the final version of the NbS Global Standard launched in July 2020.

From October-December 2018, IUCN facilitated several online meetings with the members of GBM CSO Network to explain the criteria and support the documentation process. In March 2019, IUCN facilitated a second training workshop of the GBM CSO Network on NbS in Sreemangal, Bangladesh. The members learned how to present their project interventions and findings through case studies and also joined a field visit to Baikka Beel, a wetland sanctuary extending over 100 ha, located in Hail Haor region, in northeastern Bangladesh. The Center for Natural Resource Studies (CNRS), one of the members of the GBM CSO Network in Bangladesh, has been working in the area for 30 years on community engagement in natural resource management.

Following the workshop, CSO members finalized NbS stories and shared them with IUCN for review and compilation. More than 15 members shared stories of NbS based on their past and current work. The stories included a range of issues, including the role of NbS in resolving conflicts between stakeholders, reducing water related disasters and improving food and water security.

[4] NbS and its application in river basin management in the GBM Basin

The International Centre for Integrated Mountain Development (ICIMOD) also supported the capacity building and documentation process, building on their work with CSOs and communities across the Himalayan region. IUCN also engaged ITC Limited, one of the biggest private sector fast-moving consumer goods (FMCG) Company of India and representatives from governments in the documentation of case studies.

Among the case studies shared with IUCN, seven were selected for inclusion in this report. Those selected applied nature-based strategies, such as conservation of wetlands, greening of the land cover, or plantation along the river banks to control erosion. They also have strong elements of community engagement, often applying traditional knowledge, and provide data and evidence to verify the results and attribute them to the intervention. In most studies, however, the main focus was to address the challenges faced by communities and therefore, they lack data on the biodiversity gains. The alignment of these case studies with the eight criteria of IUCN Global Standards for NbS is discussed further in Chapter 5.

Between July-August 2020, IUCN facilitated series of online webinars on Nature-based Solutions with the support of the GBM CSO Network. The webinars shared the case studies and highlighted the role of Nature-based Solution in addressing water management challenges[5] in the GBM river basin. More than 250 participants from Civil Society Organizations (CSOs), academic institutions, private sector, including young water professionals participated in these online dialogues and shared their inputs on the case studies.

Figure 4. Participants of the first NbS training workshop for GBM CSOs network (Kathmandu, June, 2018)@IUCN

[5] Experts: Nature-based solution can help address water management challenges

3 Case studies: nature-based solutions for the management of the GBM river basin

3.1 Introduction to the case studies

To demonstrate the range of applications of the NbS concept in the management of river basins, this section presents a seven case studies in detail. The case studies have been selected to explore how CSOs and local communities are applying various nature-based approaches to address issues such as water and food security, disaster risk reduction, biodiversity conversation and poverty reduction.

Case Study	Societal Challenge addressed	Title	Location/ River Basin	Ecosystem Type	Lead Organisation
1	Food, water and habitat for economically important aquatic species	Securing community land rights and restoring wetlands to enhance biodiversity and ecosystem services (in Hail Haor in Bangladesh)	Hail Haor, Bangladesh; Meghna river basin	Wetland Ecosystem	CNRS, Bangladesh
2	Water and food provision	Improving water security and farmer's income through integrated watershed management in the Datia Watershed	Datia Watershed; Madhya Pradesh; India Ganges river basin	Semi-arid ecosystem	Development Alternative, India
3	Water, soil and pollination services	Demonstrating climate smart agriculture to enhance the resilience of large cardamom farmers in the Kangchenjunga transboundary landscape	Teplejung District, Nepal; Ganges river basin	Mountain ecosystem	International Centre for Integrated Mountain Development, Nepal
4	Food, water, and nutrient recycling	ITC Limited and IUCN collaboration for reviving traditional irrigation systems (ahar & pyne) and enhancing ecosystem services in Asarganj agriscape	Munger District, state of Bihar, India; Ganges river basin	Flood plain agriculture	IUCN India and ITC Limited India
5	Disaster risk, social and economic development	Reducing landslide disasters and creating livelihood Opportunities Through Eco-safe Roads in Nepal	Gandaki province; Ganges river basin	Mountain ecosystem	IUCN and University in Lausanne, Switzerland
6	Regulating and Supporting Services	Engaging community in design and implementation of land-slide and erosion control strategies in the Teesta River Basin	West Bengal, Brahmaputra river basin	Hills and Flood plains	MAUSAM, India
7	Control of river bank erosion and floods	Community experiences with the development of bamboo-grass based embankment to control riverbank erosion	Rowmari upazila, , Brahmaputra river basin, Bangladesh; and Chandapur (Banara River) and Bibapatti (Chaudhar River) in Kanchanpur, Nepal	Flood plains	Oxfam Bangladesh, Gana Unnayan Kendra, Bangladesh and NEEDS Nepal

CASE STUDY 1

Securing community land rights and restoring wetlands to enhance biodiversity and ecosystem services in Hail Haor, Bangladesh

Center for Natural Resource Studies (CNRS), Dhaka, Bangladesh, M. Mokhlesur Rahman

Societal Challenges:

Ecosystem services:

Financial Support: USAID, Management of Aquatic Ecosystems through Community Husbandry (MACH) Project

Timeline: 1999 to 2006

Background

Hail Haor[6] is a wetland ecosystem located in northeast Bangladesh, in the Meghna river basin. It is surrounded by hills in the north and east. Hail Haor includes a variety of land use types, including wetlands, swamp forest, marshes, agriculture fields and rivers.

[6]Marshy wetland ecosystem in the north eastern part of Bangladesh covering the districts of Sunamganj, Moulovibazar, Sylhet, Kishorganj and Netrokona

For 7-8 months of the year, most of the area of Hail Haor is flooded, extending to over 13,000 ha in the peak of monsoon. In dry season, the water is restricted to deeper pockets, locally called "*beels*" (wetlands), of different sizes, ranging from 2 ha (Jethua Beel) to more than 100 Ha (Baikka Beel) and covering a total area of 3,000 ha. The Hail Haor provides habitat for more than 70 indigenous fish species and also wintering ground for rare and endangered migratory bird species such as Teal (*Anas crecca*).

The ecosystem services of the Hail Haor support the livelihoods of more than 170,000 people living in 60 villages around the haor. The majority of people in these villages depend on agriculture and fisheries as their main source of livelihoods. The beels provide water for irrigation for the boro (winter) rice and also act as breeding sites for economically important fish and aquatic biota.

The ecosystem services at the Hail Haor were declining. A variety of factors contributed to this decline, including overexploitation of water resources, the land-use changes promoting conversion of perennial beels for agriculture and aquaculture activity and increasing rates of sedimentation of beels (due to forest degradation and intensive agriculture practices on the hill slopes). These changes have also severed the connectivity of the beels with the Manu River and affected the inundation pattern and local fish migration.

The problems are further accentuated by a lack of community engagement in wetland management. Government land use policies fail to support community rights for fisheries in beels. There are also ambiguities and conflict around the institutional roles and responsibilities. The Ministry of Land (MoL) is responsible for leasing the beels for fisheries, whereas, the Department of Fisheries (DOF) is responsible for the implementation of the Fish Act, Bangladesh (1950), which aims to promote conservation and sustainable utilisation of fishery resources in country. These ambiguities also precipitate conflict at the community level. In the dry season, farmers cultivate water intensive winter rice (boro rice). The increase in the rice cultivation area over the years and over-extraction of water from beels is a source of conflict between farmers and fishermen.

Activities

During the project inception phase, intensive consultations with local communities (farmers and fishermen) was facilitated to identify main challenges and solutions. The lack of community rights to use the beels, habitat degradation and over-extraction of natural resources were identified as the main reasons for the decline in ecosystem services. The fishermen requested the project to secure community rights on beels, design interventions to improve the management of wetlands and reduce water abstractions for irrigation in the dry season.

Figure 5: Participants of the 2nd NbS training of GBM CSO Network surveying the Baikka Beel Sanctuary, Hail Haor, Bangladesh© IUCN

To establish a baseline, the project initiated research and community surveys and estimated the economic value of the ecosystem services provided by Hail Haor. The value of fisheries, non-fish aquatic products and agriculture benefits from Hail Haor was estimated at US$ 8 million annually in 2000.

In 2000, the project secured a 10-year lease for the communities to manage the beels. The leased area was divided into eight village clusters and a Resource Management Organisation (RMO), led by local communities, was created for each cluster. The RMOs included user communities of all socio-economic groups, including fishermen, and were linked to government-led processes, such as the Local Government Committees (LGCs), headed by the Chief Executive Officer of the sub-district.

To strengthen the capacity of RMOs on wetland management, the project facilitated trainings and learning visits on wetland restoration and management. Micro-credit schemes were also initiated to diversify livelihoods and decrease the dependence of the local community on agriculture and fisheries.

Figure 6: Members of Baragangina RMO during their interaction with GBM CSO Network, Hail Haor, Bangladesh © IUCN

With the support of RMOs, community conserved areas were created at eight sites within the Hail Haor, including the Baikka Beel. The RMOs were given the responsibility of wetland monitoring, raising awareness on the importance of wetland resources among local people and implementation of micro-credit programmes for alternative livelihood generation. In consultation with poor fishermen and farmers, the RMOs developed management plans for each site. They also initiated habitat restoration activities, excavating beels and drainage canals (khals) to increase the water retention capacity and facilitate movement of fishes across beels and planting local tree species, such as Hijol or Indian oak (*Barringtonia acutangula*) to reduce soil erosion and increase water retention. RMOs worked to restock indigenous economically important fish species and promote agriculture practices that reduce soil erosion, such as adoption of contour farming on hills. They also supported a shift to less water intensive cash crops (maize, oil seeds, and pineapples) to reduce water extraction from the beels and nearby stream.

Results

The restoration of the wetland habitat increased the total economic value of Hail Haor by approximately 25%, from USD 8 million in 1999 to USD 10.9 million/year in 2006[7] due to improved management of resources compared to baseline situation (1999).

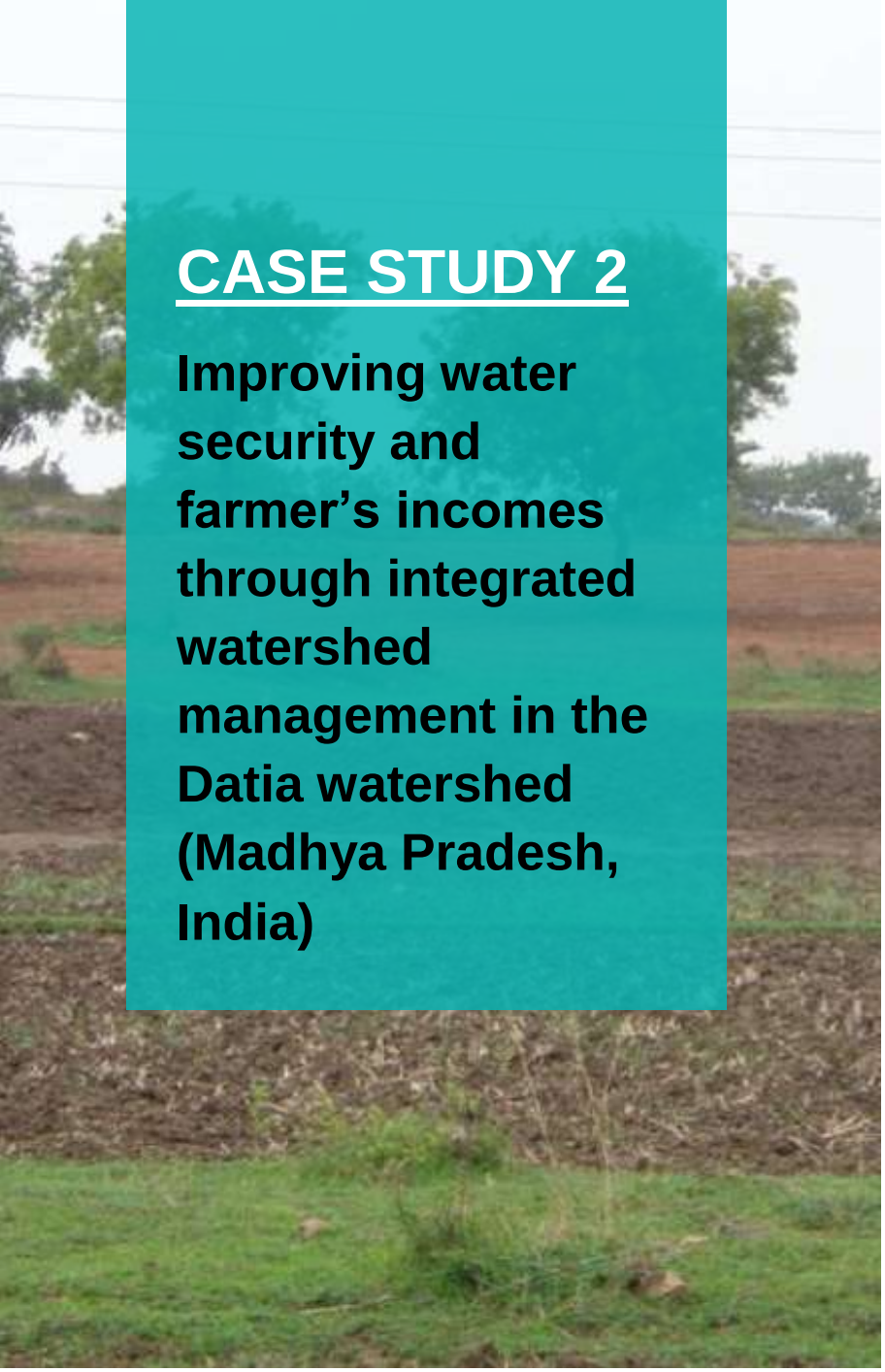
The diversity of water birds visiting the Baikka Beel more than doubled, from 18 species in 2003, to 39 species in 2019. A 33% increase in fish consumption was recorded among the households living within catchment the Hail Haor from 2000 to 2004, particularly benefiting the landless and marginal farmers.

In July 2003, the Ministry of Land designated Baikka Beel as a permanent sanctuary, giving up an annual lease income of about US$1,500, and recognised the Baragangina Resource Management Organization (RMO), led by the communities, as the custodians of the beel. Thus, RMOs responsibility to protect the sanctuary and educate the wider community on the need for its conservation and sustainable use was officially recognised.

Lessons Learned

The recognition of community based institutional mechanisms and the creation of Baikka Beel Wildlife Sanctuary by the Ministry of Land was an important factor in the sustainability of the activities initiated by the project. Among the eight RMOs established in the Hail Haor area, only Baikka Beel RMO is still functional. The benefits from the creation of Baikka Beel sanctuary are felt at the landscape level. The sanctuary has increased fish populations in the nearby beels, which is reflected in the increase in the household fish consumption. The increase in bird population in the area provides opportunities to generate additional income through tourism.

[7] Economic Value of Bangladesh Wetlands MACH (Technical Paper 6), Paul Thompson and Luke Colavito



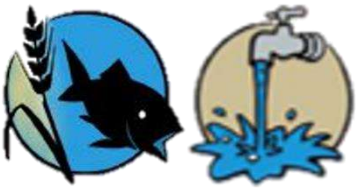
CASE STUDY 2

Improving water security and farmer's incomes through integrated watershed management in the Datia watershed (Madhya Pradesh, India)

Development Alternatives, Gitika Goswami; Satabdi Mohapatra; and Kavya Arora

Societal Challenges:

Ecosystem services:



Financial Support: Department of Science and Technology, Government of India, Climate and Development Knowledge Network (CDKN)

Timeline: 2014-2018

Background

The Datia watershed is located in Datia block, in the Bundelkhand region of Madhya Pradesh, India. The 5,527 ha watershed is drained by small seasonal rivers including, Sindh, Pahuj, the Mahuar and the Betwa, and supports a population of more than one hundred thousand people.

Figure 7: View of a traditional farmstead Datia District, India© Development Alternatives

Historically, the Bundelkhand region was thickly forested[8] but is increasingly characterized by bare hilly terrain with sparse vegetation. Agriculture is the main source of livelihood for residents, and increasing population and demand for agricultural land have led to decreased forest cover. At the village level, the irrigation infrastructure is not well developed, and there few non-farm livelihoods or income-generating opportunities for local farmers to support themselves in case of crop failure. Low quality soil also contributes to high surface runoff during the monsoon (July-August). Water is scarce and women have to travel long distances to fetch water for basic needs. Across the Bundelkhand region, low income levels are reflected in the high incidence of malnutrition among children and cases of farmer suicides due to indebtedness. Climate change and recurring droughts in the region have further decreased agricultural productivity, making this one of the poorest regions in the country.

Activities

To improve agriculture productivity and farmers' income, Development Alternatives initiated integrated watershed management in the Datia Watershed in 2014. The project collaborated

[8] Bundelkhand Drought: Retrospective Analysis and Way Ahead. National Institute of Disaster Management, New Delhi

with academic institutions to conduct GIS mapping of the watershed and identify degraded areas for restoration. During both the planning and implementation phases, multiple consultations were done with academic partners, such as Environment Planning and Coordination Organisation (EPCO), National Institute of Disaster Management (India), Institute of Development Studies (University of Sussex) and Kings College, London to ensure comprehensive project design.

The project applied a ridge to valley[9] approach to identify sites for the creation of water

Figure 8: Farmers Club Meeting on the Integrated Watershed Management Strategies, Datia Watershed ©Development Alternatives

conservation structures, such as increasing vegetation, developing check dams and deepening water channels. At higher elevations, the project initiated tree plantation to increase green cover and also constructed ponds and check dams to maximise water retention and reduce surface run-off. The approach was modified in flat lands around agricultural fields, where the reopening of water channels and planting of trees/grasses around the fields was completed to improve soil moisture. The ridge to valley approach is promoted by the governments to provide a holistic approach to watershed management and has been tested by Development Alternatives in other parts of the Bundelkhand region since the 1990s.

A Watershed Committee (WC) was formed with representatives from local government (Panchayat/Gram Sabha), as well as farmers, women and other marginalised groups. The major role of the WCs was to monitor execution of water and soil conservation measures initiated by the project.

[9] Ridge to Valley - A Holistic Watershed Perspective (WOTR India)

The WCs were trained on watershed management strategies and designing of soil and water retention structures, such as check dams and ponds, to improve rain water availability at the landscape level. Under the WC's supervision, tree species such as Amaltas (*Cassia fistula*), Gamharm (*Gmelina arborea*), Saguan and Khair (*Acacia catechu*) were planted in the degraded areas.

The project also facilitated targeted capacity building workshops for the local farmers, particularly targeting women self-help groups on climate resilient agriculture practices, such as the wadi model[10] (agro-forestry system) and agriculture diversification strategies (crop-livestock integrated farming), to reduce farmers vulnerabilities to crop failures and associated economic loss. Farmers were motivated to plant fruiting trees such as guava, papaya, mango, lime and pomegranate to meet their household needs, as well as woody species such as Subabul (*Leucaena leucocephala*) to provide firewood decreasing dependence on the nearby forest area. The project also supported the local forest department in the restoration of degraded forest areas in the watershed.

Figure 9: Women-farmers and beneficiaries of the training workshops on climate smart agriculture practices, tending their crop, Datia Watershed, India © Development Alternatives

To improve the farm income, farmer clubs and women's self-help groups were developed and members were trained on integrated farming practices such as agri-horticulture or vegetable cultivation, promotion of organic farming and the use of varmi-composting. A Watershed Development Fund was established, as a revolving fund to provide micro-credit services for

[10] Wadi: A model for sustainable tribal livelihood

initiating businesses. The WC's were given the responsibility to manage the funds and ensure their proper utilisation.

Results

The project led to the greening of more than 360 Ha of watershed, which included tree plantation in 60 ha of community land and 200 Ha of forest and promotion of fodder and vegetable cultivation in 100 ha of non-productive land in four villages located within the watershed.

There has been a 30 percent enhancement in the average income of farming households annually, due to improved water availability and diversification of agriculture.

Figure 10: A farmstead benefitting from improved irrigation and livelihoods diversification strategy, Datia Watershed, India © Development Alternatives

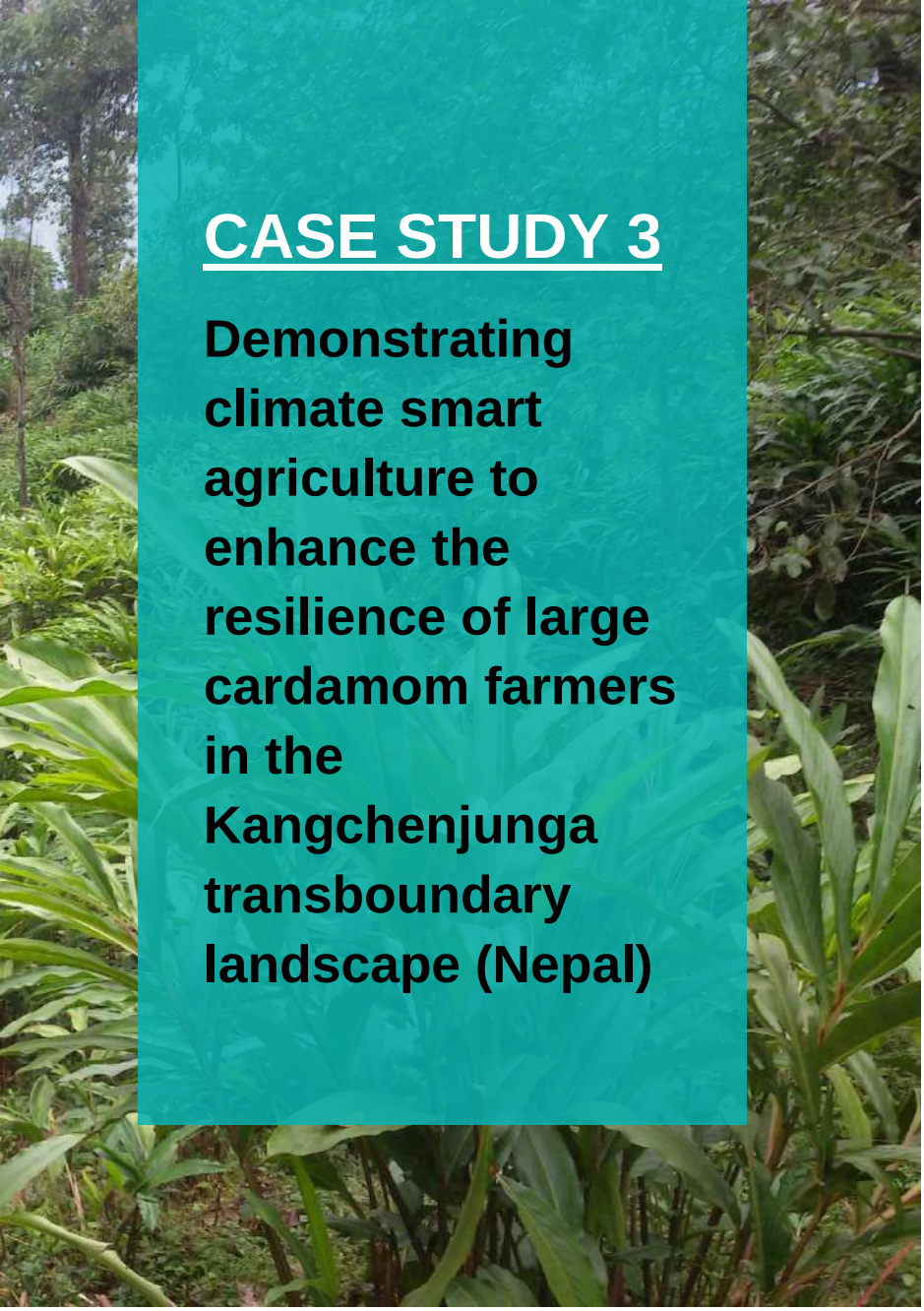
Farmers were trained on improved agriculture techniques such as multi-cropping, agri-horticulture models and water conservation strategies. The beneficiary farmers now harvest 2-3 crops as opposed to just one earlier.

Figure 11: Water storage pond in a farmstead to harvest and channelize rainwater, Datia Watershed, India © Development Alternatives

In the eight project villages, a total of 71,000 cubic meters of rainwater harvesting potential was created through the development of ponds, check dams, and an overall increase in the green cover in the watershed. An average increase in the groundwater level of 0.48 meters was recorded in 78 wells in the seven villages monitored during April 2014-June 2017.

Lessons Learned

The case highlights that the success of integrated watershed management depends on a clear understanding of the different land use types, and the engagement of different stakeholders including, farmers, local government and technical experts in the design and implementation of restoration initiatives. This example also highlights the potential for hybrid solutions (including NbS and non-NbS components) to tackle water scarcity and irrigation challenges in the semi-arid agriculture systems.



CASE STUDY 3

Demonstrating climate smart agriculture to enhance the resilience of large cardamom farmers in the Kangchenjunga transboundary landscape (Nepal)

International Centre for Integrated Mountain Development, Kathmandu, Nepal, Surendra Raj Joshi; Sanjeev Bhuchar; Min Bahadur Gurung; Anu Joshi Shrestha; Harish Chilwal

Societal Challenge:

Climate change mitigation and adaptation

Ecosystem service:

Provisioning Services Food

Provisioning Services Water

Provisioning Services Nutrient Cycling

Financial Support: European Union (EU)

Timeline: 2012-2018

Background

The Kanchenjunga Landscape (KL) is a high altitude transboundary landscape spreading across Nepal, India and Bhutan. Large cardamom (*Amomum subulatum*) is one of the niche products of this landscape and also the main cash crop grown by small farmers. Due to the ability of large cardamom to provide a high return per unit of land, it is considered 'black gold' by the local farmers.

Surveys indicate that large cardamom contributes approximately 30% of the annual household income, ranging from USD 650 per household per year (ITC 2017) in Nepal, to approximately 800-900 USD in Bhutan and India.

In the last decade, Nepal has overtaken India as the world's biggest producer of large cardamom with a 68% share in the market. In Nepal, more than 21,960 households in 51 districts are engaged in its farming. The area under cardamom plantation has increased by 20% from 12,584 Ha in 2010 to 15,055 Ha in 2018, and from 37 districts in 2007 to over 51 districts in 2017 (Shrestha 2018).[11]
However, climate change and price fluctuations have impacted the productivity of large cardamom and increased the farmers' distress and poverty. Rising temperatures, loss and degradation of forest cover and decreasing abundance of pollinators have led to changes in the flowering and harvesting time, affecting small farmers in large cardamom growing areas.

Figure 12: View of a conventional farm of large cardamom in Nepal © ICIMOD

A survey of large cardamom farmers indicated that the farmers in Taplejung are facing a reduction in yield due to viral diseases including chirke and furkey, as well as the degradation of soil conditions. Furthermore, the crop is highly vulnerable to price fluctuations, for example in 2014, farmers received USD 28 for one kilogram of large cardamom, but in 2017 price dropped to USD 10. This situation clearly indicated that traditional agriculture management practices are not able to cope with the climate change and market fluctuations. In addition, many farmers have shifted from food crops to large cardamom plantations, making local food security a priority concern for the communities. Considering the need to support local farmers for the adoption of climate smart agricultural practices and integrated management of forest, wetlands and agriculture at the landscape level, ICIMOD initiated the Rural Livelihoods and

[11]Shrestha, K.P. (2018). Growth Trend Analysis of Large Cardamom in Nepal. Nepalese Horticulture, Vol. 13, 2018

Climate Change Adaptation in the Himalayas (Himalica) Project[12] initiated a demonstration of Climate Resilient Agriculture (CRA) practises in the Taplejung district of Nepal.

Activities

To implement the project, a partnership was established between key government agencies (industry, agriculture and environment), the Environment Conservation and Development Forum (ECDF), Nepal; SAARC Business Association of Home based Workers (SABAH), Nepal; and the District Chamber of Commerce.

The project completed ecosystem assessments of large cardamom-based farming systems to gain insight into ecosystem health and trends in climate change impacts.[13] The study found, from 1996 to 2015 land under forest cover, which includes government managed forests and community managed forests, decreased slightly. But there was a significant increase in the area under agro-forestry enterprises, such as large cardamom plantation and crop farming terraces. During the household surveys, participants indicted a decline in both freshwater availabilities impacting the productivity of large cardamom farms. Based on the household survey, 12 large cardamom farms (from 296 households) were selected in the Taplejung District for the demonstration of climate smart agriculture practices at the landscape level.

The project facilitated training of farmers on a package of practices (POP) focusing on climate smart measures with the technical support from ECDF. These included, a) promotion of local varieties that are resilient to extreme weather conditions; b) promotion of organic agriculture, including the development and use of Jholmal – a homemade bio-pesticide and bio-fertilizer made from green manure and cow urine; c) mulching and inter-cropping to maintain soil health/organic matter; and d) use of mobile technology to disseminate information on soil types, disease and pest management, timing for the planting of the crops, and information on the prevailing price and demand-supply status of large cardamom. Measures to improve water use efficiency were introduced, such as drip and sprinkle irrigation. Soil moisture was conserved through mulching, planting of local shade tree species and rainwater harvesting. In addition, small pits (0.5–1 ft deep and 1 ft diameter) were dug between every 3-4 cardamom clumps to collect water and increase soil moisture.

Raw cardamom pods contain 80% water at the time of harvesting. Therefore, before selling them in the market, the farmers dry the pods using traditional dryers, which depend on fuelwood sourced from nearby forest areas. The project collaborated with Nepal Commercial Agriculture Research Programme and developed energy efficient dryers, which were about twice as fuel-efficient as the local dryers (bhattis), and these were distributed to the farmers in the demonstration area.

[12] ICIMOD Himalica Initiative
[13] A Multi-Dimensional Assessment of Ecosystems and Ecosystem Services in Taplejung, Nepal

To further increase the farmers' incomes, the project promoted processing of the raw cardamom to develop market-ready products, such as cardamom tea mix and cardamom spice powder (biryani masala). In partnership with SABAH, the project developed the CARDAMONIA market strategy - which included, a) development of cardamom mix soft drinks and cardamom-based products and their promotion by chain of village café and restaurant chains managed by SABAH; and b) series of trainings workshops focusing mainly to women entrepreneurs were organised to develop value added products with the brand name *'Himalica- Green Products from the Mountains.'*

Figure 13: Training of women entrepreneur on product diversification and value addition using different parts of large cardamom© ICIMOD

A Spice Garden Tourism concept was developed in partnership with Nepal Tourism Board; the Trekking Agencies' Association of Nepal; Wolfmatrix pvt. Ltd, Nepal; and the Environment Conservation and Development Forum. Local youth and communities received training on homestay tourism, hospitality management and guiding trekking. A community enterprise, Kangchenjunga Himalica Agriculture Industry (KHAI), was registered with 13 members (10 women) and established an office in Kathmandu. Farmers were also trained in bee keeping for both income generation and pollination services.

Results

Overall, there was a 50% increase in the productivity of large cardamom yields, from 112 kg/Ha to 163 kg/Ha, contributing to an increase in annual household income from 600 to 770 USD.

Five community irrigation schemes were developed, and two natural ponds, Lalitar Pokhari and Pathiverafedi Kalipokhari, were rehabilitated, through the removal of silt and garbage, planting of multi-purpose indigenous tree species to create a natural fencing of the ponds, and the cleaning of water channels that bring water into the pond from nearby hills.

Figure 14: Integrated large cardamom farm after the adoption of package climate smart measures by local farmers in Taplejung District, Nepal © ICIMOD

The adoption of POP along with rotational harvesting of shade trees, integration of beekeeping and legumes, and other crops resulted in a number of biodiversity benefits such as improved abundance of natural pollinators, better growth of large cardamom plants and less consumption of fuel wood. The rehabilitation of natural ponds led to improved water retention in the soil and growth of lush green vegetation around the rehabilitated ponds. All beneficiary households adopted at least one element of the POP. For example, 64 household prepared vermi-compost pits and 21 households set up smokeless drying facilities. The project directly benefitted 285 households through improved water availability. Traditionally, farmers were selling cardamom pods in 40kg sacks. The trainings supported farmers to produce and sell value added products from cardamom pods, increasing the household income from cardamom by 50%-100%. The newly established Kangchenjunga Himalica Agriculture Industry generated a turnover of USD 12,000 in its first year of operation, 40% of which went to the community to which the members belonged.

At the request of local municipal government, the project supported the formulation of a five-year Strategic Action Plan and Vision for Agriculture Development in 2018 for the Taplejung municipality. The plan is aligned with Nepal's Agriculture Development Strategy (2015- 2035), and integrates the learnings from the project demonstration sites.

Lessons Learned

Improved water use efficiency at the farms, coupled with the diversification of livelihoods, such as, processing of raw large cardamom to create value added products made the beneficiary families more resilient to price fluctuations compared to the control group. The productivity of large cardamom plantations can be enhanced with climate smart agricultural practices, and without any use of chemical fertilizers. This requires promoting a package green agriculture practices - plantation of local fruit trees to provide shade to the large cardamom crops and reduce soil erosion, and restoring two natural ponds to improve soil moisture.

CASE STUDY 4

ITC-IUCN collaboration in reviving traditional irrigation systems (ahar-pyne) and enhancing ecosystem services in Asarganj agriscape

ITC Limited, Manjunath Lakshmikanthan; Columbia Global Centers, Aditya Petwal; International Union for Conservation of Nature and Natural Resources, Archana Chatterjee

Societal Challenge:

Ecosystem service:

Financial Support: ITC Limited

Timeline: 2016-2019

Background

South Bihar in India is located in the flood plains of the Ganges river basin. The region is characterised by the presence of numerous wetlands interspersed with agriculture fields. The farmers traditionally practice the ahar-pyne system for irrigation and flood management.[14] Under this system, a network of water channels (pyne) are dug into the soil and connected to small retention ponds.

[14] Ahar pynes: Traditional flood harvesting systems of South Bihar

This network of channels helps to transfer river and rain water to nearby agricultural fields to irrigate kharif (mostly paddy) and rabi (wheat or gram) in winter season. The ponds (ahar) and channels (pyne) also help reduce the impacts of floods during the monsoon by channelizing excess water into ahar's. Additionally, the ponds provide opportunities for income generation for farmers, through provisions of fisheries and other flood based agricultural crops, such as water chestnut.

However, the practice of ahar pyne is under decline and several of these traditional ponds have been encroached upon or suffered from siltation. During 1930 to 1997, areas under ahar pyne agriculture system declined[15] from 0.94 million ha to 0.53 million ha. This has increased the vulnerability of local farmers to floods, which are becoming more pronounced due to climate change and the absence of an integrated land use management strategy.

Overall, the productivity of agriculture in the Munger district is also declining. Research[16] by ICAR shows that limited livelihood options, a lack of integrated farming system models and small and fragmented land holdings are the main challenges contributing to the underdevelopment of the region. The research also identifies multiple economic benefits of farming models that promote multiple uses of ponds and wetlands, thorough integrated fish, agriculture, horticulture and aquatic crops.

Figure 15: Agriscape in Chorgaon, Asarganj Munger, Bihar, India ©ManjunathL

IUCN and ITC Limited, a diversified Indian conglomerate, initiated a collaborative study in 2016, which reaffirmed the need to revive the ahar-pyne system to improve the productivity agriscapes. A pilot initiative was taken up to revive the ahar-pyne system and demonstrate the role of landscape management strategies in enhancing ecosystem services (provision of water and pollinators) for optimum agriculture yields.

[15] Traditional water management systems - An overview of Ahar-pyne system in South Bihar plains of India and need for its revival

[16] Livelihood Improvement of Underprivileged Farming Community : Some Experiences from Vaishali, Samastipur, Darbhanga and Munger Districts of Bihar

For pilot, three villages (Chaurgaon, Sajhua and Makwa) in the Asarganj block of Munger district were selected for project intervention. The total population of these three villages is approximately 12,000 people. More than 90% of households are below the poverty line and include marginal farmers and landless labours engaged in agriculture.

Activities

Figure 16: Farmers meeting on the side of traditional Ahar (pond), Asarganj, Munger, Bihar, India ©ManjunathL

The project conducted satellite-based land use land cover (LULC) mapping of Asarganj block to understand different land uses and their interactions at the landscape level. In Asarganj, 95.1% of the land was found to be cropland, 0.22% is waterbodies and 1.45% has tree cover. The remaining landscape is settlements, riverbed and barren land. No natural forest were reported in the Asarganj block.

On-ground assessments and community consultations confirmed that ahar and pynes are disappearing. Sajuwa village had more than 20 ponds in 2000, with only five ponds currently remaining. The community recognised the role of these ponds in buffering against the impacts of floods, and providing other services such as wastewater treatment, water recharge and the provision of water for irrigation, cattle and fisheries.

Consultations with farmers and key respondent interviews also indicated a decline in the abundance of pollinators across the Asharganj block. Farmers also reported a decline in the population of earthworms and termites, blaming the overuse of pesticide for poor soil health. The LULC mapping indicated that Asharganj block has long stretches of agriculture fields without much green cover, a potential reason for the decline in the population of pollinators such as bees. Therefore, the project initiated tree plantation to create habitat for birds and pollinators and reduce soil erosion and the siltation of wetlands. Nearly 9000 tree species, such as *Sesbania grandis, Dalbergia sisson, Syzygium cumini, Ziziphus mauritiana, Artocarpus heterophyllus* and *Moringa oliefera,* were planted in the three pilot villages, on the field bunds and around wetlands. One of the important consideration in the selection of tree species was its utility for local farming community, for example Sesbania is a leguminous tree and thus helps improve the nitrogen in the soil, provides fuel wood, and the flowers and leaves are commonly eaten in South Asia, Moringa fruits and leaves are used as vegitables and revered for its medicinal values (treating asthma, diabetes, obesity, blood pressure) and Syzgium is favoured for its fruit, timber, and ornamental value.

Figure 17: Farmers engaged in restoration of ahar-pyne and plant protection activities, Munger, Bihar, India ©ManjunathL

The project supported capacity building of farmers through workshops and on-farm demonstrations on water use efficient Climate Smart Agricultural practices, pest and disease management, and integrated farming strategies in floodplain agriculture systems to help enhance the income of the farmers.

Two ponds (ahar) were selected for restoration and their connectivity with other pond systems was enhanced through digging new channels (pynes). To increase the depth of the ponds, the community was engaged in desilting of ponds and planting of Napier grass (*Cenchrus purpureus*) and multi-purpose tree species around the ponds. To make these ponds ready for integrated fish and agriculture farming, they were treated with Mahua (*Madhuca* sp.) oil cake,

lime and cow dung slurry. Community-led pilots were initiated at these sites, to demonstrate the potential of integrated water chestnut-fisheries farming models in improving farmers' incomes. Both ponds were stocked with fish fry and a protocol for monitoring the ponds was developed in consultation with the farmers participating in the pilot demonstration.

Results

Figure 18: Farmers harvesting fish from restored ahar (pond), Chargaon, Munger Bihar ©Mr ManjunathL

The project made a business case for conservation of the ahar-pyne system. The water user groups who participated in the demonstration were able to generate a profit of 6000 to 8000 Indian Rupees (100 USD) from water chestnuts (*Trapa natans*) grown in 10% of the ahar; and 70,000 to 80,000 (1,000 USD) with fish cultivation. The ahar-pyne system also provided critical irrigation post-monsoon and enhanced rabi wheat cultivation by 74% in the area.

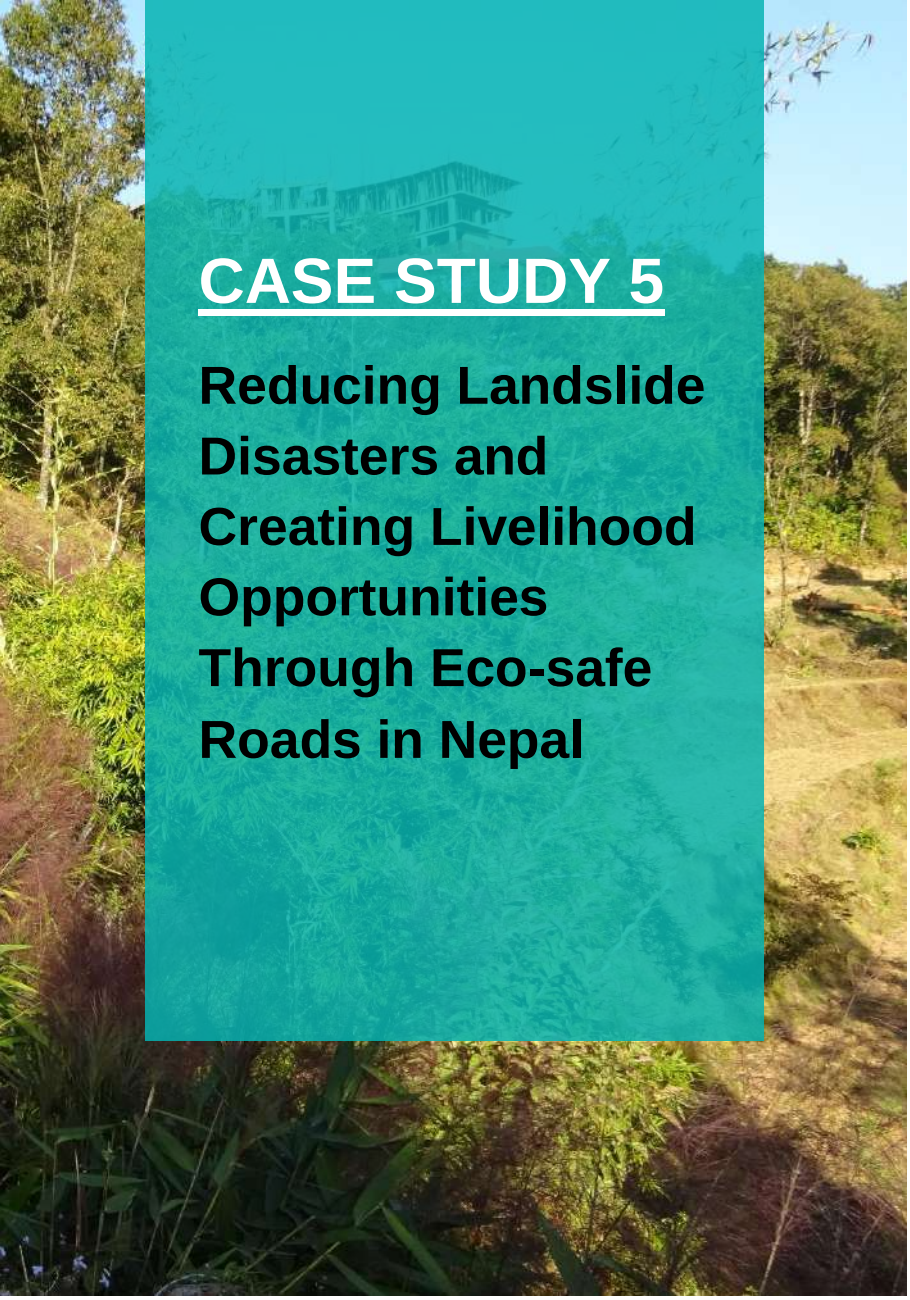
The project created awareness among the local farming communities on the advantages of conserving traditional ahar-pyne systems as well as the importance of local stewardship for the maintenance and conservation of wetlands.

The lessons learned from the project were consolidated to develop a toolkit on sustainable agri-scape development. The plan was submitted to the state government, and a formal

collaboration with District Rural, Development Agency (DRDA), Rural Development Dept. was established in March 2021, to restore the entire ahar-pyne system in Munger through MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme). During phase II, ITC Limited supporting the development of plans for replicating agriscape management concept in other locations, such as, in Ghod river basin, Maharastra, and Bhavani river basin in the state of Tamil Nadu.

Lessons Learned

It is critical that assessment of the problem is done with a landscape approach (agriscape). There is a need to address challenges using approaches that not only strengthen ecosystem services, but also have a positive economic impact on most vulnerable groups. For example, consultations with local communities indicated that the loss of ahar-pyne system and dearth of pollinators were main reasons for low agriculture productivity. This led to the design of a targeted intervention around the revival of ahar-pyne system and improving the green cover at the landscape level to enhance ecosystem services.



CASE STUDY 5

Reducing Landslide Disasters and Creating Livelihood Opportunities Through Eco-safe Roads in Nepal

Government of Nepal, Pem Narayan Kandel; Independent expert, Sanjaya Devkota; International Union for Conservation of Nature and Natural Resources, Anu Adhikari

Societal Challenge:

Disaster risk reduction

Ecosystem service:

Erosion Control

Financial Support: Germany's Federal Ministry of the Environment, Nature Conservation and Nuclear Safety's, International Climate Initiative (BMU-IKI)

Timeline: 2012-2017

Background

Rural earthen roads are a lifeline for local communities in Nepal. The abundance of earthen roads has increased by more than 15 times, from approximately 200 km in 1998 to over 56,000 km in 2016. The roads are often constructed by the communities without formal engineering assessment and design. The roads are often closed for months during and after the monsoon due to slope failure and debris deposits, as they have poor drainage systems and limited slope protection measures. Thus such roads require annual re-construction with large investments to clear debris and to keep them operational.

Although these roads are important for the socio-economic development of the communities, the increasing concentration and haphazard development of the rural earthen roads is one of the leading cause of slope failures, land-slides and soil erosion in many hill districts in Nepal,

including the Gandaki Province.[17] The Nepal government recorded 115 deaths from landslides in hilly districts, from April-July 2020 (MoHA, Nepal 2020).

The Ecosystems Protecting Infrastructure and Communities (EPIC) project (2012-2017), led by IUCN and partners, initiated pilots to reduce the landslide vulnerabilities of the local communities in three hill districts, in the Gandaki, Syangja, Kaski, and Parbat. The pilots demonstrated value of ecological engineering[18] approaches in simultaneously reducing the risk of landslides by creating '*eco-safe roads'* and generating additional income for local communities.

Activities

Figure 19: Villagers preparing site for the demonstration of eco-safe roads in Gharelu Village, Nepal ©Sanjaya Devkota

To develop baseline information, the project established a partnership with local and international universities for Geographic Information System (GIS) mapping, land use changes and identification of erosion and landslide hotspots in the three selected districts. The baseline studies conducted by University of Lausanne (UIL), Switzerland observed that the rate of soil erosion in the Tilahar Village (Parabat District) was approximately 30 cubic meters during the

[17] Haphazard construction of rural roads causing landslides
[18] Ecological Engineering: A New Paradigm for Engineers and Ecologists

monsoon season in 2014. In the watershed of Phewa Lake (Kaski District), the research documented an increase in the road network from 23 km in 1979 to 305 km at the end of August 2016, identifying 174 landslides hazard zones in the area.

Based on the vulnerability of the community to landslides, three sites were selected in pilot districts to demonstrate eco-engineering solutions for landslides and soil erosion control. After the identification of pilot sites, IUCN supported local partners in establishing pilot demonstration sites through engaging local communities and sharing information on site-specific vulnerabilities.

Each demonstration site applied a range of slope stabilization measures, including the construction of low cost drainage canals along the roads and drystone protection wall, live fence palisades and live check dams. At each pilot site, fruit bearing trees were planted along the road to stabilize the soil and provide additional income for the local community. Additional soil stabilization was provided by the plantation of local grass species. Seven species were selected by the local communities including, broom grass or Amriso (*Thysanalaena maxima*), Urlo Khar (*Cymbopogon microtheca*), Napier (*Penniseluim purpurreum*), Salim Khar (*Chiysopogon gryllus*), Babiyo (*Eulaliopsis binate*), Kush (*Cannabis indica*) and Kans (*Saccharum spontaneum*). An additional species, Vetiver (*Chrysopogon zizanioide)* was chosen based on expert advice. Research indicates that a single broom grass plant can bind an average 3.8 cubic meter of soil and thus can stabilize the slopes along the roadsides, significantly decreasing the soil erosion and vulnerability to landslides. In addition, a Rhizotron[19] was installed to study the soil characteristics and its interactions with plant roots.

Figure 20: Rhizotron plot at the Gharelu Village, Nepal ©SanjayaDevkota

[19] techniques for measurement of root system parameters, such as growth rate, soil penetration as well as interaction of roots with the soil flora and fauna using non-destructive and repeated observations.

At the three sites, total 50,000 grass seedlings were planted along the road, and low-cost civil engineering structures, including walls made from local stone, were erected where immediate support was needed. Other measures to stabilize the slopes included use of bamboo poles to construct fascines.[20] In dry and fragile soil slopes, jute netting was installed to allow the species to grow and prevent further soil erosion.

To create additional livelihood opportunities for the communities, the project facilitated capacity building workshops on the development of marketable products, such as brooms, from the broom grass species. In Parabat District, the project developed a women's self-help group and linked it to the District Micro-Entrepreneurs' Group Association, opening up additional avenues for income generation. Three nurseries, with a total annual capacity of more than 100,000 seedlings, were established with support from the District Soil Conservation Office. In Tilahar, a nursery with an annual capacity of 50,000 seedlings was established and is managed by communities.

The project facilitated four national workshops to ensure wider dissemination of the lessons learned and integration into policy. The national workshops involved more than 300 national and local government officials. At least 52 people from sectors not directly involved in the project visited the demonstration sites to gain first-hand experience of the practical application of eco-engineering in reducing community vulnerability to landslides and soil erosion.

Results

Monitoring of the demonstration sites indicated that the eco-engineering measures considerably reduced soil erosion rate. In Tilahar village, the project calculated losses of 30 cubic meters of soil during the monsoon season in 2014. In 2015, the slopes were stabilised by planting trees and grass species on slopes along the road and low concrete wall (toe wall) was developed in the steeper parts to prevent slippage or spreading of the soil. Results from 2016 demonstrate that soil loss was reduced to 1.5 cubic meters after the 2015 monsoon. The results demonstrate ecological engineering is very effective in reducing the extent of slope failure and soil erosion.

The project demonstrated additional benefits for communities from eco-safe roads, through the generation of extra income from selling of grasses and shrubs for fodder, sale of brooms from Amriso (*Thysanalaena maxima*) and fruits from the trees planted along the road to control soil erosion.

[20] Bundles of live woody stems that, when planted in trenches, grow into clumps of erosion-fighting vegetation.

The project published *Community-based Bio-engineering for Eco-safe Roadsides in Nepal,*[21] a training manual based on the lessons learned from implementation. The manual provides guidance to communities and local government agencies on the occurrence, assessment and mitigation of road construction-induced landslides and erosion. Throughout the project, more than 66 community members were trained in the technical aspects of eco-engineering.

Figure 21: A women farmer planting broom grass along the roadside close to her agricultural field, Tilahar village, Nepal@IUCN

The learnings from EPIC programme were replicated at other sites through IUCN's Up-scaling Mountain Ecosystem-based Adaptation (EbA)[22] project in 2017. A Green Climate Fund (GCF) proposal titled, *Improving Climate Resilience of Vulnerable Communities and Ecosystems in the Gandaki River Basin*, *Nepal* was developed in 2016 to upscale the project learning at the basin level. The Gandaki basin project was approved in 2020[23] and will run for 7 years. It aims to reduce the impacts of landslides and floods on local communities through implementing EbA across the Gandaki basin in Nepal. The project will be executed by Government of Nepal - Ministry of Forests and Environment.

[21] Community-based Bio-engineering for eco-safe roadsides in Nepal
[22] Scaling-up Mountain EbA (Using Nature-based Solutions to adapt to Climate Change)
[23] Improving Climate Resilience of Vulnerable Communities and Ecosystems in the Gandaki River Basin, Nepal

Lessons Learned

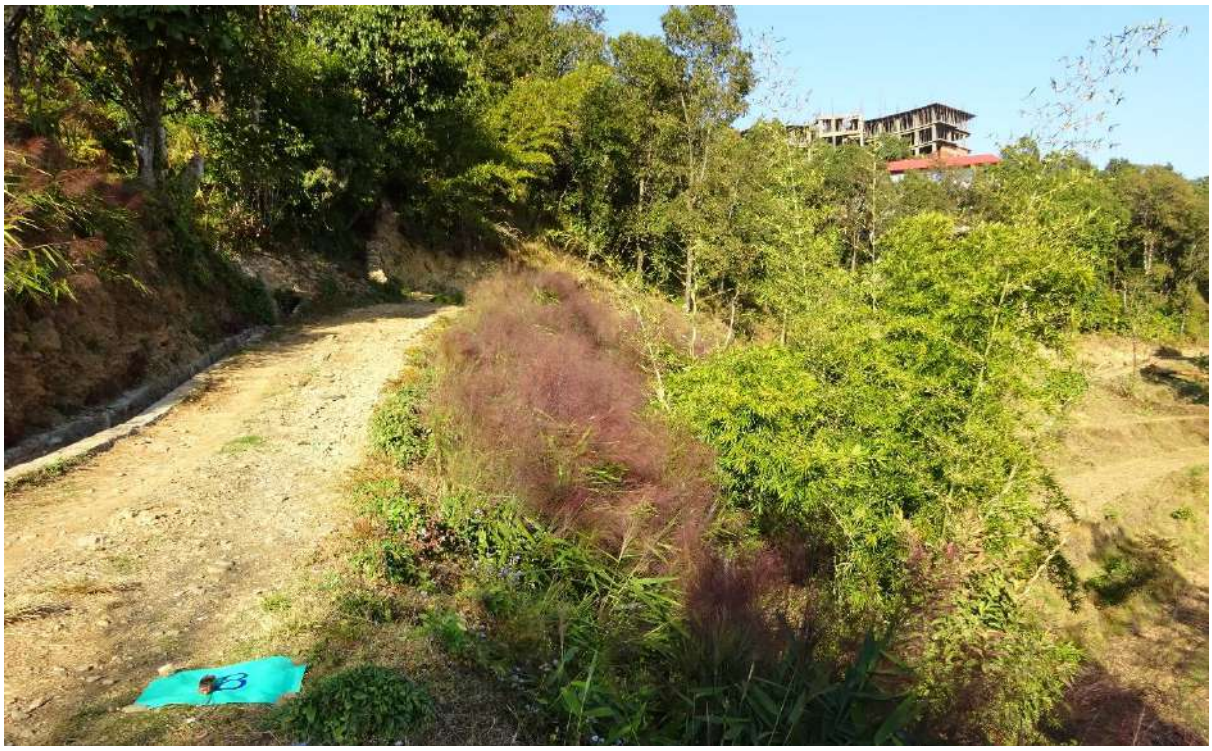
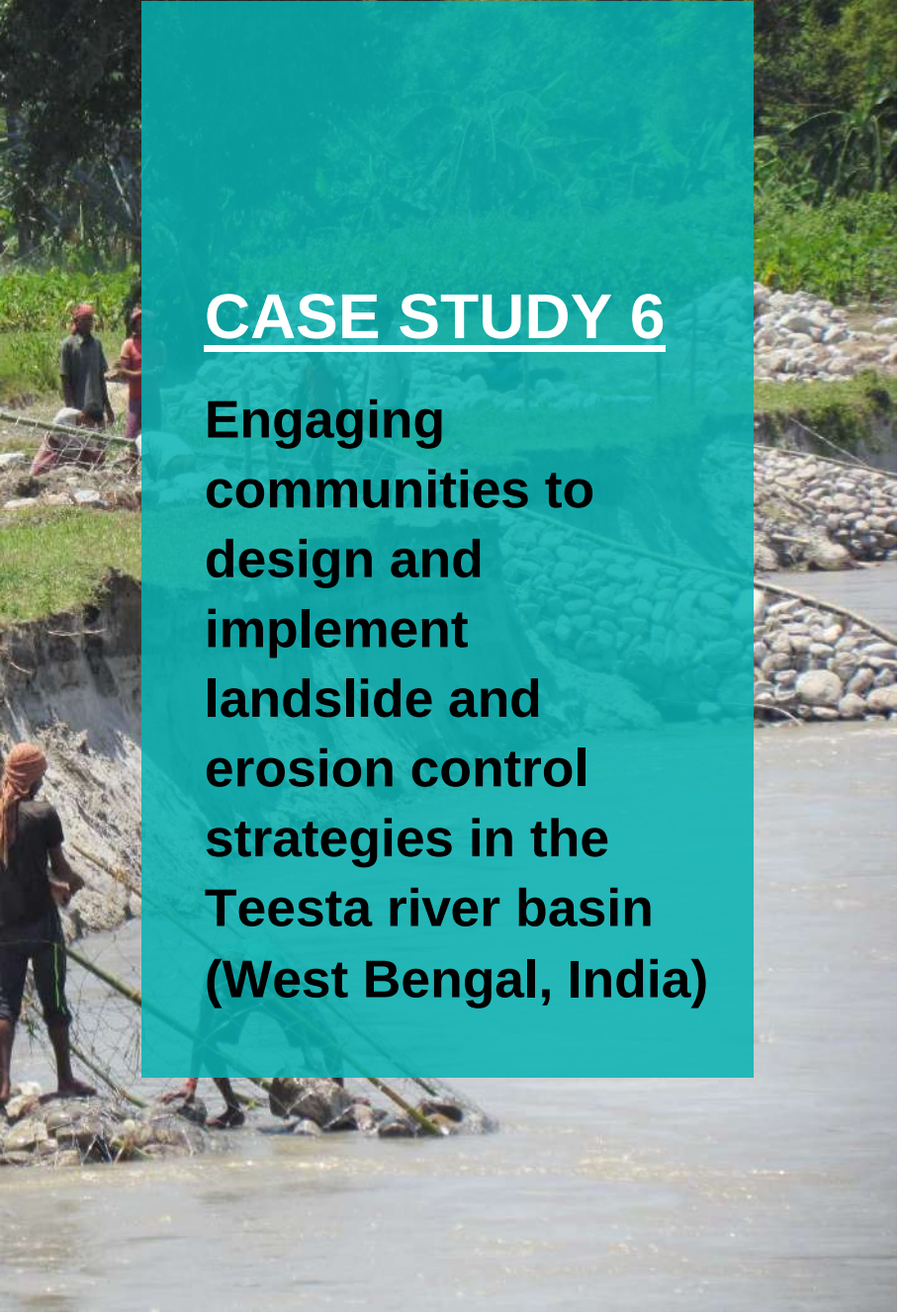


Figure 21: Eco-safe roads after two years of project intervention with lush green grass growth along the sides ©ESR Nepal

Economic valuation is an important tool in promoting nature-based solutions. Studies on the cost effectiveness of eco-safe roads versus the conventional bulldozed roads, or grey roads, suggested that during “normal monsoons” (based on historical rainfall records) the eco-safe roads become more cost-effective after 12 years compared to grey roads,[24] as the costs for repair and maintenance are significantly lower. Though the initial costs of eco-safe roads is higher, they can withstand the monsoon rains, provide access to the community through reduced travel costs and can generate additional income for local communities.

[24] Dr. M. Vicarelli, (Department of Economics, University of Massachusetts, Amherst, USA)



CASE STUDY 6

Engaging communities to design and implement landslide and erosion control strategies in the Teesta river basin (West Bengal, India)

Movement for Advancing Understanding of Sustainability & Mutuality (MAUSAM), Mr. Soumya Dutta; North Eastern Society for Protection of Nature (NESPON), India, Arnab Bhattacharya

Societal Challenge:

Disaster risk reduction

Ecosystem service:

Flood control

Financial Support: Small grant by Greengrants the Global Fund (GGF) and International Rivers Safety's, International Climate Initiative (BMU-IKI)

Timeline: 2017- 2019

Background

The Teesta river basin covers an area of 12,159 square kilometres, of which 83% is in India and 17% in Bangladesh. The Teesta merges with the Brahmaputra (Jamuna) at Teestamukh Ghat (Kamarjani-Bahadurabad) in Bangladesh.

In the hilly region, in the states of Sikkim and West Bengal (Darjeeling) in India, the river is turbulent, flowing with high velocity through narrow and deep valleys, making this stretch highly prone to riverbank erosion and landslides. The river enters the plains in Jalpaiguri (West Bengal) in Gazaldoba where the Teesta Barrage project is located. In the plains the river is less erosive but there are issues of frequent flash floods.

There are a number of cascade hydropower projects on the Teesta river in Sikkim, including Teesta-V commissioned in 2008. The construction of hydropower dams have increased both the frequency of landslides and earthquake vulnerability across the hilly region of basin. An assessment of the Teesta-V project using the Hydropower Sustainability Assessment Protocol[25], indicates several gaps, such as, a lack of a systematic approach to communications and consultations with the stakeholders, and shortfalls in the biodiversity assessment relating to impacts on fishes and their hatcheries.

Figure 22: Local villagers sharing the problem related to river bank erosion in Padamati Char, Teesta River, India ©MAUSAM

In West Bengal, the Teesta Barrage Project (TBP) is considered among the largest irrigation projects of eastern India. When phase II of the project will be completed, it is expected to irrigate an area of 922,000 hectares in six districts of north Bengal and will produce 67.50 megawatts of hydropower. Concerns have been raised regarding the impacts of barrage operations on the communities[26] and also availability water downstream. Communities living close to the barrage rely on sub-canals for irrigation and have complained about reduction in flow since the project has begun. Villagers in Jalpaiguri District have linked the erratic operation of barrage gates and the sudden release of large quantities of water with increased frequency of flash floods and riverbank erosion. Erosion is particularly concerning for the villagers, as thousands have lost their farmlands and houses.

To support the communities in addressing these challenges, MAUSAM initiated consultations in the affected communities in selected villages to support them in coping with these impacts.

[25] Teesta-V Power Station - Hydropower Sustainability Assessment Report (NHPC, 2019)
[26] Political Economy Analysis of the Teesta River Basin

MAUSM worked with the local communities to design localised interventions to control landslides and river bank erosion. Villages in following districts were selected for intervention:

1. Darjeeling (West Bengal): Karmat, 29th Mile and Jholi villages have limited road connectivity and are severely affected by landslides. More than 90% of the people live below the poverty line and are highly dependent on non-timber forest products (NTFP) and government subsidies to sustain the village economy.
2. Jalpaiguri (West Bengal): Padamati Char (river-island) and Mallan Pally village downstream from Teesta barrage. Fisheries are the main source of livelihoods, but many people are also engaged in trade or are working as wage labourers. Local communities in the district complain of sudden unannounced discharge from the Gazaldoba barrage as the leading cause of inundation affecting farmlands and loss of houses and chars (river islands).

Activities

In collaboration with the village government (Panchayat), MAUSAM and partners (NESPON, International Rivers) initiated community consultations to develop low-cost and local solutions to control landslides in hilly villages (Karmat, Jholi, Kandung and 29th Mile) and river bank erosion in the plains (Mallan Pally village and Padamatir Char).

The project team conducted several consultations with the communities to identify the main drivers of landslides and river bank erosion. Technical discussions with the communities were held on the role of natural relief features, rock characteristics, and land use management practices on landslide and erosion.

Community members were introduced to slope stabilization measures using Vetiver grass (*Chrysopogon zizaniodes*). Vetiver is a deep-rooting and fast-growing grass species native to South Asia. If grown along the slope, it contributes to the slope stabilization through the development of long and dense roots below the soil. The plant takes 2-3 years to mature and establish a dense root system that can reduce the impacts of erosion.

Initially communities were hesitant to explore Vetiver-based slope stabilisation measures, as they favoured hard engineering solutions, such as stone-concrete embankments or a dry wall, despite recurrent costs associated the low effectivity. However, after several rounds of dialogue and technical discussions, the communities agreed to engage in the design and implementation of Vetiver-based slope stabilisation measures.

In 2017, seedlings of Vetiver grass (*Chrysopogon zizaniodes*) were distributed in each intervention village. Financial resources were mobilised through the Mahatma Gandhi Employment Guarantee Act (MNREGA) programme of the Government of India, for the planting of the Vetiver seedlings along the along the roadside and bare area in the hill slopes, and along the river banks. Vetiver nurseries were created in Karmat and Jholi villages and

Padamatir Char to provide a regular supply of planting materials and additional income for the local communities.

Results

Communities and village governments were convinced to explore the application of Vetiver in slope stabilisation rather than fully depending on hard infrastructure and government support.

After the first year of plantation, the survival rate of Vetiver was continuously monitored by the communities themselves. On the hill slopes, the survival rate of Vetiver was very high and villagers indicated a decrease in soil erosion after the first year of planting, whereas along the river banks, due to the high erosive power of the river stream, the survival rate of planted Vetiver was low, reducing its effectivity in controlling river bank erosion.

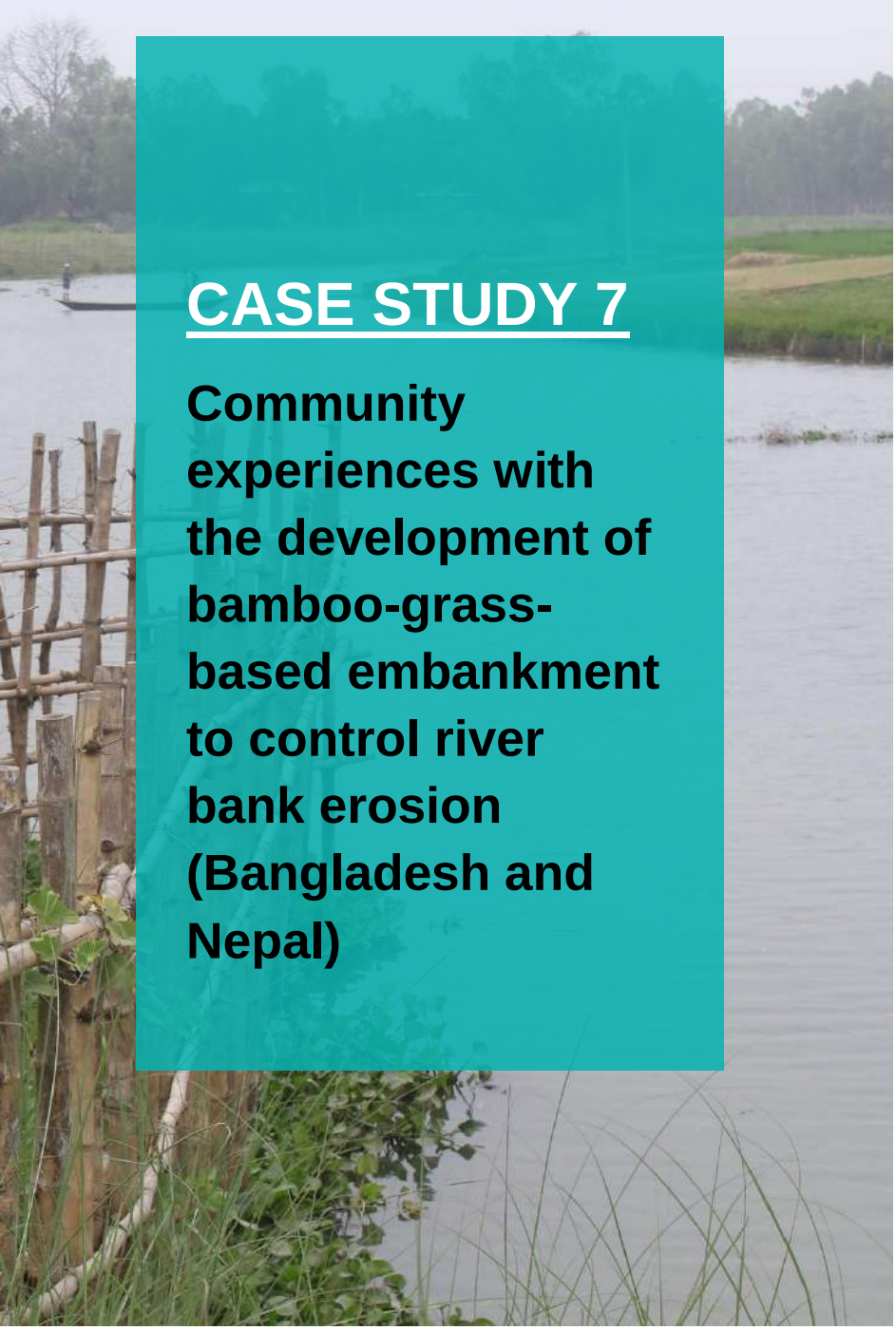
In 2018, building on these experiences, MAUSAM worked with communities downstream of Taeta barrage to plant Vetiver along the most vulnerable river banks. However, this time the plantation was re-enforced with sandbags to improve the survival rate of plants and its effectiveness in reducing bank erosion. Unfortunately, by the end of 2019, due to protests against the Citizenship (Amendment) Act, 2019 and the COVID-19 pandemic, these villages became inaccessible to the project teams, affecting the implementation and monitoring. But the successful sites in the hills are still being managed by the communities, and the experiment on re-enforcing Vetiver plantation with sandbags has yielded promising results.

Figure 23: (Left) Vetiver nursery in Karmat village (Right) Vetiver plantation along the Teesta river bank downstream of Teesta barrage ©MAUSAM

Lessons Learned

Long-term engagement with the community is an important factor in building trust. MAUSAM has been working in the intervention area for more than a decade to support the communities in adapting to the impacts of climate change. On the other hand, North Eastern Society for the Preservation of Nature and Wildlife (NESPON) is working on the community forest rights issues for more than 20 years. Due to long-term relationship, these two organisations had a good rapport with the communities. This helped trigger discussions on green infrastructure solutions despite community preference and belief in grey solutions, such as construction of concrete embankments. Dialogues on the technical issues such as relief features, as well as factors that contribute to increased vulnerability to erosion helped in convincing the communities to try green infrastructure solutions as an erosion control strategy.

The activities also demonstrated that Vetiver plantation alone is not effective in controlling erosion at sites with high flow velocity or steep slopes. In 2018, MAUSAM worked with one of the villages downstream of Taeta barrage, to plant Vetiver, however, this time the plantation was reinforced with sandbags which improved the survival rate and effectiveness in controlling erosion.



CASE STUDY 7

Community experiences with the development of bamboo-grass-based embankment to control river bank erosion (Bangladesh and Nepal)

Oxfam Bangladesh, Nuzhat Nueary; Gana Unnayan Kendra (GUK) Bokhtiar Hossain; National Environment and Equity Development Society (NEEDS) Nepal, Kishan Khadka

Societal Challenge:

Disaster risk reduction

Ecosystem service:

Erosion Control

Financial Support: SIDA (Oxfam Bangladesh) and UKAID (NEEDS Nepal)

Timeline: 2018 – ongoing (Banglades) and 2015-2020 (Nepal)

Background

River bank erosion is a pressing issue across the Ganges-Brahmaputra-Meghna (GBM) basin. In 2019, erosion destroyed the homes of at least 8,000 people in Bangladesh's northern districts during heavy July floods and displaced at least 300,000 people[27] across the country. The situation is similar in Nepal, with thousands of people losing their agricultural land and house to erosion and flooding. This has created problems of outmigration from the villages and a negative notion among communities about the river – many communities consider rivers as a threat to their lives and livelihoods.

[27] Bangladesh's disappearing river lands (The New Humanitarian)

Figure 24: Bamboo-grass based embankments increase sedimentation and reduce river bank erosion on Jinjiram ©Bokhtiar Hossain

Government-led interventions to address bank erosion and flooding generally focus on hard infrastructure solutions (gabions, concrete embankment) as the main strategy. Communities believe that hard infrastructure is more suitable and expect continued support from the government for concrete embankments. The hard measures are relevant, and may be necessary in some river systems and in specific stretches of the rivers with high flow rates or erosion threats. However, there are alternatives to hard infrastructure that are based on traditional knowledge. Across the GBM basin, there is a traditional practice of using locally sourced bamboo to fence river banks to control erosion, called ‘bandals’ in Bangladesh and ‘basan’ in Nepal.

The experiences of Oxfam Bangladesh in Namapara Village, on the banks of Jinjiram River in northern Bangladesh; and NEEDS Nepal’s work in Banara and Chaudhar rivers in Kanchanpur, Nepal, indicate that bamboo fencing is both a cost effective and inclusive erosion control strategy.

Activities

Oxfam Bangladesh (Jinjiram River)

One of the bandal sites is located at Namapara village, Rowmari Upazilla, Kurigram District. The village is home to approximately 220 families and their main livelihoods are farming and fishing. The village is affected by river bank erosion in the monsoon season (July-September), which is more pronounced when the floodwaters are receding.

Oxfam Bangladesh and partners facilitated a series of community consultations (Nadi Baithoks or River Camps) in Namapara village in 2018. These consultations discussed local water governance challenges and ways to address them at the community level. During these consultations, communities identified the loss of fertile agricultural land as the main threat to their livelihoods and agreed to experiment with hybrid bamboo-grass based embankments as a solution to control riverbank erosion. The Women's Self-Help Group (SHG) in the village agreed take the lead in the design and implementation of bamboo fencing.

Figure 25: Nodi Boithak or meetings with community affected by riverbank erosion in Borobondho, Jakigonj-1 village, Bangladesh ©Bokhtiar Hossain

The Women's SHG organized meetings with officials of Upazilla Parishod (local government) and received their support and funding for the initiative. Gana Unnayan Kendra (GUK) and

Oxfam Bangladesh organized multiple workshops for families living along the river (river camps) to build the capacity of villagers on bandals, and taught engineering approaches such as planting local varieties of grasses and trees along the bank to reinforce the bandals. After the trainings, the community agreed to plant local grass species along the bank to stabilize the riverbanks.

A total of 30 bandals, each 10-12 meters long were erected in series at a 30-40 degree angle to the riverbank along an 800-meter river stretch in Namapara village. The bamboo was buried a minimum of five meters into the riverbed to protect the bandals from being easily washed away. After constructing the bandals, community members planted local grasses including Nolkhagra (*Arundo donax*) and Torpado Grass (*Panicum repens*) which complement the bandals by stabilizing the bank slopes and improving their effectiveness.

NEEDS Nepal (Banara and Chaudhar River)

Figure 26: Riverbank stablisation activities applying bamboos and grass plantation in Chaudhar River, Nepal ©Kishan Khadka

In 2017, NEEDS started working in Chandapur (Banara River) and Bibapatti (Chaudhar River) villages in Kanchanpur, Nepal, with the aim to support communities seriously affected by erosion. In these villages, several engineering solutions had previously been attempted by the governments and communities, however, they were expensive short-term solutions and were washed away during the monsoon season.

Most vulnerable stretch of the riverbank Chandapur and Bibapatti village was identified and fenced with bamboo. This was done in collaboration with the community disaster management committee. In Chandapur, a 400-meter long bamboo fence was erected at a cost of 400,000 Nepali Rupees (3,300 USD). The community also planted local grass varieties, such as lemongrass behind the bamboo fencing. The work was completed in nine days with locally available and sustainably sourced materials.

Results

The bamboo fencing was effective in reducing riverbank erosion at every site. Over time, due to natural silt capture and deposition behind the bamboo fences, the riverbank was extended. In Chandapur Nepal, within two years of the intervention, the land near the restored bank was utilized by the local women's group to plant cash crops, such as citronella, contributing to extra income of 15,000-20,000 Nepali Rupees annually (200 USD).

Figure 27: Bank of the Jinjiram river in Namapara Village, one year of year after the riverbank stablisation activities, with significant reduction in riverbank erosion, Bangladesh ©Oxfam Bangladesh

The local community reported an increased abundance of fish and crustacean species along the restored banks. In Namapara, Bangladesh, villagers reported that the sites along the restored river banks, between the bandals and grass plantation, were preferred by local catfish species (*Seperata* sp.) for nesting, as these were less disturbed by human interventions.

Lessons Learned

Bamboo fencing supplemented with grass plantation reduced the time for bank stabilisation. The bamboo fences divert water to the centre of river, and over time they trap the silt, leading to extension of the riverbank, rather than its erosion.

Community participation is essential for the successful deployment of bamboo fencing. In Bokbandha village, located five kilometres downstream of Namapara, bandals were erected by the local engineering department without engaging the community members. These bandals were placed parallel to the river bank, creating problems for the community by restricting the movement of local villagers and were also less effective in controlling bank erosion.

Figure 28: River bank stablised with the lush green growth of grass, Chaudhar River, Nepal ©Kishan Khadka

4 Lessons learned from documentation process

This chapter analyses the case studies through the eight criteria's identified by IUCN Global Standards for NbS. The case studies discussed in this paper were all designed and implemented before the launch of IUCN Global Standards on NbS – therefore, it is not fair to expect full alignment of these interventions with the Global Standards. This analysis can serve as the basis for revising and/or strengthening the case studies presented previously and helped identified key recommendations presented in section 6.

Criterion 1 - NbS effectively address societal challenges

This Criterion aims to ensure that the NbS is designed in response to a societal challenge(s) that has been identified as a priority by those who are or will be directly affected by the challenge(s). It requires that all the stakeholders, especially rights holders and beneficiaries of the NbS are involved in the decision-making process used for identifying the priority challenge(s) (Criterion 5).

In all case studies presented, the societal challenges identified emerged mostly from previous baseline studies. Community consultations were held to discuss and validate the societal challenges.

Case Studies 1-4 simultaneously targeted water and food security issues as the primary motivation for the application of Nature-based Solutions. Case Studies 5-7, focused on the application of NbS in reducing disasters risks, such as landslides and river bank erosion.

In most cases, the decision-making process used to identify the societal challenges is unclear. There is a need to strengthen the documentation of the strategies used to reconcile varying stakeholder views during the design of the intervention, which was lacking in these projects.

In most of the case studies, the implementing agency had a long-term presence in the project area, and past learnings and exchanges with communities provided a baseline for identifying the key societal challenges to be addressed. For example, Development Alternatives (DA) has been working in the semi-arid zones of Bundelkhand (India) since the early 1990's, particularly targeting integrated land and water management issues. Datia Watershed is located in this region, and therefore the designing of the intervention built on prior learnings and stakeholders relations.

Tangible benefits to human well-being from the intervention were recorded in all case studies. However, there seems to be a gap in the benchmarking and periodic assessment of the human well-being outcomes. In addition, in most cases, it is not clear how the implementers used results from the project to inform the adaptive planning process (Criterion 7), or why a particular solution was prioritized.

Criterion 2 - Design of NbS is informed by scale

This Criterion aims to encourage the recognition of the complexity and uncertainty that occur in land/seascapes. The scale applies not only to the biophysical or geographic perspective but also to the influence of economic systems, policy frameworks and the importance of cultural perspectives. Therefore, a "systems framing" of the NbS can help better acknowledge these interactions as well as risks.

Among the seven case studies discussed in this paper, the first four integrated landscape approaches to varying degrees (Hail Haor, Datia Watershed, Asarganj Agriscape and Teplejung District). In these case studies, the intersectoral synergies and conflict are well documented. In other cases, the intervention was site-specific, aiming to address localized challenges faced by communities, such as control of landslides along the hill roads (eco-safe roads) or river bank erosion (Jinjiram and Teesta River).

There is limited documentation of the synergies of the proposed interventions amongst different sectors. For example, the Hail Haor (Case study 1) and Asarjang initiatives (Case study 4) documented conflicts between the fisheries and agricultural sectors, therefore activities were designed to minimize this conflict. In the Teesta and Jinjiram basins, the projects facilitated community dialogues to discuss various social and physical factors contributing to landslides and river bank erosion. Because the community in the Teesta basin favoured grey infrastructure solutions for disaster risk reduction, initial dialogues with the communities were designed to explain the technical aspects and values of ecological engineering in stabilizing river banks and landslide hazard zones.

In the majority of cases, there is a lack of articulation of the positive and negative impacts of a specific project beyond the intervention site. In both the Hail Haor and Asarganj cases, the project identified the loss of connectivity of wetlands with the main river channel as a threat to local fish biodiversity and decreased landscape resilience to flooding. However, these linkages were either not considered under the scope of project intervention or the results were not captured fully. In Hail Haor, the declaration of Baikka Beel as reserve area increased the number of migratory birds visiting the site and also improved the availability of water and fish in the areas located around the beel. However, these benefits beyond the intervention site were not captured in qualitative manner leading to difficulty in articulating the benefits outside the intervention area.

Criterion 3 - NbS result in net gain to biodiversity and ecosystem integrity

NbS are derived as goods and services from ecosystems, therefore strongly depend on the health of an ecosystem. Biodiversity loss and ecosystem change can have significant impacts on the functioning and integrity of the system. Therefore, NbS design and implementation must avoid undermining the integrity of the system and instead, proactively seek to enhance the functionality and connectivity of the ecosystem. Doing so can also ensure the long-term resilience and durability of the NbS.

The case studies have limited documentation of the status of ecosystem services, except for fisheries and water provisioning services. Biodiversity characteristics such as species composition, or trends in the total number of species was generally not documented.

In Hail Haor (Case study 1) , the MACH project conducted technical studies and estimated the economic value of different ecosystem services including fisheries and agriculture. The drivers of wetland degradation were also documented in consultation with local communities. The baseline economic values were compared to showcase an increase in the ecosystem services in monetary terms due to project intervention. In another approach, the Himalica project facilitated a baseline assessment of ecosystem health, trends, and climate change impacts in Teplejung district of Nepal to identify pilot villages however, the focus was on documenting

increase in agriculture productivity and climate resilience of agri-system, rather than biodiversity gains. The project promoted eco-friendly approach to large cardamom farming leading to improvement in soil health, however, there is no documentation of the improvement's in the abundance of beneficial soil micro-fauna or any wild species of plants or animals.

A review of the solutions suggests gaps in documentation of biodiversity and ecosystem benefits in project monitoring. Targets for enhancing key biodiversity values need to be better established. In most cases, the interventions contributed to the enhancement of the ecosystem services, due to variety of factors such as a net gain in green cover, improvement in soil moisture or conservation of wetlands. These factors also contribute to the improved presence and abundance of local biodiversity, but these gains were not captured. In most cases, a review of documents does not indicate if periodic assessments were completed to document the adverse consequences of the project activities on the functioning of ecosystem. Since ecosystems are complex, with interdependent components and processes, there will always be a level of uncertainty of how activities planned to address a societal challenge will impact or influence the system. However, capturing these in future NbS design and monitoring will help minimize unanticipated impacts on the functioning of the ecosystems.

Utilizing NbS can provide an opportunity to enhance biodiversity conservation and ecosystem management efforts. As discussed under Criterion 2, Case study 1, 2, 3 and 4 were implemented with the landscape perspective and the project designs explicitly integrated activities to improve the ecosystem's integrity and connectivity, such as the conservation and revival of wetlands and planting of trees to increase the overall green cover at the landscape level.

The analysis of results from the case studies suggest that the project activities led to an increase in green cover, however, there is no documentation of any increase in the biodiversity and/or abundance of species as a result of improved green cover. Furthermore, only in Hail Haor (Case study 1), did the project design explicitly include biodiversity enhancement as one of the project objectives, and activities such as conservation of natural wetlands and reintroduction of lost or vulnerable fish species were included and monitored.

Criterion 4 - NbS are economically viable

The return on investment, effectiveness of the intervention, equitable distribution of benefits and costs are key determinants of success for an NbS in the long run. Therefore, this Criterion requires that sufficient consideration is given to the economic viability of the intervention, both at the design stage and its implementation. If the economic feasibility is not adequately addressed, NbS run the risk of being short-term projects, where, after closing, the solution and benefits provided cease to exist, potentially leaving the landscape and communities worse off than before.

A review of the results and learnings from the case studies indicates that implementers were conscious of the need for documenting the cost-effectiveness of the proposed solutions. In some cases, the lead organization collaborated with a university or engaged technical experts to undertake the analysis. However, in most cases cost-effectiveness was done at the end of the project, and not as tool for selecting a particular NbS. The cost-effectiveness of NbS is strongly articulated in the MACH (Case study 1) and EPIC projects (Case study 5). The MACH

project facilitated studies at the beginning and end of the project to document economic value of the different ecosystem services (fisheries, agriculture and flood regulation). The restoration of the wetland habitat increased the total annual economic value of Hail Haor by 25%, from 8 million USD in 2000 to 10.9 million USD in 2006. The EPIC project in Nepal documented that within a span of 12 years, the eco-safe roads became more cost effective than traditional earthen roads, and generates additional livelihood benefits for the local communities.

Most of the interventions discussed in this paper were funded by a single donor. However, during the implementation of some projects, efforts were made to mobilize additional resources. In the Jinjiram river basin, community work was funded through money received from the local government plans. In the Himalica project, efforts were made to diversify the income of farmers through innovative concepts such as Spice Garden Tourism, and the development of a community enterprise – Kanchanjunga Himalica Agriculture Industry (KHAI). The project in Datia watershed established farmer's clubs and Women's Self-Help Groups and trained them in integrated and organic farming. A Watershed Development Fund was also established, providing revolving funds as micro-credits.

Criterion 5 - NbS are based on inclusive, transparent and empowering governance processes

This criterion requires that NbS acknowledge, involve and respond to the concerns of a variety of stakeholders, especially rights holders. Also, NbS must adhere to and align with the prevailing legal and regulatory provisions, being clear on where legal responsibilities and liabilities lie. This is important and not only reduces intervention's sustainability risks, but also to enhance its social 'license to operate'.

It is unclear whether community feedback and grievance mechanisms were put in place as part of the design, implementation and monitoring of the solutions. In most cases, reports indicate holding consultations and dialogues with communities, which likely enabled a space for communities and stakeholders to express possible complaints or worries, however it does not appear to be a well-established mechanism. Equality and gender inclusion was one the main criteria used for the selection of case studies discussed in this paper. In most cases, the project design included the promotion of participation of the most vulnerable communities in the governance of natural resources. In some cases, women's Self-Help Groups (SHGs) were engaged in leading the implementation of activities, for example in Datia watershed (Case study 2) and Teplejung District (case study 3), women's SHGs were trained on integrated farming practices such as agro-horticulture, vegetable cultivation and organic farming. In Jinjiram basin (Case study 7), Nodi Baithaks (River Consultations) facilitated by the Oxfam and local partners in Namapara village provided a platform for the women's SHG to discuss the design of bamboo fencing for the control of river bank erosion and the benefits of planting of multi-purpose deep rooting grass along the river banks to reinforce the bamboo fencing. However, the engagement of youth seems absent in most of the cases.

Each intervention applied different strategies to engage and institutionalize community engagement during the project implementation. The most common strategies included the formation of Water User Groups (WUGs), Resource Management Organizations (RMOs) and/or women's Self-Help Groups (SHGs). However, there is no documentation of the community consultations in the project designing stage. It is important that communities are consulted in the beginning on identifying problems and developing solutions. Noting which

stakeholders were involved in the decision-making and the role they played in the identification possible solutions is particularly important where extreme inequality persists. This is important to ensure that processes can be adapted to encourage meaningful participation of the most vulnerable groups of the societies.

Every case study discussed in this paper focused on a single country and implementation was mostly restricted to districts or provinces of the country. In the Jinjiram Basin case, the project team acknowledged that comprehensive basin-wide NbS is required to solve the problem of erosion, and for this there is a need for transboundary cooperation, as the basin is also shared by Bangladesh and India.

Criterion 6 - NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits

Ecosystems provide a wealth of different benefits and not everyone values each of them in the same way. Therefore, tradeoffs between stakeholders and sectors is inevitable and needs to be managed effectively and equitably. This Criterion requires that NbS proponents acknowledge these tradeoffs and follow a fair, transparent and inclusive process to balance and manage them over both time and geographic space.

As discussed under Criterion 1, the identification of societal challenges was based on previous studies and the prior engagement of stakeholders in the intervention areas. There is not sufficient documentation of the potential negative impacts of the intervention, or discussion on the trade-offs required for the long-term sustainability of the projects. In some cases, trade-offs are implicit in the cost-benefit analyses conducted.

The legal and customary rights to access, use and management over land and natural resources is generally recognized by every case study. However, there is scope for the better documentation of rights and responsibilities of the different stakeholder groups with reference to the proposed NbS. This documentation will ensure the responsibilities and benefits to different stakeholder groups are acknowledged and respected and do not jeopardize the entire NbS process.

"*Where risk is unavoidable, safeguards must be in place and be periodically reviewed to anticipate and avoid adverse consequences of interventions, especially considering that inequity in trade-offs may change over time and that not all stakeholders may be equally affected. Therefore, NbS design and strategy needs to be explicit about whose benefits and whose costs will be addressed, including when and how this will be reviewed (IUCN NbS Standards 2020)."*

Criterion 7 - NbS are managed adaptively, based on evidence

Ecosystems have complex, dynamic and self-organising nature. This also means that ecosystems have greater resilience which confers a wider range of options to respond to unanticipated social, economic or climate events. This Criterion therefore, aims to exploit this attribute of ecosystems through designing of adaptive management strategy for the proposed NbS.

The foundation of adaptive management is the evidence-base provided by regular monitoring and evaluation, drawing on scientific understanding as well as indigenous, traditional and local

knowledge. By proactively adopting an adaptive management approach, the NbS can continue to be relevant through the lifecycle of the intervention and the risk of redundancy and stranded investments are minimised.

Most of the initiatives are implementing NbS strategies but don't explicitly present an initial theory of change, or formal NbS strategy, including the reasoning behind the NbS, articulation of the intended outcomes and clear understanding of the ways to achieve them.

Monitoring and evaluation plans, when they exist, focus mostly on human-benefits, and overlook the biodiversity benefits. They are also not directly articulated with a mechanism that enables adaptive management. The design and monitoring of these solutions rarely includes an assessment of potential negative impacts or trade-offs, which forms an important component of a monitoring assessment, enabling adaptation and changes in the way the solution was initially designed.

Adaptive management is mentioned in some cases, based on key results and dialogues with communities. In Case Study 6, which learned that Vetiver plantation alone will not be effective in controlling erosion in sites where flow velocity is high, one of the villages downstream of Taeta barrage reinforced the Vetiver plantation with sandbags to improve the survival rate and effectiveness of the solution in reducing river bank erosion.

Criterion 8 - NbS are sustainable and mainstreamed within an appropriate jurisdictional context

This Criterion requires that NbS are designed and managed with a view to long-term sustainability and are aligned with sectoral, national and other policy frameworks. There are various approaches to mainstreaming NbS; however, all rely on strategic communications and outreach with audience from different sectors, including individuals (e.g. the public, academics), institutions (e.g. national government, start-ups, businesses, and organisations) and global networks (e.g. Sustainable Development Goals, Paris Agreement).

Activities were designed with an understanding of the opportunities and limitations posed by local policies and regulations, however the case studies do not communicate the policy framework for their interventions, or how they could trigger policy changes. In the Hail Haor case, the local community had no access over the wetlands, and the rights to fisheries were auctioned to highest bidder alienating communities form wetland governance and use, therefore, the MACH project secured 10 year lease for selected wetlands from the Ministry of Land, and created a Resource Management Organisation (RMOs) including the the Baikka Beel RMO, which still exists and is connected to the Local Government Committees (LGCs), headed by the Chief Executive Officer of the sub-district.

Different strategies were used by the projects to share their learnings. In most cases, the projects facilitated regular meetings and site visits to share the results of the project with local line agencies. For example, the EPIC project organized dissemination and training workshops for government officials, and also developed a guidance tool for the implementation of ecological engineering strategies. In the Himalica project, the learnings from the project were used to develop a *Strategic Action Plan and Vision for Agriculture Development* of Taplejung district at the request of local government. In the Asarganj project in India, the lessons learned were consolidated to develop a toolkit on agriscape management, and agriscape plans were

developed for replication at an additional two sites located in the Ghod and Bhavani river basins in southern India.

In the EPIC, Himalica and MACH projects, documents including policy briefs, technical and mid-term appraisal reports are available online and freely accessible to individuals and stakeholders interested in researching and replicating the process. However, in most other case studies, it was difficult to find project appraisals or technical reports online.

5 Conclusions and final recommendations

The seven case studies presented in this report are of critical importance to shape the discourse on the implementation of NbS at scale in the GBM region. They each identify strategies of working with local communities in addressing societal challenges, and use the restoration or management of ecosystems as an entry point. Despite a number of gaps, as identified by the screening through IUCN Global Standard, these initiatives are pioneering a new way of thinking, while demonstrating tangible benefits.

Moving forward, IUCN will continue to work with CSOs and other relevant stakeholders to develop a practical understanding of NbS and will support the design of innovative and locally relevant NbS interventions, along with their mainstreaming in CSO programmes and government polices at the local, national and regional levels.

The section below highlights key recommendations to strengthen and improve the solutions presented, allowing them to be further refined.

1. ***Strengthen documentation of biodiversity gains:*** Biodiversity net gain is a defining criteria for any NbS intervention, therefore, it is important that these gains are captured and documented. The baseline assessment needs to be broad enough to characterise the ecological state, drivers of ecosystem degradation and options for net improvements, making use of both local knowledge and scientific understanding. The net gain in biodiversity includes both the increase in total number of species, and also abundance of the species in a particular ecological system. For example, organic agriculture practices contribute to enhancement in soil health and increases the abundance of beneficial soil organisms, but these gains were not documented. The documentation of these aspects will help in building evidence on the contributions of these local interventions to global biodiversity conservation and enhance the probability of replication and upscaling of successful strategies, and their mainstreaming in government policies and plans.
2. ***Improve mapping of the roles and influences of external stakeholders***: There is a need to strengthen the documentation of the rights and responsibilities of different stakeholder groups with reference to the proposed NbS. A key function of NbS safeguards is to ensure that intervention don't impact the most disadvantaged members of society in anyway or that they have access to the intervention's benefits. Therefore, a clear understanding and documentation of costs and benefits to different stakeholder groups is suggested as it will help avoid any conflict between the stakeholder groups and support the consensus building process among stakeholders and sectors on identification of trade-offs needed for the optimise the use of natural resources for its sustainable and equitable development.
3. ***Strengthen project adaptive management*****:** A monitoring and evaluation framework was developed in most of the initiatives discussed in this paper, however, generally they tend to focus on monitoring human benefits. None of the case studies clearly demonstrate how the learnings from the project were used in adaptive management to limit risks and unexpected impacts of the activities on any stakeholder group. Monitoring mechanisms should take into account all aspects of the NbS, including human and biodiversity benefits, involving local stakeholders and governance platforms in the implementation and review, and helping them to design adaptive management. Strengthening the documentation of

the positive and negative impacts of a particular NbS intervention will support the design of a robust adaptive management process.

4. ***Promote private sector and youth engagement***: In most case studies, the youth and private sector engagement is weak, and needs to be strengthened. Since, NbS requires working across generations, and moving away from a site-based to a systems-based approach, youth engagement is necessary for the sustainability of any NbS intervention. Engaging the private sector will help in building its capacity in NbS and support for upscaling the learnings from demonstration projects. A stronger mapping and inclusion of market based mechanisms is suggested in future programming. For example, case study 2 highlights strategies for establishing market linkages for the products developed by Women Entrepreneurs (CARDIMONIA strategy of Himalica), whereas case study 4, demonstrate the value of working closely with private sector, learning's from the Asarganj agriscape was replicated in Ghod and Bhavani River Basin with the support of ITC Limited. The other strategies to engage private sector to mobilise the resources may include grants, incentives, low interest loans for low carbon and environmentally friendly enterprise and public-private partnership projects.

Annex 1: Main contributors

Case study 1: *Securing community land rights and restoring wetlands to enhance biodiversity and ecosystem services in Hail Haor, Bangladesh*

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Annex 3: Criteria and template for case study documentation

Criteria

The IUCN Secretariat, in close coordination with the GBM CSO network and private sector partners will receive and analyse proposals for the NBS case solutions and decide which ones to follow up on. Please apply these criteria when you are selecting the case for analysis:

1. Solutions with an evidence of integrated strategy (vs. single activities), looking at solution which work in parallel on i) reducing social and environmental vulnerabilities and generate social benefits ii) restore and maintain ecosystem health iii) supported by (or enhancing existing) policies at multiple levels iv) supporting equitable governance and enhance capacities;
2. solutions strongly linked to water and basin issues (vs. broader NBS simply happening in the basin but with no real connection to the river/basin theme);
3. solutions with a potential for replication;
4. solutions presenting evidence of results (quantitative and qualitative) and references;

Solution template
Name of Country(ies) - Title of your solution
author(s), organisation(s), email(s)
Pictures

2 to 3 pictures illustrating the context of your solution and the activities (JPG format, hi-res).

Background (200 words)

Kindly provide an introduction to the topic and a summary of your solution. In 200 words, introduce briefly the context you are working on, including ecosystems and livelihoods, issues and stakeholders involved, and provide objectives and elements of your solution.

Main activities (500 words)

A NBS is usually a complex series of activities and approaches. As such, kindly start by stating the technical objective of the solution (e.g “in order to limit the flooding on xxx communities, and enhance livelihoods through fisheries a management plan for the xxx wetlands was implemented”) then move on to describing of the technical activities by categories.
Examples of activity categories of activities can be the following:

- ecosystem restoration/management;
- education on natural resources use, management, good practices;
- revising policies to integrate NbS;
- knowledge mobilisation;
- governance work;
- Others

Please also state how gender empowerment and social inclusion are taken into account in the design of these activities.

Results (250 words)

It is very important to be able to qualify and, when possible, quantify the results. You may use some of the categories below and try to be specific (e.g. avoid results like “this solution improved the livelihoods of communities” but instead “income from fisheries increased by xx% in the 4 communities concerned in the 2 years following the project” with references).
Potential results categories include:

- environmental/conservation benefits
- livelihood and income-generation benefits
- disaster risk management benefit of adaptation
- policy change or influence on government planning or up scaling of your solution

Please also specify how this solution benefitted gender empowerment and social inclusion.

Challenges (150 words)

Present briefly the key challenges in designing/implementing your solution.

- institutional
- conflicts
- funding
- lack of capacity
- Other

Key lessons learned (200 words)

It is important to summarise lessons learned (from success and challenges). The lessons learned can be centred on the following categories:

- need for science/data
- importance of partnership and collaboration
- importance of local leaderships, champions
- importance of policy integration
- importance of economic integration of the solution
- importance of demonstration activities

Inspiring Story (200 words) – optional

Know of any one or any group who benefited from the solutions and there’s an inspiring story that could come out of it? If you do, give us a little bit more information and the IUCN Asia Communications team can follow up with you and help you draft the story.

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