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COMPENDIUM ON NATURE-BASED SOLUTIONS FOR URBAN RESILIENCE IN BANGLADESH

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COMPENDIUM ON NATURE-BASED SOLUTIONS FOR URBAN RESILIENCE IN BANGLADESH

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Compendium on Nature-based Solutions for Urban Resilience in Bangladesh

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Foreword

Bangladesh's cities face growing climate risks amid rapid urbanization, calling for a new approach to urban development. At GCA, we believe Nature-based Solutions are not just complementary to traditional infrastructure—they are essential for building resilient, inclusive cities.

The Compendium on Nature-based Solutions for Urban Resilience in Bangladesh will support scaling up NbS for urban resilience by identifying and documenting existing NbS in a number of Pourashavas – secondary cities. Developed in close partnership with IUCN Bangladesh and with the generous support from the UK Government, the Compendium highlights 20 scalable NbS interventions that respond to the unique challenges and opportunities of the Bangladeshi urban context. This focus on existing NbS ensures appropriateness and local acceptability. The Compendium forms part of GCA's support to the Government of Bangladesh's Improving Urban Governance and Infrastructure Program (IUGIP), financed by the Asian Development Bank (ADB) and Agence Française de Développement (AFD).

Designed as a hands-on resource for policymakers, planners, and development partners, the Compendium offers clear guidance to support the integration of NbS into urban strategies, inform policy and regulatory reform, and identify viable investment opportunities. It also contributes to GCA's broader global effort to position NbS as a central pillar of climate adaptation. Alongside our engagement in Bangladesh, GCA is developing NbS compendiums for urban resilience across seven countries in Africa. These parallel efforts are enabling cross-regional learning, helping to identify best practices, adapt solutions to local contexts, and collectively scale up NbS as a proven strategy for climate adaptation in cities around the world.

We hope this Compendium supports the integration of NbS into Bangladesh's urban development agenda. Moving forward, coordinated action and targeted investment will be key to building resilient, cost-effective, and sustainable cities.

Joep Verhagen

Global Lead, Water & Urban
Global Center on Adaptation

MESSAGE

The Local Government Engineering Department (LGED) has long played a leading role in advancing urban infrastructure across Bangladesh, contributing to sustainable, inclusive, and resilient urban development. In the face of increasing climate-induced risks and the evolving complexities of urbanisation, it is critical that infrastructure solutions address both environmental vulnerabilities and the needs of local communities.

In this context, LGED is pleased to support the development of the Compendium on Nature-based Solutions for Urban Resilience in Bangladesh. This initiative is being undertaken in collaboration with the IUCN, International Union for Conservation of Nature and Natural Resources, the Global Center on Adaptation (GCA), the Asian Development Bank (ADB), Agence Française de Développement (AFD), with funding support from the UK Government under the Improving Urban Governance and Infrastructure Program (IUGIP), implemented by LGED.

The Compendium offers a practical, evidence-based resource, consolidating insights and case studies to guide planners, policymakers, and practitioners nationwide. It outlines actionable Nature-based Solutions (NbS) to address urban challenges such as flooding, heat stress, salinity, erosion, and water scarcity. It also supports the integration of ecosystem-based approaches into project planning and urban policy frameworks.

Aligned with Bangladesh's national priorities—including the National Adaptation Plan, the 8th Five-Year Plan, and Delta Plan 2100—the Compendium is designed to support the country's broader development and adaptation goals.

LGED remains committed to promoting the adoption of NbS in municipalities and secondary cities across Bangladesh. We will continue to foster capacity building and policy alignment to support effective implementation. It is our hope that this Compendium serves as a catalyst for mainstreaming nature-based infrastructure solutions throughout urban Bangladesh.

Md. Abdur Rashid Miah

Chief Engineer

Local Government Engineering Department (LGED)

Acknowledgement

Rapid urban expansion is transforming our landscapes at an unprecedented pace. As cities expand, natural ecosystems and biodiversity degrade at an unprecedented rate. Cities contribute significantly to climate change through increased greenhouse gas emissions, energy consumption, and deforestation. On the other hand, due to climate change, cities face unparalleled challenges, like flooding and the urban heat island effect. Nature-based Solutions (NbS) offer sustainable, cost-effective, and inclusive approaches to enhance climate resilience and improve urban liveability.

In this light, IUCN and GCA partnered to develop the Compendium on Nature-based Solutions for Urban Resilience in Bangladesh, which offers practical guidance for policymakers, urban planners, and financial institutions on incorporating NbS into urban development strategies. The partnership could support GCA under the Bangladesh Climate and Environment Programme, funded by the UK Government. This initiative is also a part of GCA's technical assistance to the Improving Urban Governance and Infrastructure Project (IUGIP), which is financed by the Government of Bangladesh, the Asian Development Bank (ADB), and Agence Française de Développement (AFD), and implemented by the Local Government Engineering Department (LGED).

The success of this initiative is the result of the collective dedication and collaboration of numerous individuals and institutions. We are deeply grateful to all who have contributed to making this important work possible.

We extend our sincere gratitude to the Chief Engineer and Project Directors of IUGIP, CRIM (Climate Resilient Infrastructure Mainstreaming), CRDP (City Region Development Project), and other officials from the Local Government Engineering Department (LGED) for their invaluable cooperation. We also wish to thank officials from the Ministry of Environment, Forest and Climate Change (MoEFCC), Department of Environment (DoE), Urban Development Directorate (UDD), Bangladesh Water Development Board (BWDB), and various municipalities, city corporations, academic institutions, NGOs, INGOs, and engineering firms for their active participation in sounding board meetings, multi-stakeholder workshops, and the national-level launch event. Their insights and support have been pivotal in shaping the compendium and strengthening the broader NbS agenda.

We want to acknowledge the thoughtful contributions of our expert authors: Tasfin Aziz, Senior Lecturer, Department of Architecture, BRAC University; Alia Shahed, Assistant Professor, Department of Architecture, BUET; Md Anisur Rahman, Urban Planner; Dr Syed Mortuza Asif Ehsan, Associate Professor, Department of Economics, North South University; Dr Mohammad Mosharraf Hossain, Professor, Institute of Forestry and Environmental Sciences, University of Chittagong. Special recognition goes to Ahammad-Al-Muhaymin, Assistant Professor, Department of Architecture, BUET, for his significant contribution.

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We hope that the compendium will inspire and inform a broad audience—urban planners, practitioners, policymakers, and researchers—by offering context-specific insights and cost-effective actionable interventions to facilitate the integration of NbS into urban planning.

Raquibul Amin

Acting Country Representative, IUCN Bangladesh and
Head, Programme Management, IUCN Asia

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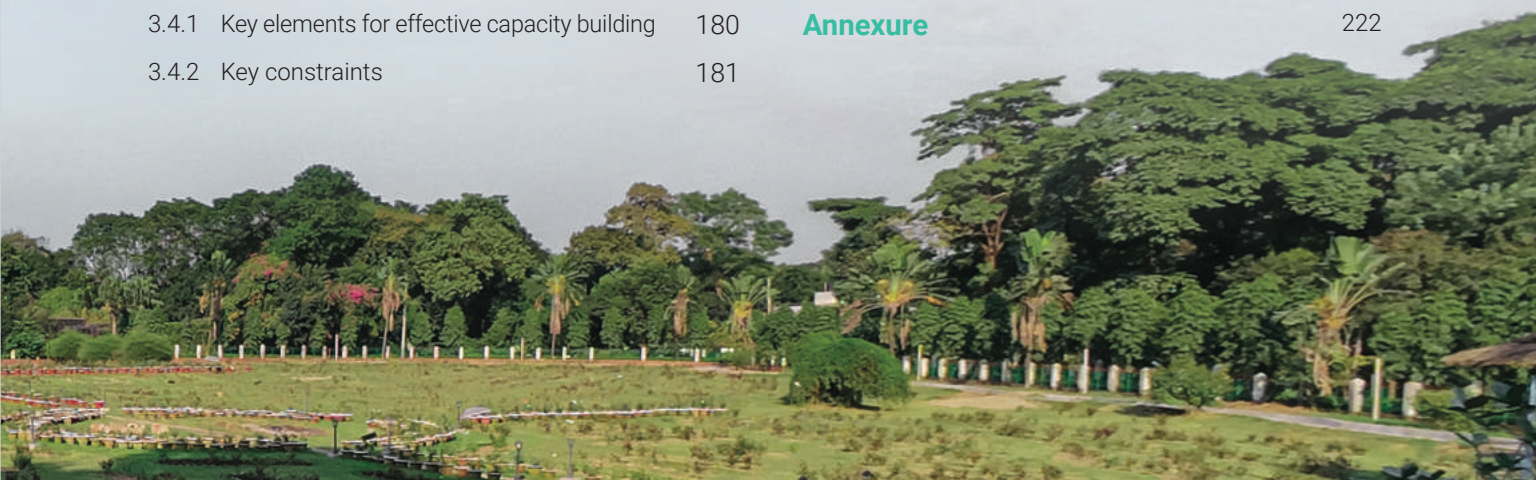
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List of Abbreviations

ADB	Asian Development Bank
AFD	Agence Française de Développement
AR	Annual Report
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistics
BCR	Benefit-Cost Ratio
BDP	Bangladesh Delta Plan
BDT	Bangladeshi Taka
BFD	Bangladesh Forest Department
BMD	Bangladesh Meteorological Department
BRAC	Building Resources Across Communities
BWDB	Bangladesh Water Development Board
CAPEX	Capital Expenditure
CBA	Cost-Benefit Analysis
CCA	Climate Change Adaptation
CDA	Chattogram Development Authority
CEGIS	Centre for Environmental and Geographic Information Services
CHD	Chattogram Hill Districts
CSR	Corporate Social Responsibility
DAP	Detailed Area Plan
DC	Deputy Commissioner
DCC	Dhaka City Corporation
DFID	Department for International Development
DOE	Department of Environment
DPHE	Department of Public Health Engineering
DSCC	Dhaka South City Corporation
FGD	Focus Group Discussion
GCA	Global Centre on Adaptation
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICLEI	International Council for Local Environmental Initiatives
IDA	International Development Association
IFAD	International Fund for Agricultural Development

IFC	International Finance Corporation
IFESCU	Institute of Forestry and Environmental Sciences of the University of Chittagong
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview
KOICA	Korean International Cooperation Agency
LEED	Leadership in Energy and Environmental Design
LGIs	Local Government Institutions
MoDMR	Ministry of Disaster and Management Relief
MoLGRD&C	Ministry of Local Government, Rural Development and Co-operatives
NAP	National Adaptation Plan
NBG	National Botanical Garden
NbS	Nature-based Solutions
NCC	Narayanganj City Corporation
NGOs	Non-government organisations
NPV	Net Present Value
OECMs	Other Effective area-based Conservation Measures
OPEX	Operational Expenses
PES	Payment-For-Ecosystem-Services
PPP	Public-Private Partnerships
PWD	Public Works Department
RAJUK	Rajdhani Unnayan Kartipakkha
RCC	Rajshahi City Corporation
RDA	Rajshahi Development Authority
RHD	Roads and Highways Department
SDGs	Sustainable Development Goals
TEV	Total Economic Value
UDP	Urban Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlements Programme
VAT	Value Added Tax



List of Icons



Yearly Average
Temperature



Population



Urban
Encroachment



Environmental
Pollution



Annual
Precipitation



Economy



Waterlogging



Urban Heat



Terrain



Soil



Economic Loss



Erosion



Natural
Calamity



Safety



Ecology



Water



Salinity



Cultural
Relevance



Ecosystem
Services



Urban
Space



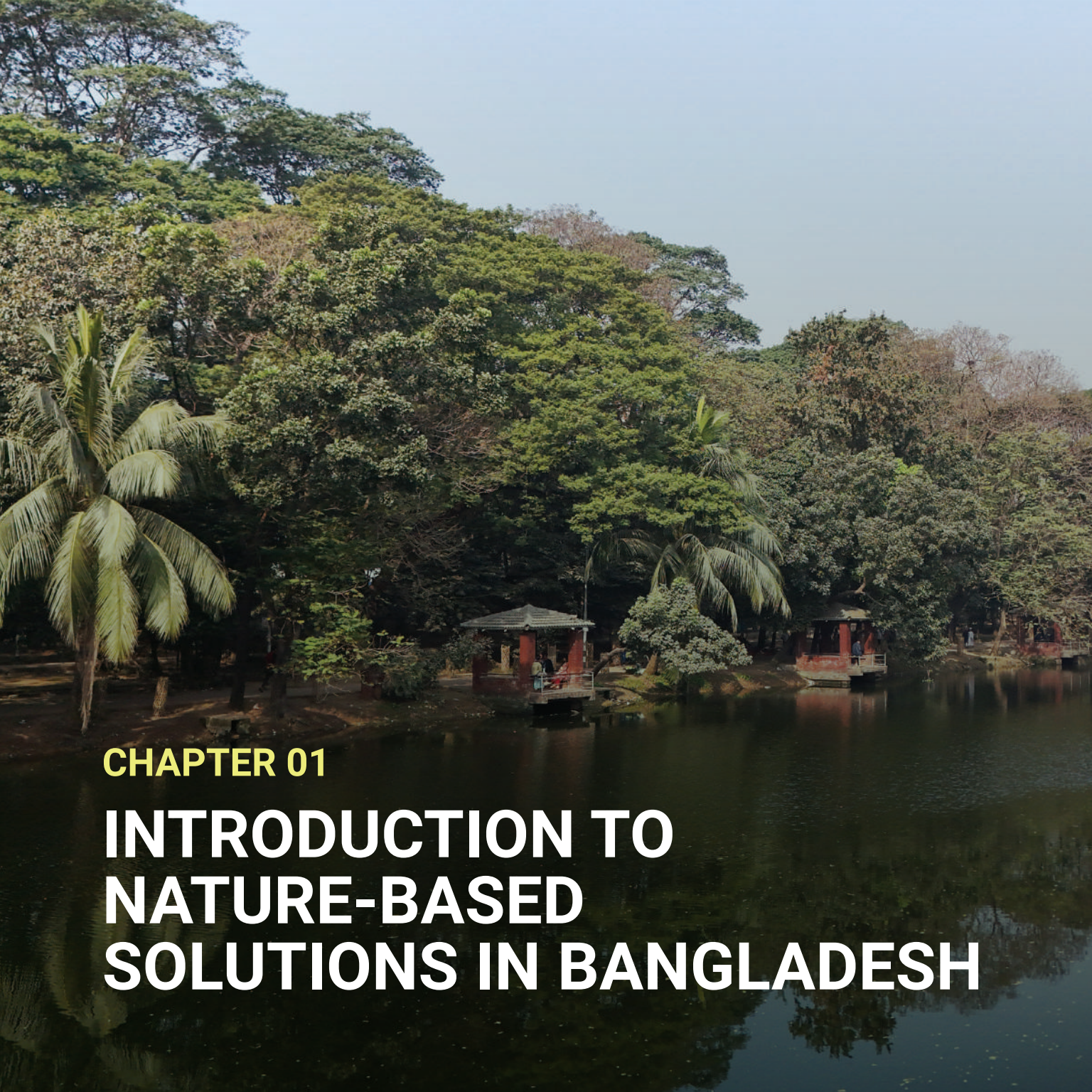
Health

Executive Summary

The compendium on nature-based solutions (NbS) focuses on showcasing locally led initiatives undertaken by various urban actors, categorised as NbS cases across the cities of Bangladesh. The existing policies, regulatory frameworks, and guidelines are reviewed to gain insight into the enabling environment for NbS implementation. Additionally, a cost-benefit assessment is included to facilitate the informed decision-making process for investment. The general purpose of the compendium is to enhance the awareness of local government institutions (LGIs) to build future urban resilience initiatives more responsive to the emerging challenges faced by the cities of Bangladesh. Additionally, the intention of IUCN in collaboration with GCA is to capacitate and make aware future investors and implementers from government, non-government, and development partners with a holistic, responsive framework and process guide. Urban actors will benefit from insights that could assist them in identifying NbS investments and policies.

The compendium has been developed using mixed methods; specifically, the information was gathered in two phases: first, through piloting in five case cities and two example cities, and second, through a literature review aimed at understanding the general urban challenges based on unique climatic zones and geographic contexts. Later, national-level workshops involving multi-level stakeholders and sounding board meetings, which consisted of a small group of subject matter experts and policymakers, were conducted to identify suitable NbS cases from various cities across the country at three distinct scales: city scale, neighbourhood scale, and community scale. Floods and waterlogging, heat risks, droughts, cyclonic winds, storm surges, coastal and tidal floods, landslides, erosion, salinity intrusion, encroachment on urban green and blue spaces, and a lack of accessible and gender-sensitive spaces in urban areas have been identified as key urban challenges. Nine potential NbS types (urban watercourse, urban water body, natural forest patch, urban plantation, urban green open space, coastal plantation, urban rainwater harvesting, bioengineering solutions, and built solutions) have been identified to showcase twenty cases within these categories. The compendium examines governance practices, policy frameworks, funding opportunities, and the technical capacity of local government institutions (LGIs) as essential components for creating a policy environment that fosters nature-based solutions (NbS) practices in Bangladesh. It thoroughly discusses the existing gaps and opportunities while also highlighting success stories within the current policy landscape. Finally, a framework for cost-benefit analysis is introduced for users, outlining a practical and systematic approach to assessing NbS projects in Bangladesh. Living in harmony with nature is the natural instinct for mankind and, indeed, represents a low-cost approach in relation to the contemporary practice of a market-driven economy. A collective awareness and willingness are necessary among and within multi-level urban actors to select the future course of development that effectively and adaptively addresses societal challenges, providing both human well-being and biodiversity benefits.



A scenic view of a pond surrounded by dense tropical forest, including palm trees, with small pavilions on the water.

CHAPTER 01

INTRODUCTION TO NATURE-BASED SOLUTIONS IN BANGLADESH

1.1 Nature-based Solutions (NbS)

In recent global development and policy discourses, Nature-based Solutions (NbS) have been adopted as a comprehensive method that combines the strength of nature with human social and technical expertise. IUCN (2016) defines NbS as: **“Nature-based Solutions are actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits”**. NbS is an umbrella concept that covers a whole range of **ecosystem-related approaches**, all of which address societal challenges from community level to territorial level. These approaches can be placed into five main categories, as shown in Table 1.

Table 1: Categories and examples of NbS approaches

Categories of Approaches	Examples
<i>Ecosystem restoration approaches:</i> Approaches that deal with ecological recovery from various states of degradation and include ecological-restoration approaches, ecological engineering approaches and forest-landscape restoration.	• Ecological restoration • Ecological engineering • Forest landscape restoration
<i>Issue-specific ecosystem-related approaches:</i> Approaches using nature, whether through its biodiversity or ecosystem services, to deal with the impacts of climate change. They cover ecosystem-based adaptation, ecosystem-based mitigation, ecosystem-based disaster risk reduction and climate adaptation services.	• Ecosystem-based adaptation • Ecosystem-based mitigation • Climate adaptation services • Ecosystem-based disaster risk reduction
<i>Infrastructure-related approaches:</i> Natural or semi-natural, green, or environmental assets that provide, conserve or enhance ecosystem services that yield societal benefits.	• Natural infrastructure • Green infrastructure
<i>Ecosystem-based management approaches:</i> Integrated management approaches of natural resources that in turn improve ecosystem health, thereby sustaining stocks and the flow of services.	• Integrated coastal zone management • Integrated water resources management
<i>Ecosystem protection approaches:</i> Area-based conservation approaches including protected area management and 'Other Effective area-based Conservation Measures' (OECMs).	• Area-based conservation approaches including protected area management

Source: Cohen-Shacham et al. 2016

NbS are characterised by their enabling ability to improve ecosystem services, providing direct and indirect benefits of natural processes provide to people (World Bank 2021). “The power of functioning ecosystems as infrastructure” (IUCN 2020) to mitigate urban challenges including disaster risk reduction, climate change, biodiversity loss, water scarcity and contamination, public health deterioration, and food and livelihood insecurity.

IUCN NbS global standards

NbS are increasingly recognised as an essential mechanism for achieving sustainable development by a wide range of stakeholders, including government, business, academia, research institution, and NGO. As a result, NbS are integrated into the policies and incorporated into development projects across various regions in the world. Therefore, the clarity and accuracy on the NbS concept and requirements are pivotal for successful implementation. In the absence of this, NbS applications risk becoming ungrounded and inconsistent. Therefore, to provide a comprehensive guidance and monitorable indicators for NbS project design and verification, IUCN published the Global Standard for NbS. This NbS standard consists of 8 criteria and 28 indicators that aim to ensure the application of this approach with its uptake tracked and measured for adaptive management. This helps maximise its contributions and inspires broader adoption.

IUCN NbS criteria help assess whether case examples qualify as NbS and provide a comprehensive indicator for planning, designing, and implementing future NbS in the fast evolving, sprawling cities, and changing landscape of urban areas in the world. The eight criteria (IUCN 2020) are as follows:

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

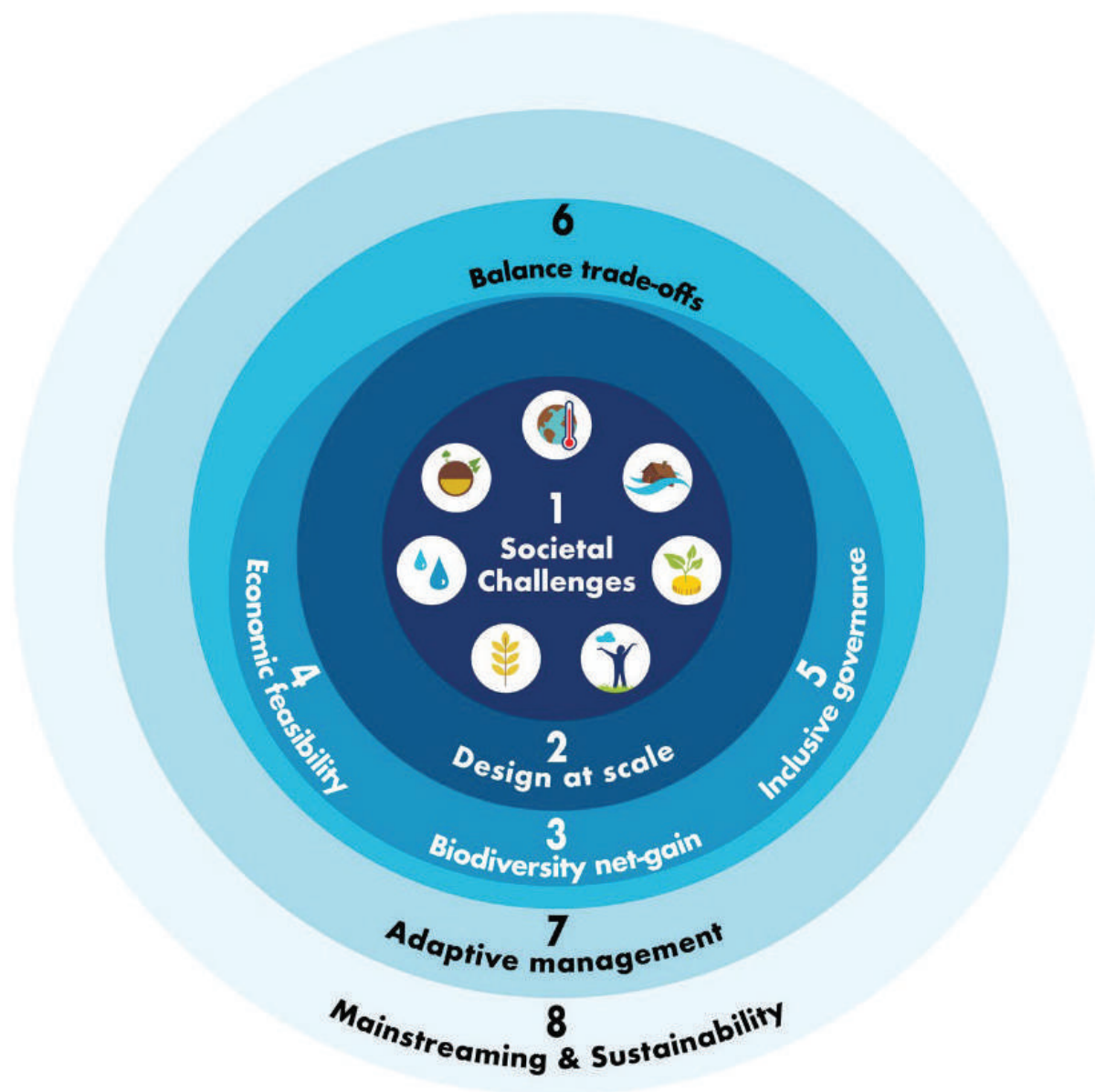


Diagram 1: IUCN NbS Global approach (IUCN 2020)

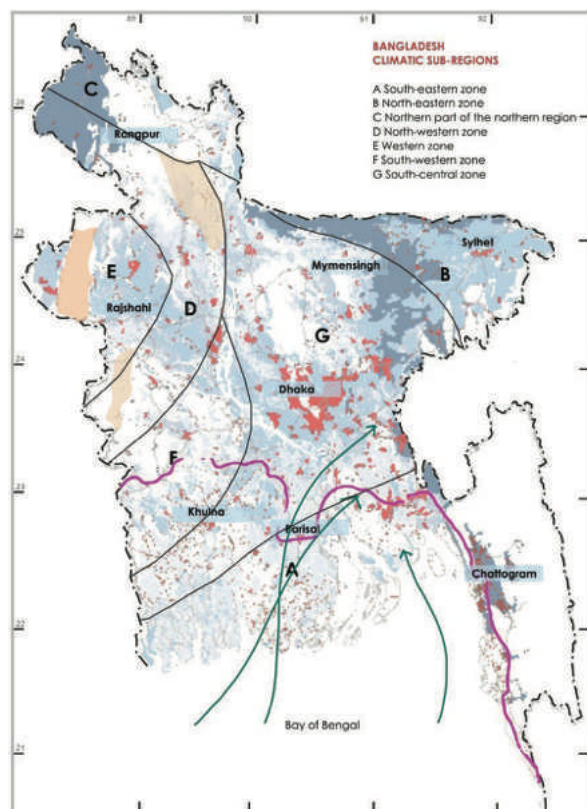
1.2 Why Do We Need Nature-based Solutions in the Cities of Bangladesh?

Bangladesh is a densely populated country with 170 million people (BBS 2022) and exposed to various climate extremes and anthropogenic hazards. Urban areas, in particular, are experiencing excessive population influx compared to rural areas leading to challenges in public service delivery, increased demand for sector-specific investments, and land cover and biodiversity loss. The Local Government (City Corporation) Act, 2009 and the Local Government (Pourashava) Act, 2009 refer to urban areas to cities (city corporations) or municipal (Pourashava) areas that are recognized for their urban characteristics, such as higher population density, economic activity, infrastructure, and governance needs. Therefore, building urban resiliency is essential to anticipate, prepare for, respond to, and recover from natural disasters, climate change, economic disruptions, and social challenges, while maintaining essential city functions and improving residents' well-being. Against this backdrop, NbS offer a cost-effective and impactful approach to adapting to environmental changes, reducing urban vulnerability, and ensuring sustainable development despite growing pressures.

1.2.1 Climate Change in Bangladeshi Cities

As the world's largest deltaic nation, Bangladesh has a dense population and is particularly vulnerable to natural disasters. Flash floods, river floods, and coastal flooding are likely to be exacerbated by intensified extreme rainfall, tropical cyclones and associated storm surges – placing lives, infrastructure, and economy at risk. In contrast, desertification symptoms are prevalent in the north, west and north-western regions due to extreme heat wave specifically the heat island effect that has become a contemporary reality of cities in Bangladesh in varied degrees.

Climate projections for Bangladesh, based on a downscaled multi-model ensemble (following the IPCC AR6), indicate a warming of 0.44°C to 0.69°C in the near term (2030s) and 1.3°C to 2°C in the mid-term (2050s). The most critical climate change-induced hazards in Bangladesh are rainfall variability, river floods, flash floods, urban floods, sea-level rise, salinity, cyclonic storm surges, droughts, extreme heat waves, extreme cold, riverbank erosion, lightning, landslides, higher sea surface temperature and ocean acidification. Due to climate change, most climate-related hazards will increase in frequency and/or intensity (NAP 2023-2050). Map 1 depicts the climatic sub-regions and climate risk exposure scenarios.



Source: adopted from Climate Knowledge Hub and Sarker et al. (2017)

Climate profile (sub-regions)

Southeastern zone (A): Heavy rainfall and small range of mean temperature

Northeastern zone (B): Mild summer temperatures, heavy rainfall and a cloudy cold winter.

Northern part of the northern zone (C): heavy rainfall, hot summer temperatures and cold winters.

Northwestern zone (D): hot summer temperatures and moderate rainfall.

Western zone (E): Very hot summer temperatures and relatively low rainfall.

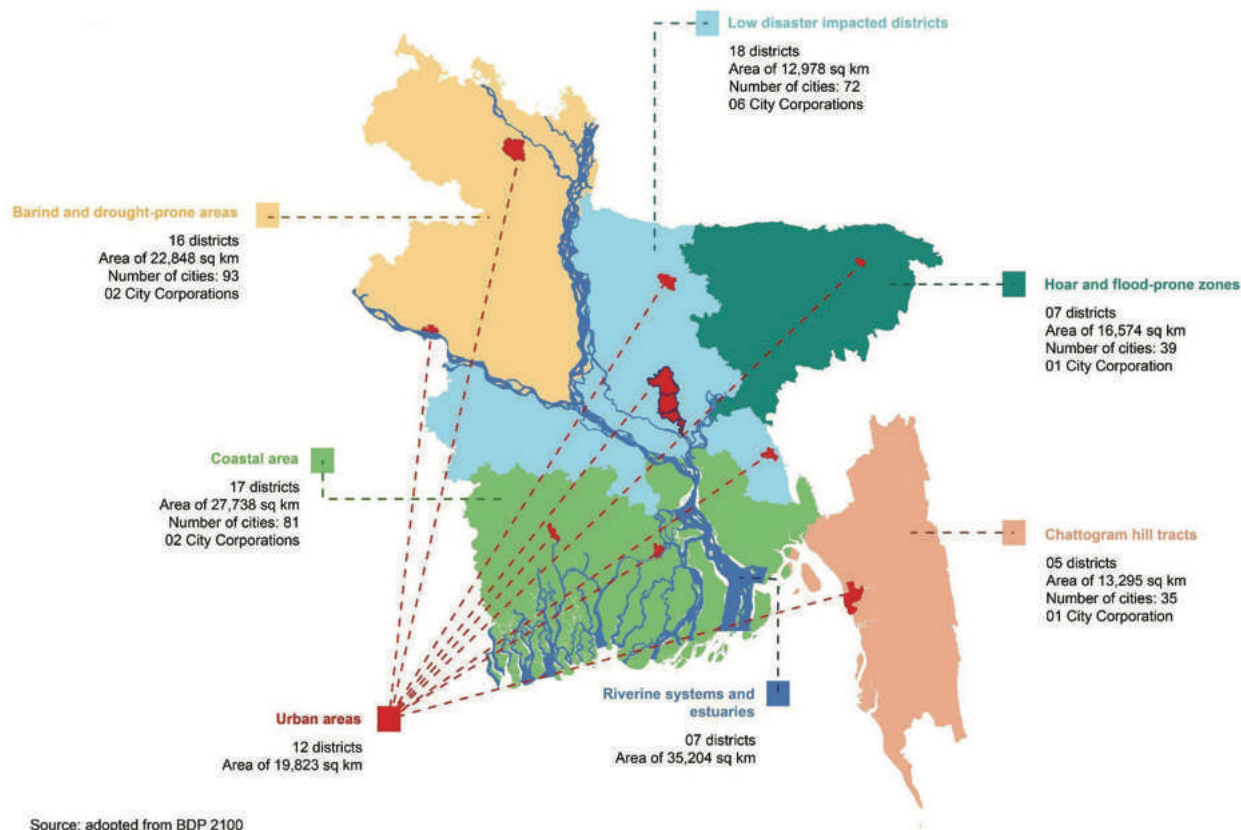
Southwestern zone (F): hot summer temperatures and fairly heavy rainfall.

South central zone (G): mild summers and fairly heavy rainfall.

Map 1: Climate Sub-regions and risk exposure, Bangladesh

The amplified exposure to risk of climatic catastrophe and anthropogenic hazard are highly correlated with the geographic location of human settlements. As Bangladeshi cities are

still dependent on agriculture and agro-industrial economy, the wellbeing of cities is impacted along with the variable nature of micro and macro climatic context.



Map 2: Geographic Regions and general city characteristics, Bangladesh

National Adaptation Plan of Bangladesh (2022) outlined the core climate induced challenges of the country, and its urban areas as: monsoon and

flash floods, drought, riverbank erosion, urban flood, sea level rise and storm surge, salinity intrusion, extreme heat, heatwave, lightning, landslides,

and sea surface temperature increase and ocean acidification. Depending on their location and the realities of urban development, Bangladeshi cities face the majority of the above-mentioned challenges. Cities have the dilemma of balancing out the extra-pressure of urbanisation and effective use of the allocated national revenue budget and locally sourced revenue. Traditional civil construction based spatial development practices are expensive. In order to restore the long-lost green-blue-grey nexus inside urban areas and re-connect the flow of natural systems, NbS is a generally recognised, well-liked, and equitable alternative to the conventional development paradigm. Besides, the existing policy framework has some references to accommodate NbS in the cities operations, such as the Local Government Division's guidelines for using 10% of their ADP for green and climate resilient investments.

1.2.2 Role and Benefits of NbS in Cities

We live in an urban reality, where urbanisation drives multiple changes in the landscape in both direct and indirect ways to people in the urban environment. Many cities in the world are facing the same fates including population growth, impact of infrastructure development, the increasing risk of flood and drought, and the loss of urban biodiversity. We are at a critical moment to consider how we can build and plan for future cities that reconnect with nature, enhance human well-being, and transform into inclusive, equitable, resilient, and sustainable. Achieving this requires fundamental shift in our relationship with nature alongside and

investment in urban planning, design, development and governance that brings ecology into the centre of our complex and complicated urban systems (McPhearson *et al.* 2023).

Cities around the world have developed the tools, plans, and measures to mitigate the challenges resulting from the impacts of climate change and urbanization, such as green infrastructure to complement hard, grey, or structural solutions. Moreover, the green infrastructure offers multiple co-benefits from providing wildlife habitats in the city to creating opportunities for recreational spaces that promote social interaction. This is the starting point for the framework of nature-based solutions that address the societal challenge (McPhearson *et al.* 2023)

The term NbS has been used widely due to the broad range of possible solutions that are applicable across diverse landscapes. NbS has garnered interest in the urban sector for its dual roles in promoting human well-being and enhancing biodiversity at the same time. At the same time, governments worldwide have embraced the concept of NbS as a key strategy to secure essential ecosystem services such for human health and wellbeing. Overall NbS is seen as a cornerstone for addressing societal challenges in cities, especially biodiversity loss and climate change.

1.2.3 NbS in Bangladeshi Cities

NbS are increasingly being widely discussed as effective strategies to address the urban challenges

faced by cities in Bangladesh. As urbanization continues to accelerate, secondary cities beyond major ones like Dhaka, Chattogram, and Rajshahi are grappling with issues such as flooding, drought, heat islands, water pollution, and loss of green spaces. NbS, including urban open green spaces, urban forest patches, natural inland wetlands, and bio-retention areas, offer sustainable alternatives to traditional infrastructure. These approaches not only boost resilience against climate change but also enhance air quality, regulate stormwater, and promote the health and well-being of city residents. In Bangladesh, there is an increasing awareness of NbS, as municipalities, business organisation, individuals, and local communities are undertaking various initiatives that have significant environmental, social, and economic advantages. Nonetheless, obstacles persist in expanding these solutions, necessitating more robust policy frameworks, increased investment, and heightened public awareness to completely harness their potential in reshaping urban environments.

1.3 About this NbS Compendium

The compendium of Urban Nature-based Solutions in Bangladesh has been developed as a guidance document to support the growing demand for NbS as an alternative tool focusing on an ecosystem-based approach by enabling the scoping, identification, planning and design of potential investments in nature-

based solutions. IUCN Bangladesh took the challenge of developing the document which is considered to be the first of its kind in Bangladesh. The Global Center on Adaptation (GCA) South Asia is financing with an intention to capacitate and aware future investors, implementers from government, non-government and development partners with a holistic nature responsive framework and process guide. Insights will help enable urban actors with the potential identification of NbS investments and policy revision.

This compendium seeks to address three key questions:

- (i) what existing NbS are applicable for different urban challenges,
- (ii) what policy frameworks enable effective NbS implementation, and
- (iii) how the costs and benefits of NbS implementation can be measured.

The compendium is structured as follows: Chapter 2 provides a contextual NbS typology, presents implemented urban NbS cases, and evaluates their quality. Chapter 3 examines the policy guidelines, plans, laws, and regulations necessary to facilitate the adoption of NbS in Bangladeshi cities. Chapter 4 serves as a toolkit for assessing the merits of NbS for end users, including a cost-benefit assessment example to help users better understand the process. Chapter 5 outlines the way forward and strategic recommendations to mainstream NbS into future urban development initiatives.

1.3.1 Pathway to Urban NbS Compendium

The preparation of the urban NbS compendium initially focused on five municipalities (Nilphamari, Kulaura, Moulvibazar, Sandwip, and Bandarban) and two example cities with strong NbS practices (Narayanganj and Rajshahi city corporations) as pilot case study cities, representing different geographic and climate zones of Bangladesh. The exploration of these pilot cities helped to identify both the unique, location-specific challenges and the general urban issues faced by cities in Bangladesh. Key Informant

Interviews (KII) and Focus Group Discussions (FGD) with relevant city officials and civil society members were utilized in this process. The second phase of the exploration aimed to identify NbS cases from various cities across the country at three different scales: City Scale, Neighbourhood Scale, and Community Scale. National-level workshops and sounding board meetings served as the initial source for identifying relevant NbS cases. Subsequently, KIIs were used to develop detailed briefs for each individual case.

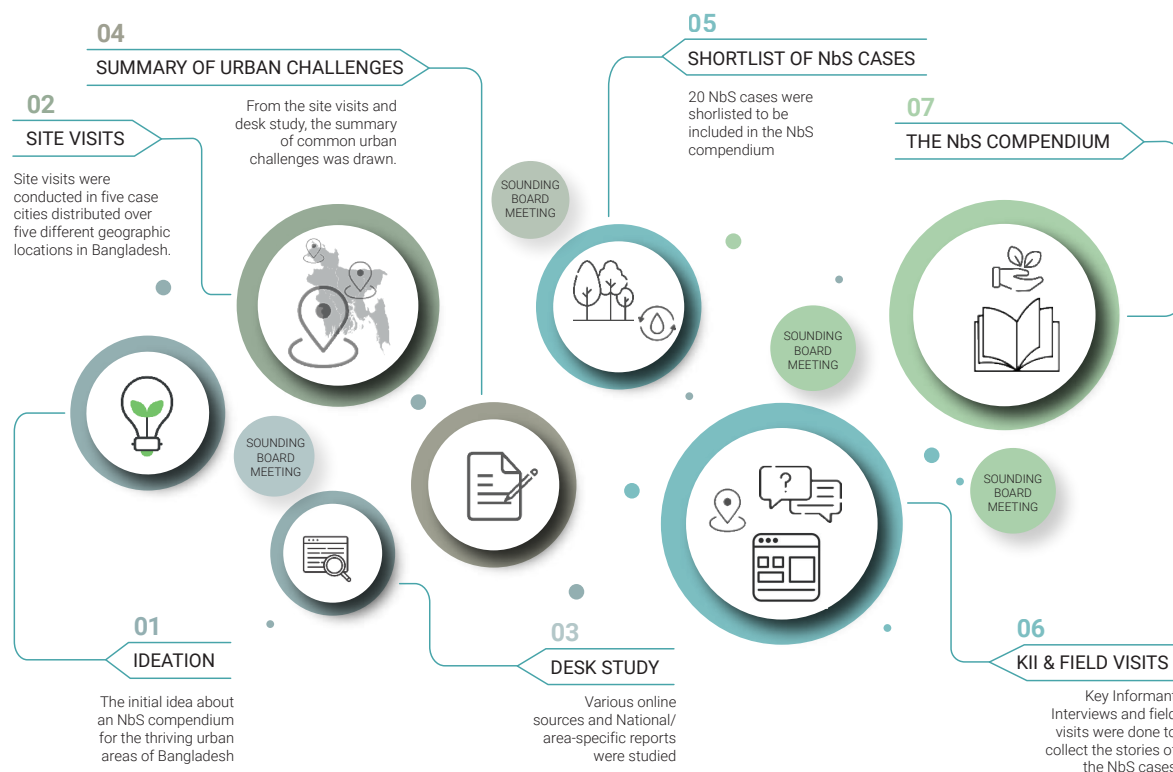


Diagram 2: Approach to developing urban NbS compendium

1.3.2 General Urban Challenges

Cities in Bangladesh are facing multi-faceted challenges, including both natural and man-made factors. These challenges stem from a combination of economic, societal, and nature-centric causes. This study specifically focuses on the environmental challenges faced by cities in Bangladesh. Based on the pilot study, a set of general challenges has been identified and is presented in Table 2.

Table 2: Identification of general urban challenges of sample case cities

City	Spatial and Non-spatial Challenges	
	Natural	Man-made
Nilphamari	Drought, Storm Water Drainage/Runoff, Ecological Connectivity, Biodiversity Loss, Unused urban land parcels and rooftops, Potable Water Scarcity during dry season, Decreased water retention capacity of surface water sources, Monsoon Flooding	Public Land Encroachments (Baor and river), Heat Island Effect, Unplanned Development, Municipal Solid Waste, Waterlogging, Water Pollution, Biodiversity Loss
Moulvibazar	Storm water drainage, Decreased water retention capacity of surface water sources, Public Land Encroachments (forest, river and streams), Ecological Connectivity, Biodiversity Loss, Earthquake Resilience	Rapid deforestation, Heat Island Effect, Unplanned Development, Public Land Encroachments (forest, river and streams), Municipal Solid Waste, Biodiversity Loss
Kulaura	Flash Flood Resilience, River Erosion, Decreased water retention capacity of surface water sources, Ecological Connectivity, Biodiversity Loss, Earthquake Resilience	Public Land Encroachments (forest, river and streams), Heat Island Effect, Municipal Solid Waste, Unplanned Development, Insufficient playgrounds and citizens space, Biodiversity Loss
Bandarban	Flash Flood Resilience, Municipal Solid Waste, Ecological Connectivity, Biodiversity Loss, Potable Water Scarcity, Soil erosion	Public Land Encroachments (forest, river and streams), Unplanned Development, Water Pollution, monoculture, aggressive horticulture, Deforestation, landslides, Biodiversity Loss

City	Spatial and Non-spatial Challenges	
	Natural	Man-made
Sandwip	Connectivity, Cyclones, Tidal Surges, Salinity Intrusion, Ecological Connectivity, Biodiversity Loss	Public Land Encroachments (forest, river and streams), Municipal Solid Waste, Unplanned Development, Lack of Drainage Facility, Biodiversity Loss

Source: Field Survey, KII, FGD, 2022

1.3.3 Key Urban Challenges

An in-depth review of the literature on urban challenges in Bangladeshi cities, along with findings from the pilot study, highlights the following key urban challenges that require special attention in future development initiatives.

- Floods and Waterlogging
- Heat Risks
- Droughts
- Cyclonic Winds, Storm Surges, and Coastal/Tidal Floods

- Landslides and Erosion
- Salinity Intrusion
- Others (Encroachment over urban green/blue spaces and Lack of accessible and gender-sensitive spaces in urban areas)

The following chapters of the compendium showcase NbS are implemented across Bangladesh cities at various scales, policy provisions for NbS and an economic viability assessment framework and emphasizing how cities can intervene to reduce key urban challenges in future development decisions.

An aerial photograph of a large, dark green, oval-shaped pond situated in the center of a densely built urban area. The pond is surrounded by a thick ring of lush green palm trees and other tropical vegetation. Surrounding the pond are various multi-story buildings, some with flat roofs and others with more complex structures. A prominent building with a blue and white striped facade is visible on the right side. The overall scene illustrates a natural water body integrated into a city environment.

CHAPTER 02

NATURE-BASED SOLUTIONS COMPENDIUM

This chapter showcases twenty inspiring examples of nature-based interventions from Bangladesh, each highlighting different facets of NbS. For each case, an 8-point radar diagram provides a subjective assessment of NbS against the 'Eight Criteria' (outlined in Section 1.1 of Chapter 1) and identifies whether this intervention adheres to the IUCN Global Standard for NbS. Likert scale of 1 to 5 is used to obtain a score for each criterion to generate the corresponding point of the octagon in this assessment. While these interventions may not fully align with all the criterias outlined in the IUCN Global Standards for NbS, as they weren't initially designed as NbS, they effectively demonstrate how such solutions can address urban challenges and promote sustainability. Moreover, they highlight the potential for implementing NbS on a variety of scales, from household to community to city-wide levels.

A matrix on the following page highlights the major types of NbS designed to tackle common urban challenges in Bangladesh. Notably, each NbS offers a range of ecological, economic, and social co-benefits alongside addressing specific urban issues. The numbers listed beneath each NbS name correspond to the case examples discussed in detail later in this chapter.

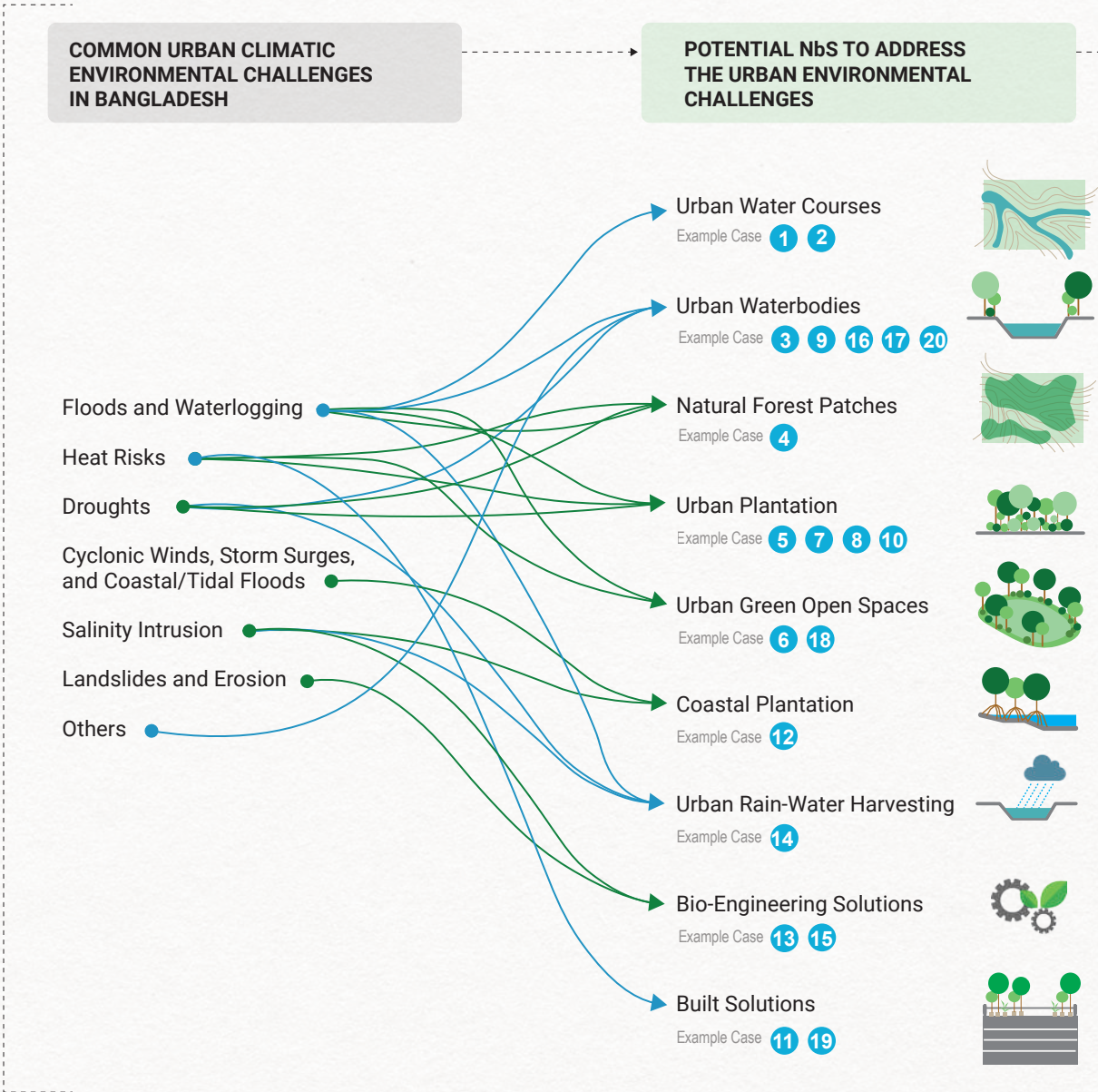


Diagram 3: A matrix depicting major types of NbS to tackle common urban challenges in Bangladesh

CO-BENEFITS OF THE NbS		
 ECOLOGICAL	 ECONOMIC	 SOCIAL
Riparian vegetation, habitat for birds, fish, small animals and insects	Riparian vegetation can be used as energy crops and facilitate local crafts	Seasonally varied recreational space, urban open space, better living quality
Trigger biodiversity in urban area; bird, fish, and small animal sanctuary	Urban fish culture, riparian crops, catering small businesses nearby	Urban recreational space, urban green/ blue open space, better living quality
Biodiversity hotspots for variety of native trees, birds, amphebians and insectsts	Native fruits and vegetables, honey, wood and other byproducts	Better urban liveability for the community; scope for urban leisure
Cater biodiversity and create habitat for birds, amphibians and insects	Fruits, vegetables, wood, firewood and other crops	Urban recreational space, pleasant views and better living quality
Cater biodiversity and create habitat for birds, amphibians and insects	Cost benefit from wood, firewood, leaves, fruits etc.	Urban gathering space, hosts various festivals; beneficial for health
Biodiversity hotspots, variety of native tree species conserved	Cost benefit from Wood, firewood, leaves, fruits and coastal protection	urban leisure space, storm protection, better living quality
Cater aquatic and terrestrial biodiversity in some cases	Urban fish culture, riparian crops harvest	Urban recreational space, urban green/ blue open space, better living quality
Cater aquatic and terrestrial biodiversity	Cost benefit from lower building cost and easy maintenavnce	May become source of urban leisure
Cater urban ecology by becoming a stepping stone for biodiversity	Cost benefit from natural thermal control, water and waste management and other ecological services	Better urban living quality and sustainable management of life and resources

GREEN AND BLUE NbS MEASURES

GREY+ GREEN/BLUE MEASURES



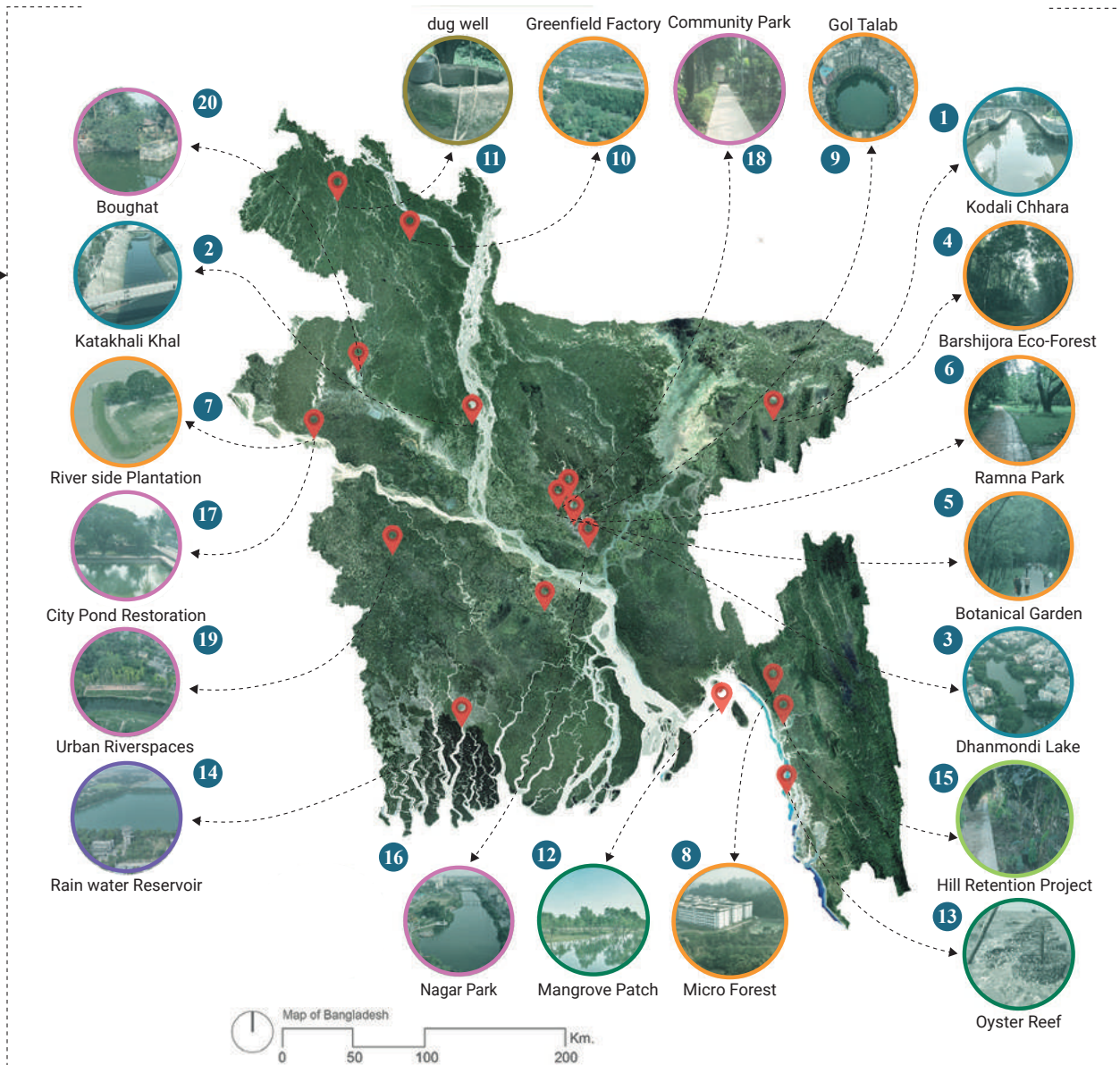
NbS EXAMPLES FROM BANGLADESH ADDRESSING URBAN CLIMATIC ENVIRONMENTAL CHALLENGES

COMMON URBAN ENVIRONMENTAL CHALLENGES IN BANGLADESH

-  Floods and Waterlogging
-  Heat Risks
-  Droughts
-  Cyclonic Winds, Storm Surges, and Coastal/Tidal Floods
-  Salinity Intrusion
-  Landslides and Erosion
-  Others

Here, twenty NbS case examples are demonstrated in the map of Bangladesh. The coloured ring around each example image denotes the main challenge it addresses from the given legend of urban challenges. In the following part of this chapter, the challenges and the NbS examples are further explained.

Photo 1: Aerial View of Water Treatment Plant, Mongla



Map 3: 20 NbS case examples from Bangladesh addressing urban climatic environmental challenges

2.1 NbS for Floods and Waterlogging

Bangladesh, characterised by mostly flat terrain and interspersed with numerous rivers and tributaries, experiences annual flooding. Approximately 92.5% of the basin area of its three major rivers—Brahmaputra, Jamuna, and Meghna—lies outside its borders. During the monsoon season (June–September), most of the country's annual rainfall occurs, forcing the flat terrain to manage massive cross-border and domestic runoff through its intricate river network (Mirza 2022). Often, this volume exceeds the drainage capacity, making Bangladesh one of the most flood-prone countries globally, with around 80% of its total area vulnerable to riverine flooding (Hasnat *et al.* 2018).

In urban areas, unplanned encroachment on floodplains, along with the loss of wetlands and streams, has intensified the impacts of flooding. Urban waterlogging has become a persistent issue during the wet season, heavily disrupting city life with casualties, traffic congestion, and economic losses due to flash floods (Akter *et al.* 2017).

Factors like rapid population growth, unplanned urbanisation, impervious surfaces, wetland depletion, insufficient drainage, and climate change have increased the frequency of urban floods in recent years. The examples of Nature-Based Solutions (NbS) presented in this section, focusing on reclaiming, rejuvenating, and conserving urban watercourses and water bodies, offer strategies to mitigate this growing challenge.

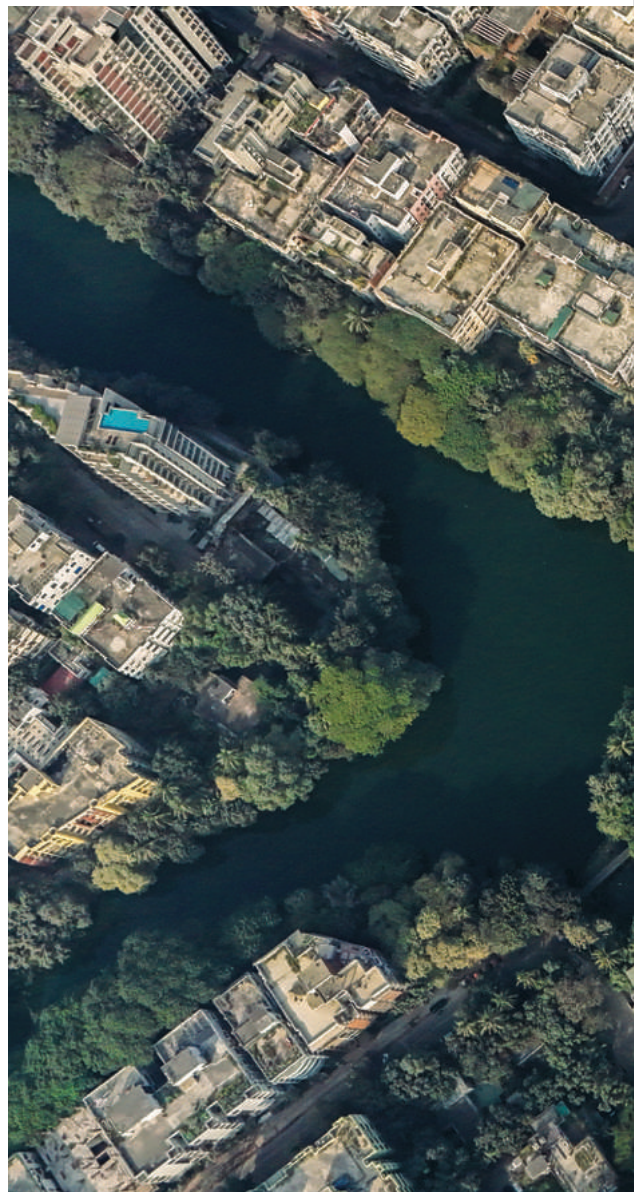
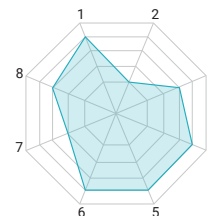


Photo 2: Aerial View of Dhanmondi Lake, Dhaka



1 Kudalichora Canal, Moulvibazar

NbS Type: Urban Watercourse



Subjective assessment of NbS using eight IUCN Global Standard criteria

The Kudalichora Canal is an inspiring example of how restoring natural waterways can significantly enhance urban living and climate resilience. Flowing through the heart of Moulvibazar Municipality, the Canal, alongside the Manu River, serves as the area's primary drainage system. It originates from streams in the Barshijora forest and hills, travels through Fata Bill, Moulvibazar Sadar, and Khainzar

Haor, and ultimately merges with Hail Haor. Once known as the "Curse of Moulvibazar" due to flooding, waterlogging, and severe pollution, the Canal underwent a transformation through a restoration project led by the municipality. This initiative not only improved its drainage capacity but also turned it into a functional and visually appealing urban waterway, benefiting both the community and the environment.



Photo 3 : Aerial View of Kudalichora Canal, Moulvibazar

Stakeholders

Moulvibazar Municipality, Local Government,
Rural Development and Co-operatives (LGRD),
Residents

Cost of Project

25 crore Taka;
Funding agency: LGRD

City Profile



24.5 °C



2860 mm per
year



Holocene
food plain,
low elevated
terrace, and
irregular
hillocks



Silty clay,
clayey silt, and
sand



68,303



Foreign
Remittance,
Business

Urban Challenges Addressed



Illegal encroachment
on both sides of the
canal



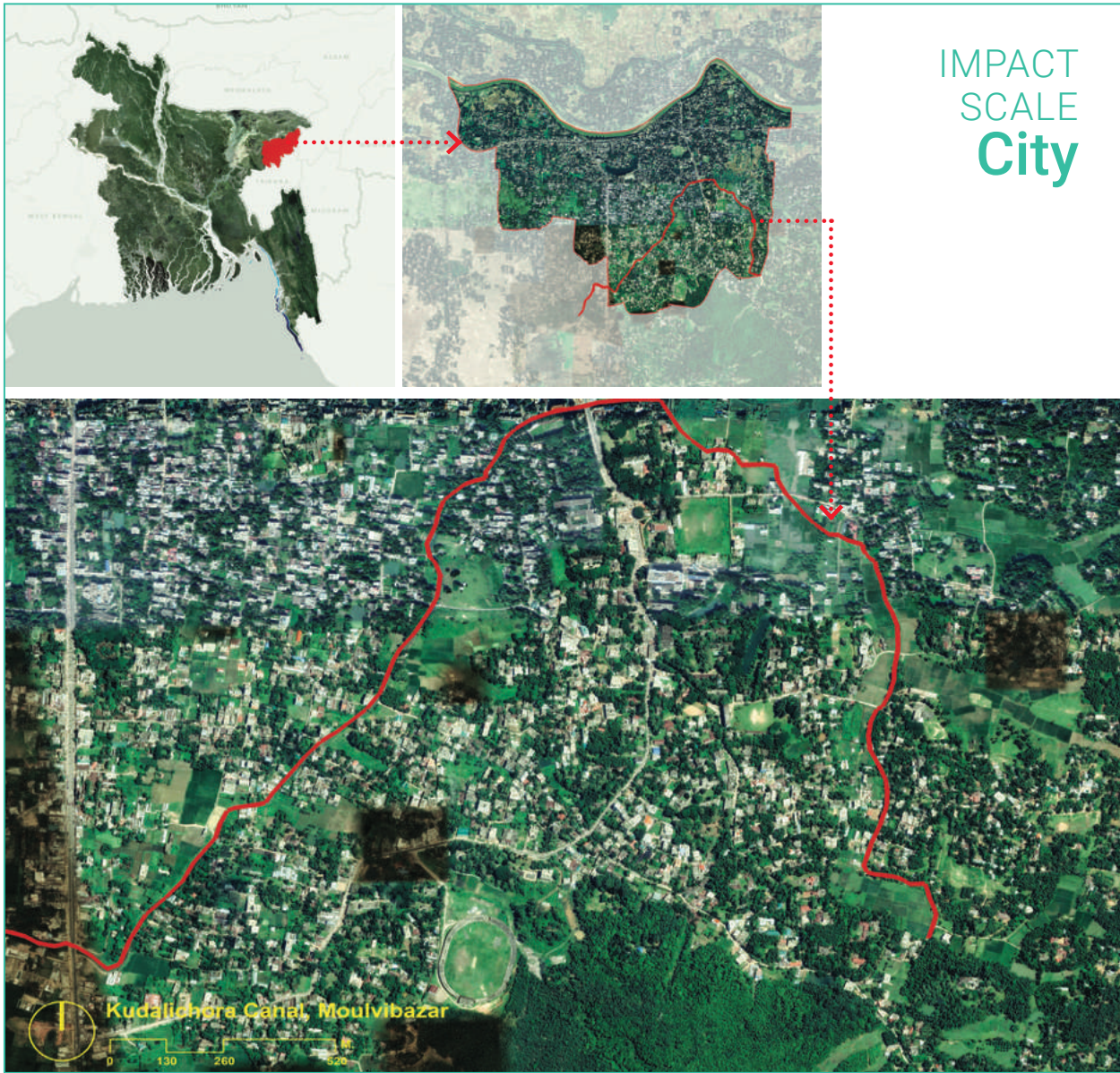
Indiscriminate
waste-dumping and
odour pollution



Waterlogging in the
city



Economic losses
due to urban
waterlogging



Map 4: Location of Kudalichora Canal, Moulvibazar



Photo 4: A view of Kudalichora Canal, Moulvibazar

Story of Kudalichora Canal, Moulvibazar

Historically, the Kudalichora Canal served as Moulvibazar Municipality's primary drainage system and was once navigable by small boats. With clear water, it supported local fishing and acted as a vital ecological resource. Over time, encroachment, lack of maintenance, and waste dumping led to its deterioration, causing severe waterlogging during moderate to heavy rainfalls. The Canal collects upstream water and flows into Hail Haor, with the "Fata Bill" once functioning as a connected reservoir. However, extensive land encroachment led to the filling of the Fata Bill and the establishment of settlements, further reducing the Canal's capacity. Before its restoration, the Canal's width varied between 2 and 18 meters, and adjacent homes frequently faced flooding, connectivity loss, health issues, and bad odours. The pollution also decimated aquatic life, contributing to economic losses from reduced agriculture and fish cultivation in Moulvibazar Municipality and surrounding areas.

The Kudalichora Canal spans approximately 17 kilometres, with 5 kilometres passing through Moulvibazar Municipality, covering Wards 1, 2, 3, and 7. The restoration of the Canal was divided into five phases, including, raising public awareness, cleaning and enhancing its capacity, building slope-protective walls, and adding amenities like walkways, toilets, seating, light posts, and guard rails. The project also aimed to enhance local economic prospects through agriculture and fisheries.

In 2018, the mayor and officials of the Moulvibazar Municipality recognized the need to restore the Kudalichora Canal and initiated the restoration project. The first phase focused on raising public awareness through consultations with residents. The second phase involved a volunteer campaign Organised by the district administration and municipality, engaging local stakeholders to clean the canal and remove accumulated waste. Following approval by the LGRD, the project commenced, with nearly all work completed by 2024. The project was implemented using a participatory approach. Although land acquisition and the removal of some structures were necessary, residents supported the project due to its long-term benefits.



Photo 5: Greeneries surrounding the Kudalichora canal

Maintenance

Moulvibazar Municipality is responsible for the operation and maintenance of the Kudalichora Canal. A 2% surcharge, known as the "Kudalichora Surcharge," is added to municipal bills, generating up to 10 lakh Taka annually for the canal's maintenance.

Co-Benefits Attained



Boosting urban ecology through the canal and canal-side plantation



Better navigability in canal and canal acting as a blue-green corridor



Urban recreational space

Critical Reflections

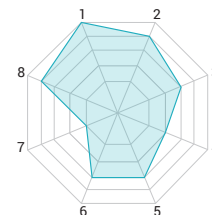
Despite ongoing awareness campaigns and waste collection efforts, some households still discharge septic waste into the canal. The Municipality should allocate more resources for more frequent and effective awareness campaigns.

The downstream section of the canal is outside the Municipality's jurisdiction, preventing restoration and cleaning efforts. Collaboration with the Upazila Authority is essential to address this issue.

To be an effective Nature-based Solution (NbS), the project should not be implemented piecemeal. It must address all portions of the Canal as parts of an integrated system addressing larger scales to provide long-term, sustainable benefits.

2 Katakhalī Khal, Sirajganj

NbS Type: Urban Watercourse



Subjective assessment of NbS
using eight IUCN Global Standard criteria

The Katakhalī Canal, a historic waterway recently restored, is a vital natural feature of Sirajganj City, known for its vulnerability to flooding. After years of stagnation and encroachment, the canal was reconnected to the Jamuna River in 2019 through an intervention by the Sirajganj Water Development Board. It links the Jamuna River to the north with the Hurashagor and Bangali Rivers to the southwest and south, flowing approximately 8 km through Sirajganj

in a north-south and partly east-west direction. The restoration effort included clearing pollution, removing encroachments, restoring natural water flow, and adding urban amenities like bridges, walkways, and plantations, transforming the canal into a vibrant urban space. While the project is not fully complete, it stands as a promising model for restoring urban canals, mitigating waterlogging, and enhancing resilience in riverine flood-prone regions.



Photo 6: Aerial View of a portion of the Katakhalī Khal, Sirajganj

Stakeholders

Sirajganj Municipality, Ministry of Local Government and Residents

Cost of Project

About 25.8 crores; Funded mostly by the Government of Bangladesh

City Profile



29.68°C



1610 mm per year



Mostly flat with some low-lying areas and many depressions



Clay loam, silty clay, silty loam, silt and sandy loam



188,528



A principal jute trade Centre

Urban Challenges Addressed



Illegal encroachment on the canal



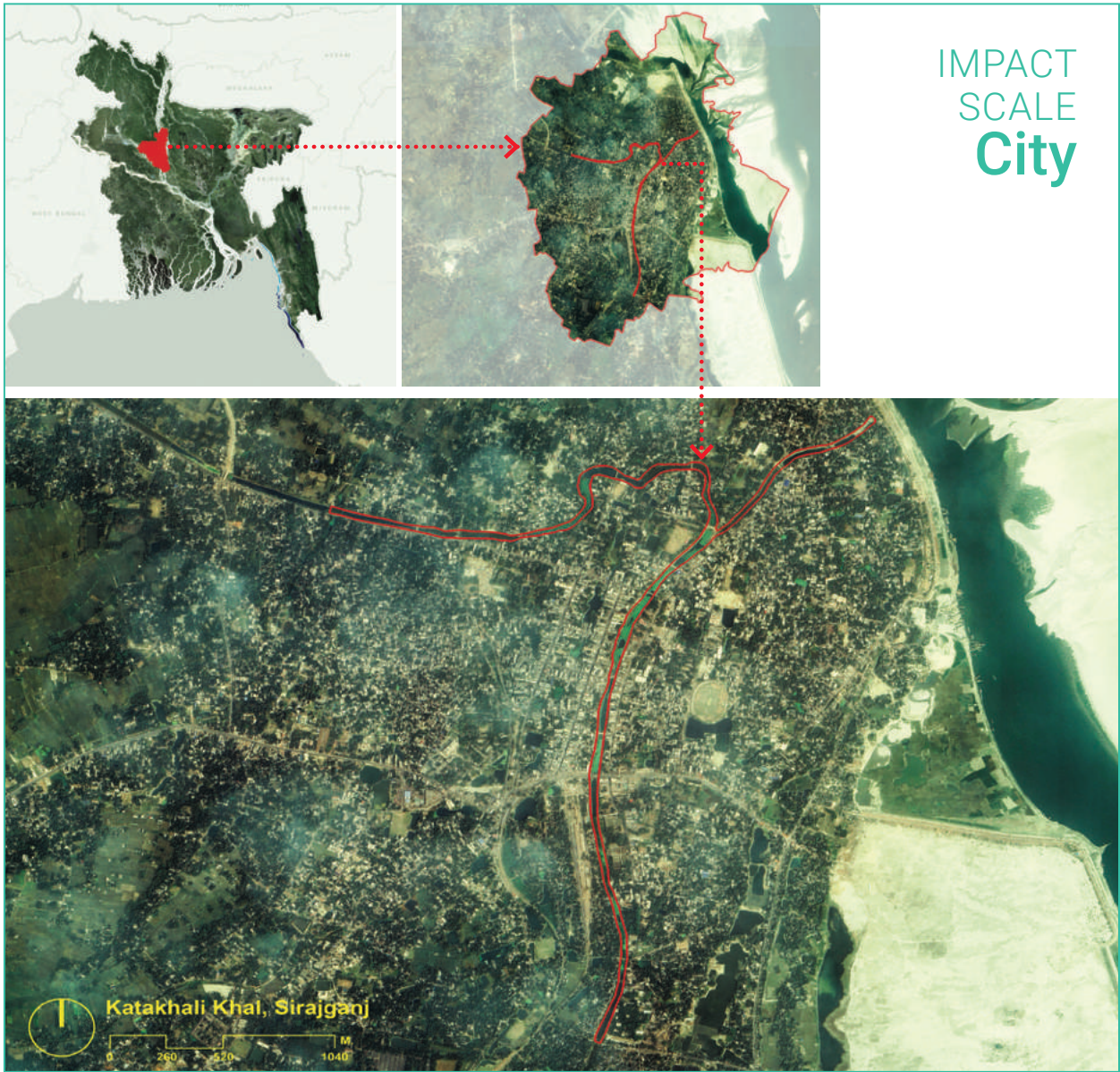
Indiscriminate waste-dumping and odour pollution



Severe waterlogging in the city



Need for a healthy urban space felt by residents



Map 5: Location of Katakhalī Canal, Sirajganj



Photo 7: A view of the Katakhal Khal and a bridge across it

Story of the Katakhal Khal, Sirajganj

The Katakhal Canal, originally excavated by the British in 1803 to support their jute trade, was named 'Katakhal Khal' and connected to the Jamuna River at both ends. Once a busy waterway used by boats and launches, the canal's navigability declined after Bangladesh's independence. By the 1980s, fish farming had halted boat movement, and illegal encroachments and waste dumping transformed the canal into a polluted and stagnant dumping ground.

Between 2019 and 2022, a restoration project led by the Ministry of Local Government aimed to revitalise the Katakhal Khal and its surroundings. The canal was re-excavated, three scenic bridges were constructed, and a 3-kilometre walkway with trees planted along the edges was created to enhance the area and connect local communities. In 2019, the Water Development Board also installed a sluice gate to reconnect the canal to the Jamuna River, significantly improving its water quality when opened during the 2021 monsoon season. The restoration renewed hope for the residents of Sirajganj, as the canal's improved condition brought tangible benefits to the city. Since the completion of the Katakhal project in 2021, waterlogging has been eliminated in the city during the rainy season, further demonstrating the canal's critical role in urban resilience. The re-excavated canal proved to be an

effective flood defence during the 2024 flood, as it helped contain and quickly drain large volumes of water, protecting Sirajganj while surrounding areas suffered from riverine flooding.

The project was completed by the Ministry of Local Government and handed over to the Sirajganj Municipality for ongoing maintenance, with active community involvement during the implementation phase.



Photo 8: Shallow water and water hyacinth infestation in the canal in the dry season (image taken during December 2024)

Maintenance

After completion, the project was handed over to Sirajganj Municipality for operation and maintenance, with the engineering and conservancy departments working together alongside the local community and ward councillor.

Co-Benefits Attained



Boosting urban ecology through the canal and canal-side plantation



Canal acting as a blue-green corridor



Urban recreational space

Critical Reflections

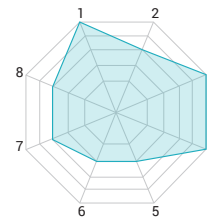
Due to a lack of public awareness and engagement, the canal faces continued pollution and waste dumping.

Fund constraints hamper regular maintenance of the canal, leading to the accumulation of waste and water hyacinth in the canal.

To serve as an effective Nature-based Solution (NbS), the canal must flow uninterrupted across all seasons, remain connected to the river, and maintain green, natural edges to function as a blue-green corridor for the city sustainable benefits.

3 Dhanmondi Lake, Dhaka

NbS Type: Urban Waterbody



Subjective assessment of NbS using eight IUCN Global Standard criteria

Dhanmondi Lake, centrally located within the residential area of Dhanmondi, is a prominent public gathering space in Dhaka city. This expansive urban waterbody is highly valued for its scenic natural setting, featuring lush greenery, walkways, bridges, and public amenities such as restaurants, cafeterias, and civic spaces like the Rabindra Sarobar amphitheatre. Initiated in 1996, this was one of

Dhaka's earliest formal lake development projects, effectively preserving the aquatic environment while promoting urban ecology, biodiversity, and mitigating urban heat. The lake remains an essential component of Dhaka's urban landscape, serving as a vibrant social hub and an economically viable model for sustainable urban development.



Photo 9: Aerial View of Dhanmondi Lake, Dhaka

Stakeholders

The residents of Dhanmondi, The Ministry of Housing and Public Works, The Fisheries Department, The Ministry of Local Government, Rural Development, and Co-operatives, the Dhaka South City Corporation, The Department of Environment (DOE)

Cost of Project

The renovation and development project (2021) cost was 14.6247 crore BDT

City Profile



25.3°C



2,085 mm



Combination of flat Madhupur terrace and marshes



Dupi Tila sands aquifer overlaid by Madhupur Clay



10,295,786



Garment manufacturing, trade, and services

Urban Challenges Addressed



Precaution against urban encroachment



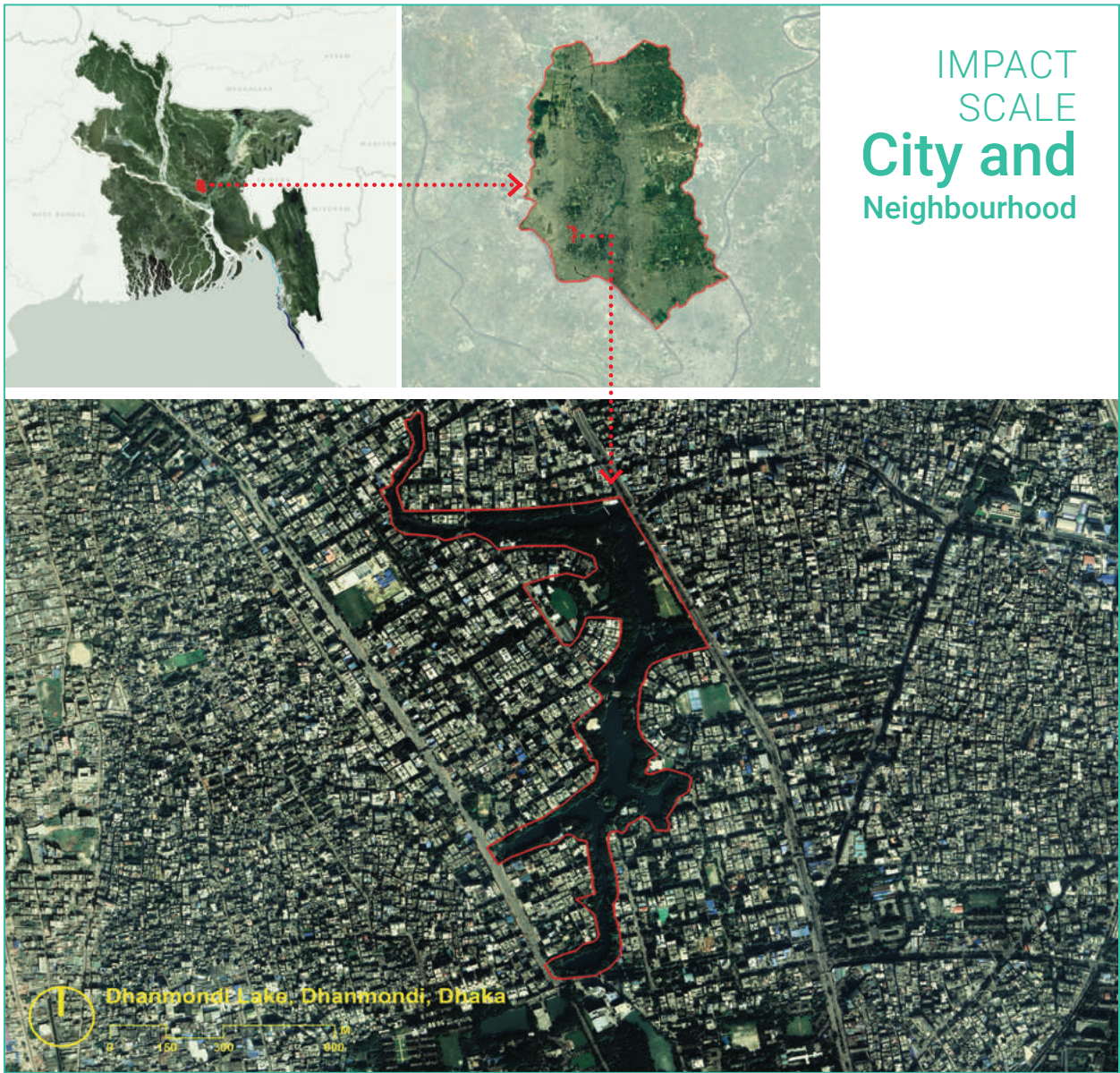
Preventive measures against environmental pollution



The need to conserve local ecology



The need for a healthy urban space felt by the residents



Map 6: Location of Dhanmondi Lake, Dhaka



Photo 10: A view of the Lake and greeneries along its edge

Story of Dhanmondi Lake, Dhanmondi, Dhaka

The present-day Dhanmondi Lake was historically part of an abandoned channel of the Karwan Bazar River (formerly the Caravan River) and was originally connected to the Turag River. Over time, urban expansion led to significant portions of this waterbody being filled, leaving part of it to function as a stormwater drain emptying into Begunbari Khal. The Dhanmondi residential area was developed in 1956, encompassing 240.74 hectares, including the lake. Covering about 16% of the area, the lake plays a crucial role in supporting the drainage system of Dhanmondi and its surrounding areas, contributing significantly to urban water management.

The 'Dhanmondi Lake and Lakeside Area Development Project' was initiated by Dhaka City Corporation (DCC) and the Ministry of Local Government and Rural Development (LGRD), with design and development led by VITTI Sthapati Brinda Ltd. Spanning 3 km in length, 35-100 m in width, and a maximum depth of 4.77 m, the lake was designed to create an accessible public space while preventing encroachment through a buffer zone. Its success in drawing visitors from across the city can be attributed to features such as permeable paved walkways, bridges, tree planting, and a range of amenities, including the Rabindra Sarobar Amphitheatre, restaurants, coffee shops, play areas, a health club, and a boat club, all of which contribute to the enrichment of the urban environment.

The project was initiated in 1996 and opened to the public in 2000. Between 2011 and 2013, significant improvements were made, including cleaning, re-excavation, and the construction of small bridges, drains, public toilets, and streetlights. Efforts to enhance the surrounding environment included tree planting, iron fencing, and walkway construction. In 2021, the Dhaka South City Corporation (DSCC) launched a renovation project, which involved building new food courts, renovating existing ones, constructing a new 450-meter walkway, and updating the lake's shoreline. These initiatives aimed to further improve the lake's public accessibility and environmental quality.



Photo 11: Aerial view of the public amphitheatre, "Ravindra Sarobar" at Dhanmondi Lake

Maintenance

The management of Dhanmondi Lake involves five government entities. The Ministry of Housing and Public Works owns the lake, while the Fisheries Department manages aquatic development. The Ministry of Local Government, Rural Development, and Co-operatives, along with Dhaka South City Corporation, handles development and maintenance. The Department of Environment (DOE) ensures environmental protection. Monthly management costs are around 12 lakh BDT (1.44 crore BDT annually), with an additional 1 crore BDT for repairs, Totalling an operational budget of 2.5 crore BDT and revenue of 3 crore BDT.

Co-Benefits Attained



Boosting urban ecology through lake and lake-side plantation



Potentially reducing urban heat



Urban recreational space



Hub of cultural activities



Income generating for temporary and permanent businesses

Critical Reflections

In 1996, engaging the community was challenging due to limited awareness of the ecological and social value of green spaces in a dense urban setting. Today, such projects must prioritise participatory approaches.

Despite regular maintenance, waste dumping in some areas of the lake remains a challenge and must be addressed to ensure its long-term environmental sustainability.

2.2 NbS for Heat Risks (Urban Heat Island, Heat waves, Extreme heat)

Bangladesh, like many other countries, is experiencing fast urban growth, leading to the replacement of natural land cover with impervious surfaces. This shift has resulted in major ecological impacts, particularly the intensification of heat in urban areas (Kalnai and Cai 2003). Additionally, climate change, characterised by reduced precipitation and the loss of green and blue spaces, is exacerbating the urban heat island effect. The extreme summer heat creates heat-related stress for urban residents while negatively impacting the urban ecosystem. Nature-based Solutions (NBS) are effective strategies for mitigating urban heat-island effects (Nuruzzaman 2015)

The following examples of Nature-based Solutions focus on mitigating excess urban heat through a combination of green and blue interventions or conserving green/ blue areas from the scale of an individual building to neighbourhood, and city.

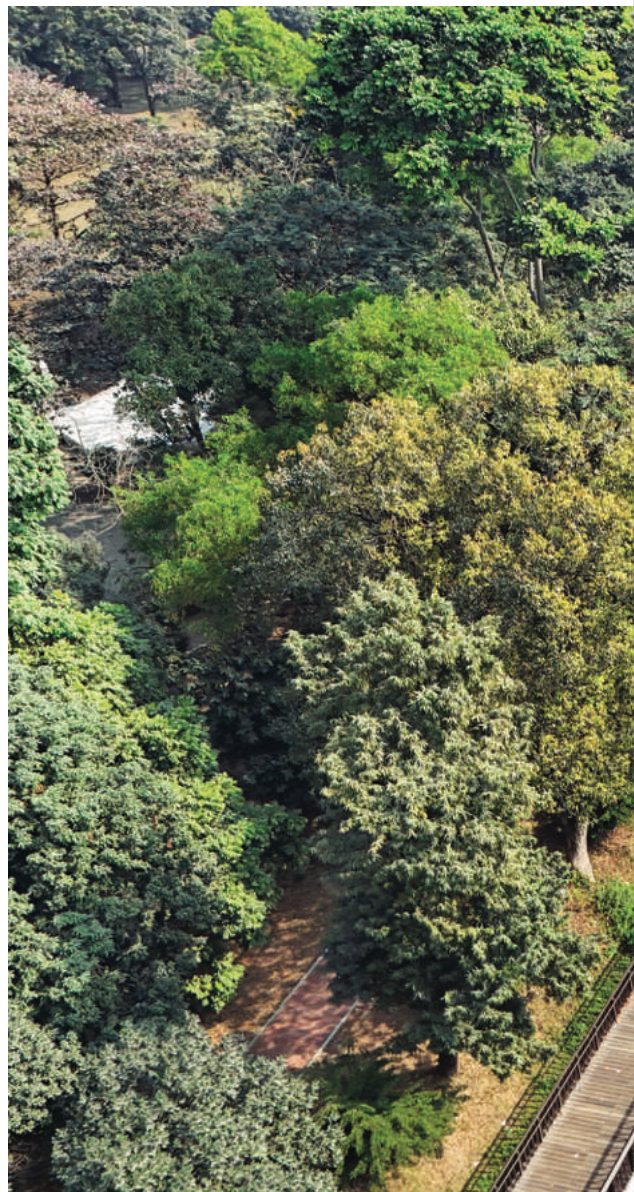


Photo 12: Aerial view of the Ramna Park, Dhaka



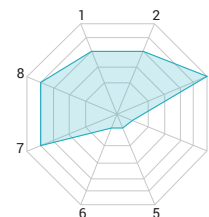
4 Barshijora Eco Park, Moulvibazar

NbS Type: Natural Forest Patch



Barshijora Eco Park, located approximately 2 kilometres of Moulvibazar city centre, is an important natural forest patch within the city's green network. The term "Eco Park" refers to a designated area within a forest that is carefully managed to preserve its natural environment, ensuring that biodiversity remains intact (Banglapedia n.d.). Barshijora Eco Park is one of the ten eco parks in

Bangladesh and serves as a significant example of a conserved ecological hotspot near an urban area. It stands as a model for other regions, demonstrating the importance of conserving ecologically diverse natural areas close to cities. Protecting such areas from encroachment and trespassing can help maintain their ecological value, offering a valuable blueprint for future conservation efforts.



Subjective assessment of NbS
using eight IUCN Global Standard criteria



Photo 13: A walkway inside the Barshijora Eco Park, Moulvibazar

Stakeholders

Wildlife Management and Nature Conservation,
Forest Department, Moulvibazar Municipality

Cost of Project

Budget 100 Crores, Initial set-up cost
1.25 Crores Taka

City Profile



24.5 °C



2860 mm



Holocene
food plain,
low elevated
terrace, and
irregular
hillocks



Silty clay,
clayey silt, and
sand



68,303



Foreign
Remittance,
Business

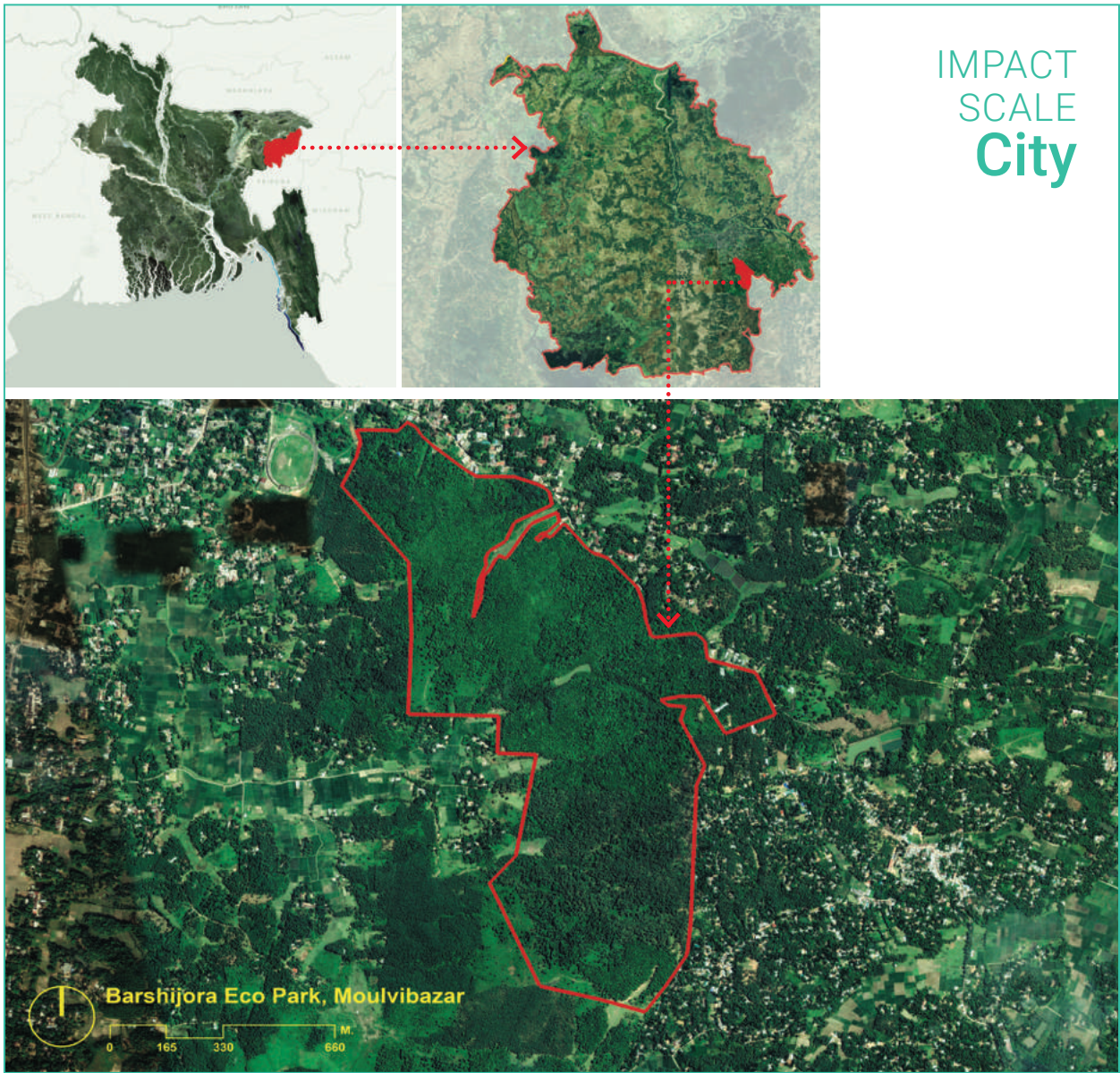
Urban Challenges Addressed



Need for ecological
conservation in the
area



Need for recreational
and leisure spaces and
touristic attractions



Map 7: Location of Barshijora Eco-Park, Moulvibazar



Photo 14: View inside the Barshijora Eco Park, Moulvibazar

Story of Barshijora Eco-Park, Moulvibazar

The area, originally a natural forest with hills and water bodies, was designated as “Barshizora Hill Reserve” in 1916 and later renamed “Laudoga Reserve Forest.” In July 2006, it was established as “Barshizora Eco Park,” with recreational structures introduced to enhance visitor experience. However, the project was suspended in 2011.

The Barshijora Eco Park spans 886.60 acres, with 859.17 acres recorded as forest land, though the actual forested area is approximately 853 acres. The Park features dense vegetation and diverse flora and fauna, including Shal, Garjan, Chapalish, Segun, Jarul, and Agar, alongside various shrubs, vines, and orchids. It is home to species such as rhesus monkeys, civets, fishing cats, porcupines, and Bengal monitor lizards. Established to promote eco-tourism while preserving nature, wildlife, and local communities, the park underwent 39 hectares (96 acres) of reforestation from 2006 to 2010, with efforts continuing.

In 2022, a project titled “Forestry and Eco-tourism Development in Lawachara-Satchari National Park and Borshijora Eco Park” was proposed to the Forest Department. A master plan is now being developed in collaboration with stakeholders and organisations to ensure sustainable management of the park.



Photo 15: Dense Forest along the walkways at Barshijora Eco Park

Maintenance

The Eco Park is managed and maintained by the Wildlife Management and Nature Conservation Division of Moulvibazar, with oversight provided by three wildlife rangers and supporting staff.

Co-Benefits Attained



Boosting urban ecology and biodiversity, ecological corridor for wildlife



Food, firewood, building materials, carbon sequestration



Urban recreational space, space for learning and inspiration



Income generated from tourism

Critical Reflections

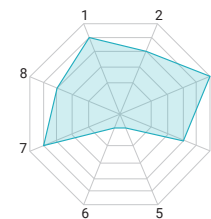
The project was initiated without community engagement, causing conflicts with local residents and leaving the park vulnerable to encroachment due to its proximity to Moulvibazar Sadar and limited land availability.

The absence of a boundary wall and insufficient visitor awareness have led to unrestricted trespassing, resource exploitation, and pollution from waste disposal.

Inadequate funding for maintenance, manpower, and equipment has resulted in the gradual deterioration of the eco-park's infrastructure.

To reduce urban heat and ensure a healthy urban environment, such large green areas should be preserved with a proper maintenance regime for the long-term success and sustainability of the NbS.

5 National Botanical Garden, Dhaka



NbS Type: Urban Plantation



Subjective assessment of NbS using eight IUCN Global Standard criteria

Among Dhaka's increasingly scarce ecological hotspots, the National Botanical Garden (NBG) in Mirpur stands out as a significant plantation area. As Bangladesh's largest plant conservation centre, the garden hosts a diverse collection of both local and exotic flora. In addition to its primary role in ex-situ plant conservation for education and research, the NBG addresses key urban

challenges. It provides wildlife habitats, serves as a corridor, mitigates climate change impacts, reduces heat risks, and offers hydrological benefits. The garden also improves air quality, reduces noise pollution, enhances urban aesthetics, and provides recreational opportunities, contributing to sustainable urban development.



Photo 16: Aerial view of the northern side of the National Botanical Garden at Mirpur, Dhaka

Stakeholders

Bangladesh Forest Department, Ministry of Environment, Forest and Climate Change, Residents

Cost of Project

Recent conservation of rare species project cost 10 Lac Taka ; Funded by the Ministry of Environment, Forest and Climate Change, Residents Initial Funding in the 1960s by the Agricultural Research Council of Pakistan and the British Overseas Development Agency (ODA)

City Profile



25.3°C



2,085 mm



A combination of flat Madhupur terrace and marshes



Dupi Tila sands aquifer overlaid by Madhupur Clay



10,295,786



Garment manufacturing, trade, and services

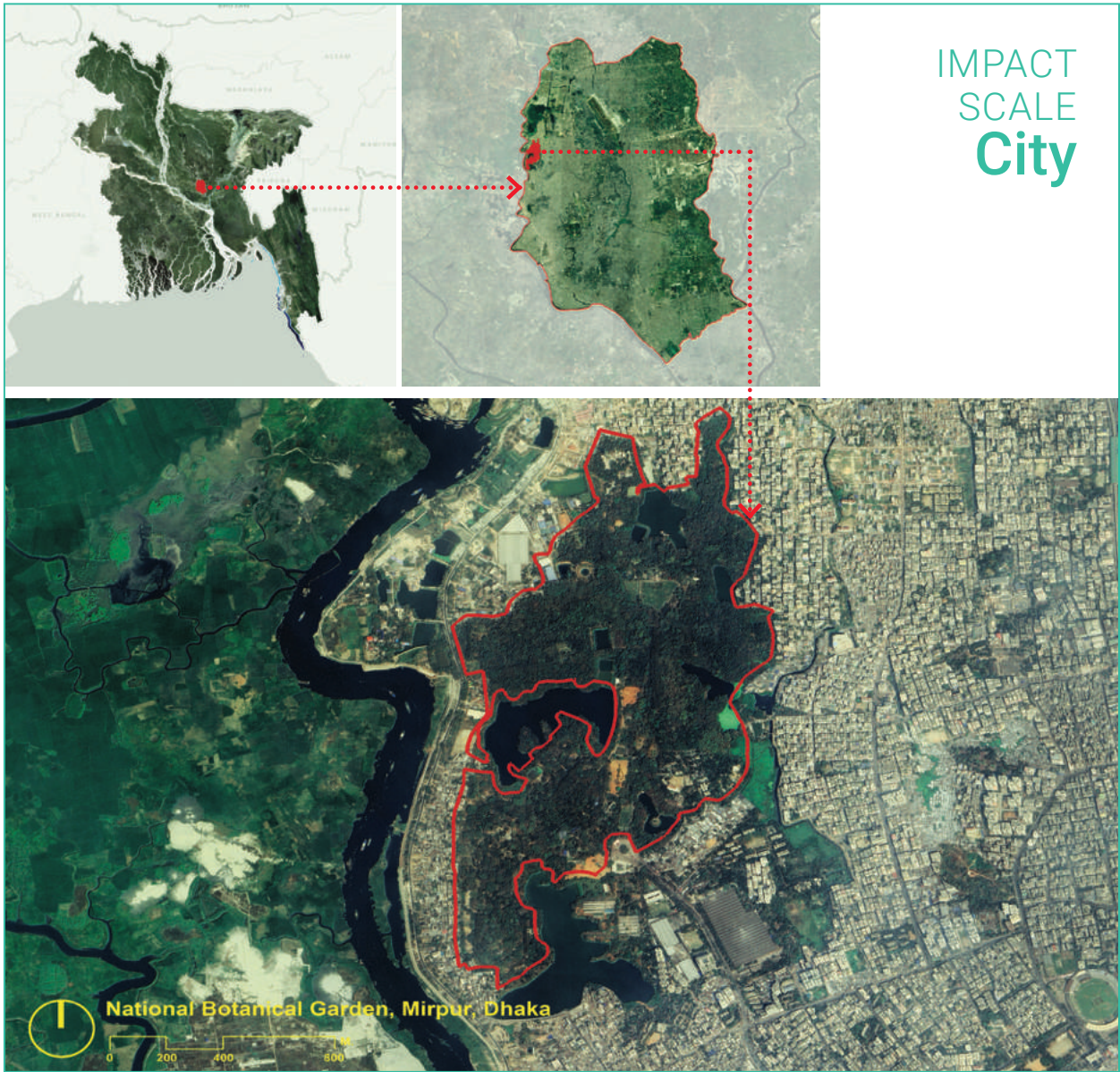
Urban Challenges Addressed



Need to Conserve diverse plant species, promote urban ecology and biodiversity



the social need for spaces for daily exercise, recreation, and leisure



Map 8: Location of the National Botanical Garden at Mirpur, Dhaka



Photo 17: View of a lake space inside the National Botanical Garden

Story of National Botanical Garden

Historical maps and studies of Dhaka reveal that the National Botanical Garden was once covered in dense natural forests before infrastructure development. The garden's establishment began in the 1960s during the Pakistani occupancy, following a 1964 UNESCO symposium on the Scientific Problems of Humid Tropical Deltas, where the creation of a herbarium in Dhaka was proposed. After Bangladesh's independence in 1971, the government continued support despite financial challenges in 1973. The Bangladesh Agricultural Research Council (BARC) later provided funding, and in 1994, the Ministry of Environment and Forests assumed control.

The National Botanical Garden (NBG), covering 84 hectares, is one of the largest botanical gardens in Bangladesh and plays a vital role in preserving the nation's natural heritage. It is home to over 56,000 trees, shrubs, herbs, and aquatic plants, including rare and exotic species. Key features include the orchid house, cactus house, six lakes, and artificial ponds, which foster diverse ecosystems. The Bangladesh National Herbarium, containing approximately 100,000 preserved plant specimens, supports research and conservation. Advanced facilities, such as greenhouses and a tissue culture research Centre, aid in propagating endangered species. A 2018 initiative focuses on conserving

226 rare plant species, including 100 tree species and 50 orchids. The garden's diverse collection and peaceful setting provide a tranquil retreat from the urban environment of Dhaka.

In recent years, a significant conservation project has been launched, focusing on introducing new species and preserving endangered plants. This initiative, supported by government funding, allocates substantial resources for research, monitoring, and propagation activities



Photo 18: Naturally shaded walkways surrounded by diverse tree species within the Garden

Maintenance

The day-to-day operation and maintenance of the NBG is managed by the Bangladesh Forest Department, including 54 gardeners, 20 security personnel, and administrative staff, handling plant care, research, security, and waste management.

Co-Benefits Attained



Wildlife habitat, improvement of hydrology and rainwater retention, mitigation of urban heat-island effect, reduction of air and noise pollution, carbon sequestration



Ecological corridor for wildlife



Urban recreational space, space for learning and inspiration

Critical Reflections

Increasing encroachment and polluting agents from surrounding urban development hinder the conservation and maintenance of the garden.

Persistent financial constraints and past funding cuts have impeded the garden's maintenance and expansion efforts, despite government initiatives.

The lack of public awareness regarding waste disposal practices and the ecological value of the garden limits its full potential.

Addressing these challenges requires increased public engagement, enhanced funding, and measures to protect the garden from urban impacts.

Cities should prioritise preserving a connected network of large green spaces over isolated areas like Dhaka's botanical garden to maximise their effectiveness as NbS.

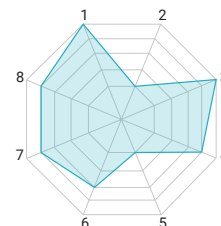
6 Ramna Park, Dhaka

NbS Type: Urban Green Open Space



Ramna Park is a prominent urban park in Dhaka, serving as a vital green and blue space for the city's residents. It holds significant socio-cultural importance and stands as one of the few remaining green and blue areas in the urban landscape. The

Park spans 68.50 acres (277,200 m²), with the lake occupying 8.76 acres (35,500 m²). As one of the most frequented parks in Dhaka, Ramna Park plays a crucial role in providing recreational space and environmental respite to the city's inhabitants.



Subjective assessment of NbS
using eight IUCN Global Standard criteria



Photo 19: A view inside the Ramna Park, Dhaka

Stakeholders

Public Works Department (PWD), Residents

Cost of Project

The latest enhancement and construction cost 460 million taka; Funded by the Public Works Department (PWD)

City Profile



25.3°C



2,085 mm



A combination of flat Madhupur terrace and marshes



Dupi Tila sands aquifer overlaid by Madhupur Clay



10,295,786



Garment manufacturing, trade, and services

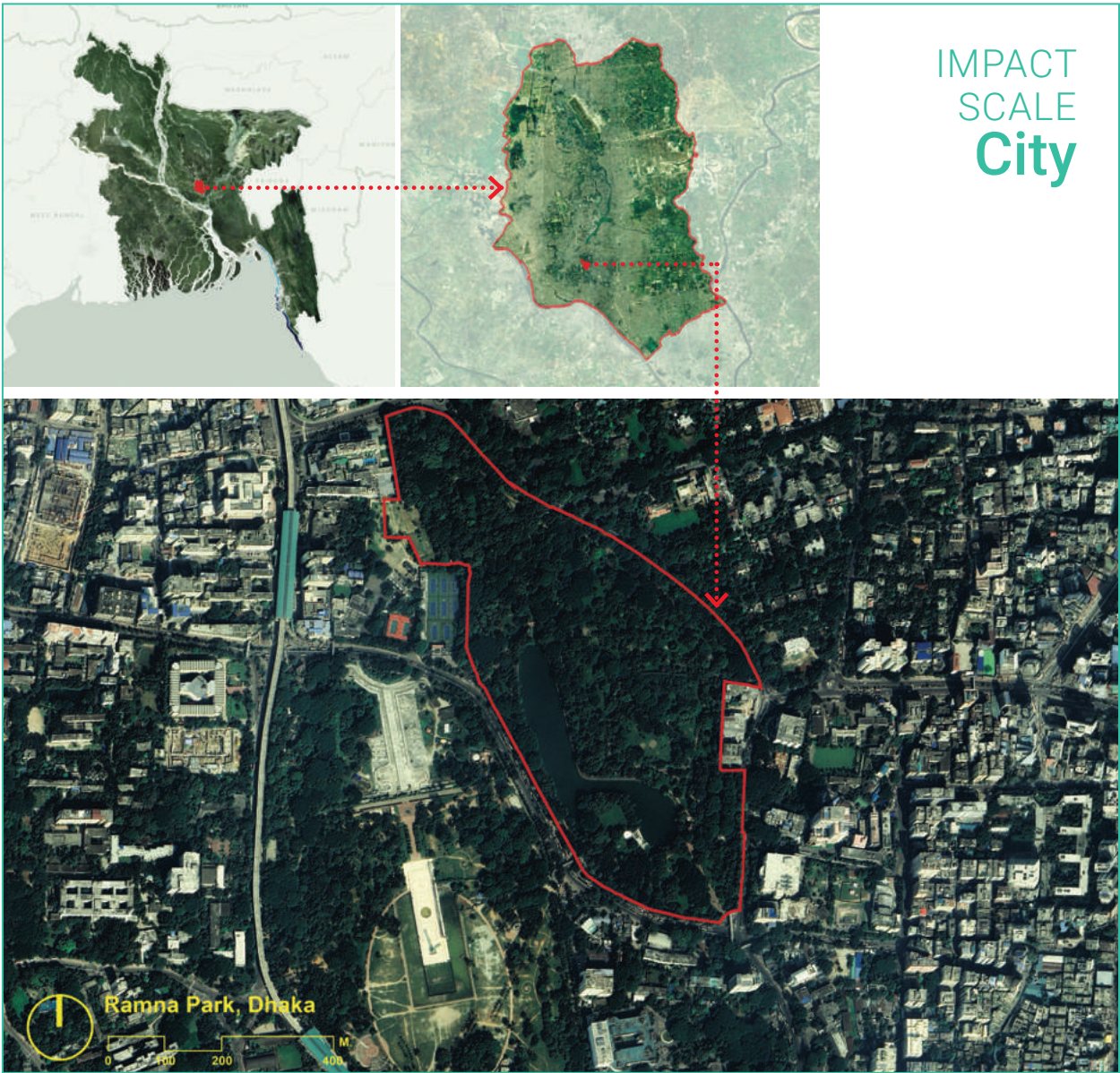
Urban Challenges Addressed



Need to promote urban ecology and biodiversity



The social need for spaces for daily exercise, recreation and leisure



Map 9: Location of the Ramna Park, Dhaka



Photo 20: Recently built walkway along the lake's edge at Ramna Park

Story of Ramna Park, Dhaka

In the early nineteenth century, Gilbert Coventry Master initiated the development of Phoenix Park in the Ramna area, which included a house, a garden, a stable, and a racecourse. In 1825, Charles Dawes cleared part of the Ramna jungle to create an egg-shaped racecourse, and further beautification efforts were made in 1840. The Park underwent a major transformation in 1908 when R.L. Proudlock, from Kew Botanical Gardens in London, was appointed to design the landscaping, laying the foundation for the park's current layout. His design incorporated tall trees, flowering plants, gardens, and water features, with construction taking around 20 years.

Ramna Park was formally inaugurated in 1949, covering 88.5 acres (358,000 m²). The current layout was conceptualised in 1952 by the Public Works Department of Bangladesh. Enhancements to the park included the deepening and extension of the lake, construction of walkways and garden paths, regrading and replanting of sections, and the installation of irrigation systems to support a wide range of tree species. Tree wells with deep vertical tubes were also introduced to facilitate root growth, and a bud-shaped water tower was built on the northern side to supply water to the park.

In 2020, during the Covid-19 pandemic, the park was closed for public safety. During this closure, the Public Works Department undertook a beautification project that included the construction of a wooden deck around the re-excavated lake, the installation of new lighting systems, and the rebuilding of pathways with red ceramic bricks and bituminous carpet. Additionally, a new café and a children's play area were added. The Park was reopened at the end of 2022 following improvements to the pandemic situation.



Photo 21: Naturally shaded open green spaces within the Ramna Park

Maintenance

The Park is maintained by the Public Works Department (PWD).

Co-Benefits Attained



Fish production, medicinal plants, firewood, Carbon sequestration, hydrological regulation, urban heat reduction



Urban recreational space



Hub of cultural activities

Critical Reflections

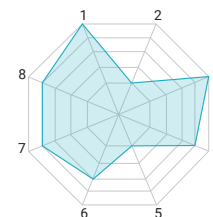
A study conducted a few years ago by the Centre for Environmental and Geographic Information Services (CEGIS), a government research organisation, indicated that non-native and invasive tree species have surpassed indigenous varieties in Ramna Park. The study also highlighted that foreign tree species have been planted repeatedly over the years, often without regard for ecological considerations or a preference for native plants which is a point of concern.

To preserve the biodiversity and tranquillity of the green and blue spaces, the Park should not be further burdened by infrastructure that is not necessary.

Despite the presence of designated waste bins, some visitors, due to a lack of awareness, continue to dispose of waste improperly, placing additional strain on the Park's maintenance.



Kolpona-Talaimari River Embankment Plantation, Rajshahi



NbS Type: Urban Plantation



Subjective assessment of NbS
using eight IUCN Global Standard criteria

The tree plantation project at the Kolpona-Talaimari river embankment, focused on native tree planting along the slopes, exemplifies a successful effort to enhance urban biodiversity and provide ecological benefits. In response to Rajshahi's rising urban heat and loss of green spaces, the Rajshahi City Corporation (RCC), with support from ICLEI South

Asia and UN-Habitat, launched the Urban-LEDS II initiative, aimed at promoting low-emission development. The project incorporated both native and introduced species, with maintenance contracted to a nearby nursery, highlighting RCC's commitment to creating a healthier urban environment.



Photo 22: An aerial view of the Kolpona-Talaimari River embankment plantation

Stakeholders

Rajshahi City Corporation, European Union, UN-Habitat, Urban LEDS, IMAGE Research and Consultancy Ltd, ICLEI

Cost of Project

Around 60 lacs Taka; Design Phase: 30-35 lacs Taka; Implementation phase: 24-25 lacs Taka

City Profile



28.49°C



94.94 mm;
city affected
by annual
drought



Situated in the
Barind tract
and Bengal
Basin region



Fertile alluvial
soils , lime-
rich Gangetic
alluvium,
clayey Barind
Tract soils



553,288



Agriculture and
Agro-processing, Silk
Industry, Education and
Research, Trade and
Retail, Construction
and Real Estate, Textile
and Small Industries

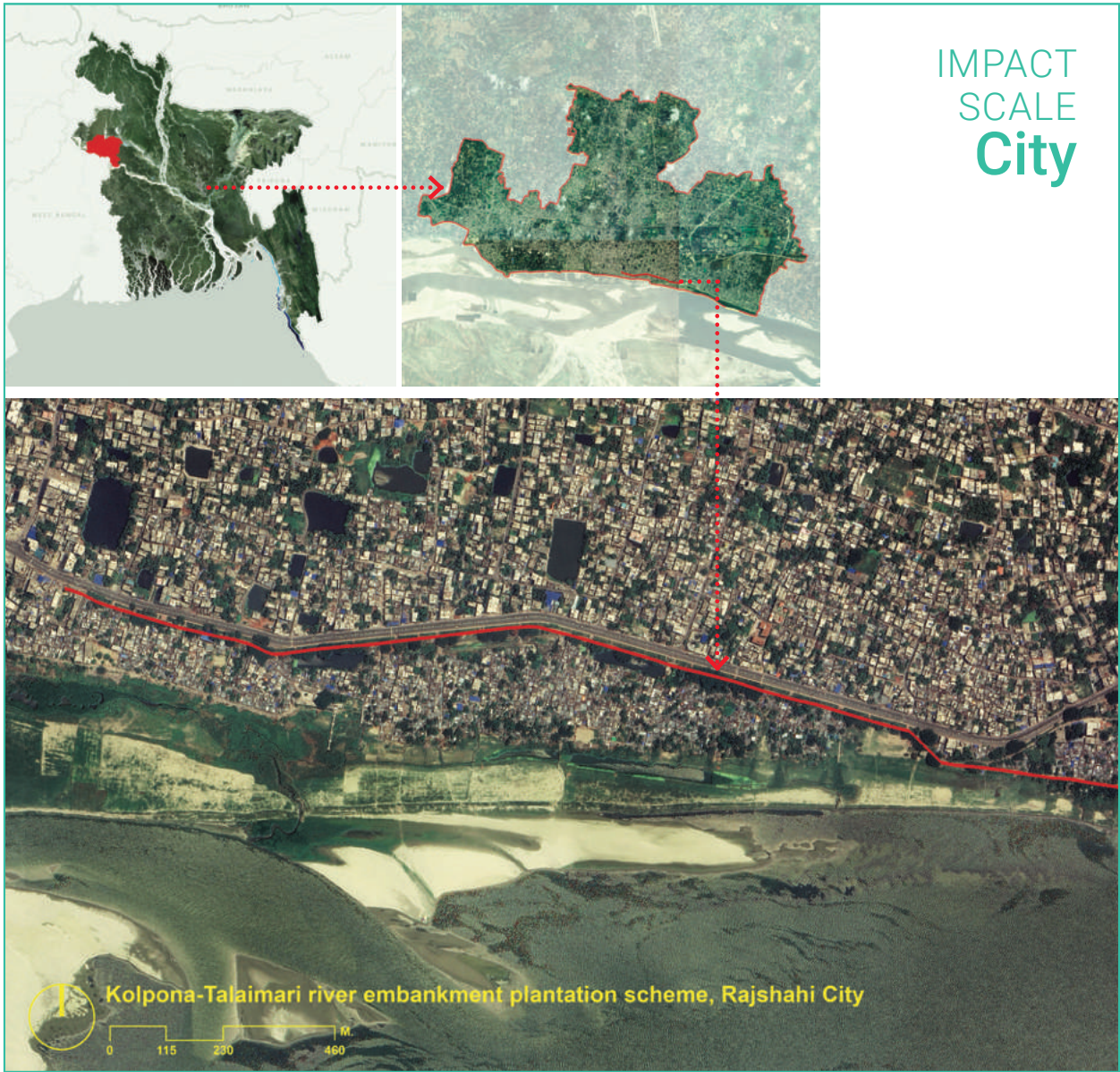
Urban Challenges Addressed



Loss of green cover
and biodiversity



Antisocial activities
on the site



Map 10: Location of Kolpona -Talaimari River embankment, Rajshahi

Story of Kolpona-Talaimari river embankment plantation scheme

The 2.5-kilometre project site along the inner slope of the Kolpona-Talaimari River Embankment was previously neglected, with nearby informal settlements and poor waste management. This resulted in household waste being disposed of on the site, creating foul odours and an unhygienic environment.

In December 2020, Rajshahi City Corporation launched a pilot biodiversity reforestation project under the Urban-LEDS II initiative. By February 2021, over 800 indigenous seedlings were planted on 29 embankment slopes, transforming the area into a habitat-rich green corridor. The planting, led by a local nursery, featured a three-layered vegetation system: hedges, shrubs, and large canopy trees, designed to support bird and butterfly habitats. The slopes were stabilised with reinforced edges, and steel bar fencing was added to prevent animal or human intrusion. Streetlights, a walkway, steps, and a water booth were incorporated to encourage public use. This redesign transformed the previously neglected site into a vibrant, biodiverse, and accessible green space.

The first phase of the project involved on-ground surveys of flowering plant diversity and GIS-based tree mapping to document species distribution. Nearly 1,800 trees, including those on the Kolpona-Talaimari embankment, were labelled to promote urban greening and public awareness. Natural



Photo 23: A view of a section of the plantation

resource maps were created for Rajshahi and its 30 administrative zones, and field studies, surveys, and focus group discussions were conducted at the community and stakeholder levels. Creating awareness about the project's importance and maintenance was essential, as some residents used the area for drying clothes and storing household items. To educate the community on urban biodiversity, stakeholders organised awareness programs before, during, and after the project's implementation.

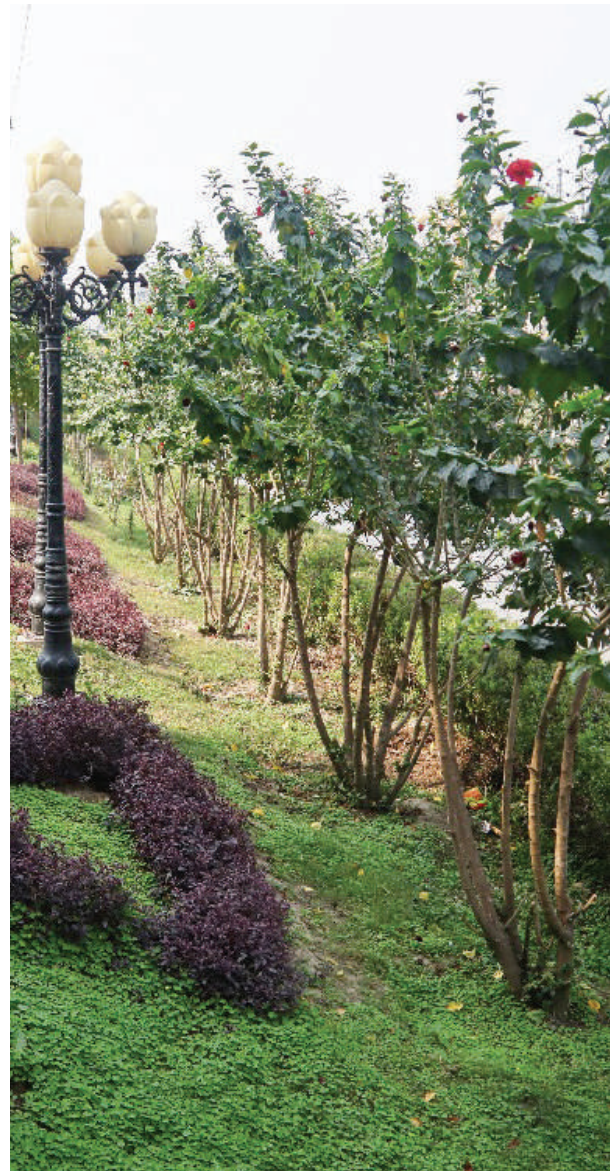


Photo 24: Native floral plantation on the slope to promote urban biodiversity

Maintenance

Initially maintained by a local nursery for two years, the project was later handed over to the Rajshahi City Corporation for ongoing management.

Co-Benefits Attained



Barrier for dust storms coming from the riverine islands, urban heat reduction, preventing soil erosion



A safe urban destination for locals and tourists



Income generating from temporary and permanent businesses

Critical Reflections

The project's well-planned tree selection process serves as a model for addressing urban challenges like urban heat and limited green spaces.

Community engagement ensures the approach tackles environmental issues while fostering sustainable urban development.

Replicating such initiatives citywide can enhance the effectiveness and holistic impact of this type of NbS in mitigating urban challenges.

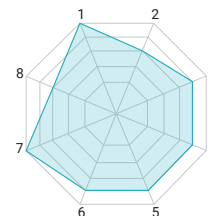
8 Miyawaki Forest, University of Chittagong

NbS Type: Urban Plantation



The Miyawaki forest project initiated by the Institute of Forestry and Environmental Sciences of the University of Chittagong (IFESCU) is located along the east and west banks of a stream on the University campus and serves as a pilot initiative for urban areas across Bangladesh. By planting native species in small, dense, multi-layered areas, the model replicates natural ecosystems, addressing urban challenges

such as biodiversity conservation, climate change mitigation, and pollution control. The project aims to restore degraded soil, create habitats for various fauna, and enhance the site's resilience against erosion and landslides. Additionally, it promotes aesthetics, education, and tourism opportunities, while serving as an experimental carbon offset project that contributes to environmental conservation.



Subjective assessment of NbS using eight IUCN Global Standard criteria



Photo 25: An aerial view of the Miyawaki Forest at the University of Chittagong

Stakeholders

Undergraduate students from the Institute of Forestry and Environmental Sciences, University of Chittagong

Cost of Project

The initial cost including maintenance for two years was around BDT 3,00,000; Funded by the Teijin-Aramid of the Netherlands.

City Profile



25.3°C



2,777 mm



A mix of hilly terrain, coastal plains, and a natural harbour along the Bay of Bengal



Alluvial soils, saline soils, red and yellow soils, and well-drained hill soils



3,230,507



Primarily driven by the port, shipbuilding, textiles, oil refining, natural gas extraction, and tourism sector

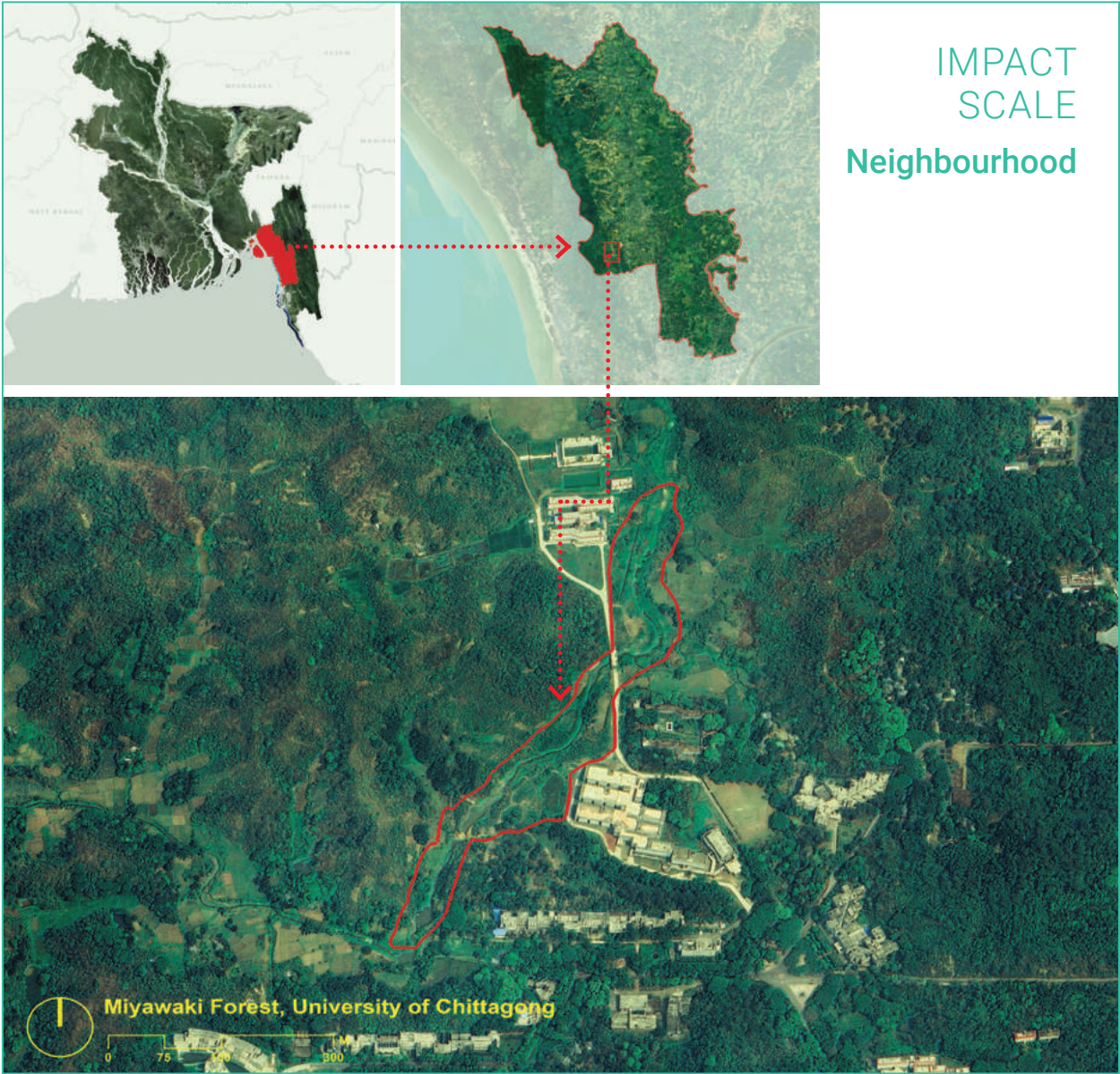
Urban Challenges Addressed



Loss of green cover and forest degraded into a barren land



Both banks of stream have been affected by erosion



Map 11: Location of the Miyawaki Forest, University of Chittagong



Photo 26: A view inside the forest

Story of Teijin-IFESCU Miyawaki Forest, Chattogram

The Miyawaki forest project targets the restoration of a 1.5-acre (~6000 sqm) site located on the east and west banks of a stream running through the University of Chittagong campus. The eastern plot was previously a construction material preparation and waste dumping site, completely devoid of vegetation. The western plot, used for seasonal farming and hill-cutting, exhibited severe soil erosion during monsoons. Both plots had experienced significant stream-bank erosion, making them challenging to restore.

IFESCU's innovative restoration approach actively involved first-semester undergraduate students, who planted and managed the Miyawaki forest throughout their studies, fostering long-term environmental stewardship. Launched in 2022, the project focused on hands-on learning, with students sourcing seeds, preparing seedlings, and overseeing the plantation over the next four years. The design prioritised natural methods, avoiding grey construction and promoting random planting, manual pitting and natural fertilisers.

During implementation, 8000 seedlings from fifty indigenous species were planted. The site preparation included clearing weeds, staking, and pitting, with deeper pits filled with compost and cow dung to enhance soil quality. Students

measured and monitored seedling growth throughout the project, with regular irrigation sourced from the stream and protection provided by bamboo fencing. This collaborative effort not only contributed to ecological restoration but also integrated sustainable practices within the local community.



Photo 27: The forest plants thriving along the stream protecting its edges from erosion

Maintenance

The students who worked during the forest's implementation also regularly maintain the forest. At the end of each semester, they submit individual reports on their assigned seedlings, which are compiled and presented to the funding agency Teijin Aramid.

Co-Benefits Attained



Boosting urban ecology and biodiversity



Soil amendment, improvement of watershed condition, increased rainwater retention, carbon sequestration



A safe urban destination for locals and tourists



Potential for replication as a payment-for-ecosystem-services (PES) model

Critical Reflections

The Miyawaki forest model at University of Chittagong is implemented in a controlled environment with readily available or subsidised resources, supported by student volunteers for maintenance. Replicating such initiatives in other urban areas could face challenges from external factors like encroachment, waste disposal, or theft, necessitating a robust implementation and management plan.

Community awareness is critical to the success of these projects, ensuring long-term support.

In the future, the PES model involving such forestry, could be expanded by cities to address both economic and climate change challenges effectively.

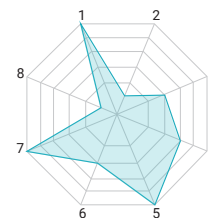
This pilot project is a small-scale initiative, but establishing a network of such forests citywide can create a significant and beneficial impact as an urban NbS.

9 Gol Talab, Old Dhaka

NbS Type: Urban Waterbody



Subjective assessment of NbS
using eight IUCN Global Standard criteria



Gol Talab, also referred to as Nawab Bari Pukur, is a small pond situated in Old Dhaka. As a heritage site, it holds significant socio-cultural and environmental value for the surrounding community. Amid the

densely packed urban fabric of Old Dhaka, this oval-shaped water feature serves as an urban oasis for residents in the nearby areas.



Photo 28: An aerial view of the Pond Gol Talab

Stakeholders

Moulvi Khawaja Abdullah Welfare Trust,
Bangladesh Water Development Board and the
residents

Cost of Project

Cost not known. The pond was
dug by Nawab Abdul Bari

City Profile



25.3°C



2,085 mm



A combination
of flat
Madhupur
terrace and
marshes



Dupi Tila
sands aquifer
overlaid by
Madhupur
Clay



10,295,786

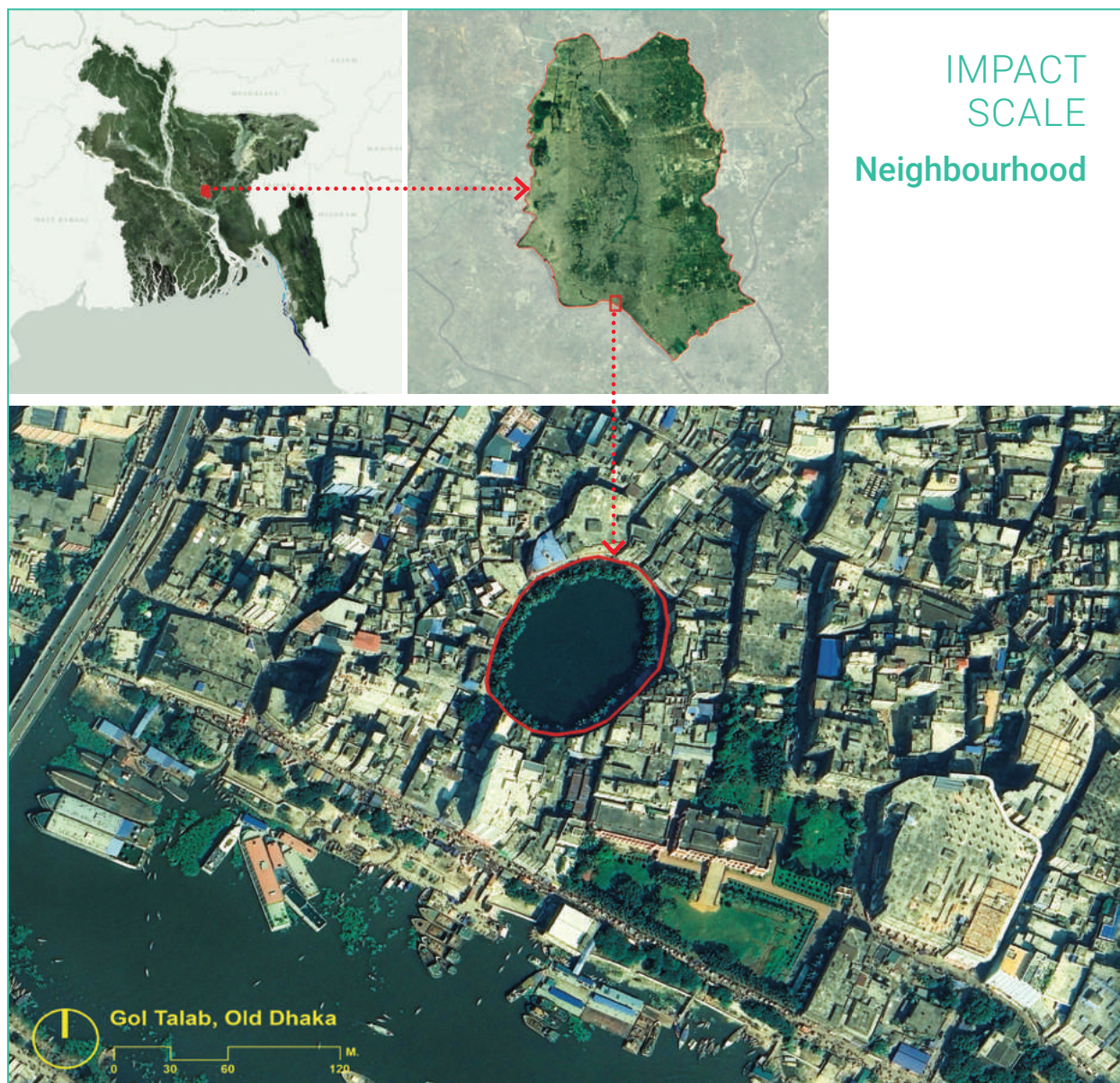


Garment
manufacturing,
trade, and
services

Urban Challenges Addressed



Need felt for a communal
space for bathing, fishing,
leisure, etc.



Map 12: Location of Gol Talab, Old Dhaka



Photo 29: The main entrance ghat of the pond

Story of Gol Talab

Gol Talab, also known as Nawab Abdul Bari Pukur, was dug in 1886 by Nawab Abdul Bari, giving it historical significance in the local area. The pond is located in a densely built urban environment, with buildings surrounding it on all sides, making it a rare green space in the heart of Old Dhaka. Covering an area of 2.23 acres and reaching a maximum depth of 23 feet (7.0 meters), Gol Talab remains an important water feature in the city.

The pond is equipped with a ghat, which serves as a space for cultural and religious activities, and informal fishing decks along its edge, reflecting the community's engagement with the water. Additionally, a formal barrier constructed from metal and brick surrounds the pond to ensure its protection. Within the pond's complex, a designated bathing area has been constructed to accommodate local practices.

Plans are underway to upgrade Gol Talab into a park, which would enhance its accessibility and integrate it further into the urban landscape, offering both recreational and ecological benefits to the surrounding community.



Photo 30: The pond used by people of all ages and from all walks of life every day

Maintenance

Gol Talab is maintained by the Moulvi Khawaja Abdullah Welfare Trust and the Bangladesh Water Development Board, as part of the 2000 National Water Management Plan. A 5-taka fee is charged for bathing, with approximately 400 daily users during summer. This fee contributes to maintenance, with exceptions for those unable to afford it.

Co-Benefits Attained



Boosting urban ecology through pond and pond-side plantation



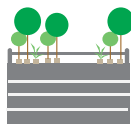
Potentially reducing urban heat, clean water for bathing and aquatic therapy

Critical Reflections

Ponds are valuable urban resources providing essential ecosystem services. Preserving them as a network of neighbourhood-scale blue spaces, integrated as NbS, can effectively address urban challenges like heat, climate change, and the decline of healthy public spaces.

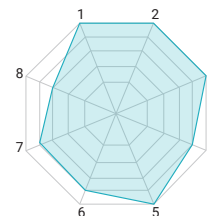
10 Karupannya Factory Ltd, Rangpur

NbS Type: Built Solution



The Greenfield Factory of Karupannya Rangpur Limited in Robertsongonj, Rangpur, Bangladesh, exemplifies worker-centric, nature-friendly design. Unlike typical factories, it offers a homely, inviting space where workers even visit on weekends for recreation. The thoughtfully designed compound fosters a connection with nature, providing comfort

and relief during work. Certified with LEED Platinum for operation and maintenance, the factory integrates green design principles, addressing climatic, environmental, economic, and socio-cultural needs. This pioneering approach sets a benchmark for sustainable, human-focused industrial spaces.



Subjective assessment of NbS using eight IUCN Global Standard criteria



Photo 31: View of the Southern façade of the Karupannya factory building covered in dense vegetation

Stakeholders

Factory owner, workers and staff

Cost of Project

Cost not known; Investment done by IKEA

City Profile



24.3°C



2,498 mm



Flat terrain,
part of the
Teesta River
floodplain,
scattered
wetlands.



Fertile alluvial,
sandy loam,
and clayey
Barind soils



708,570



Agriculture,
trade,
handicrafts,
and small-
scale
industries.

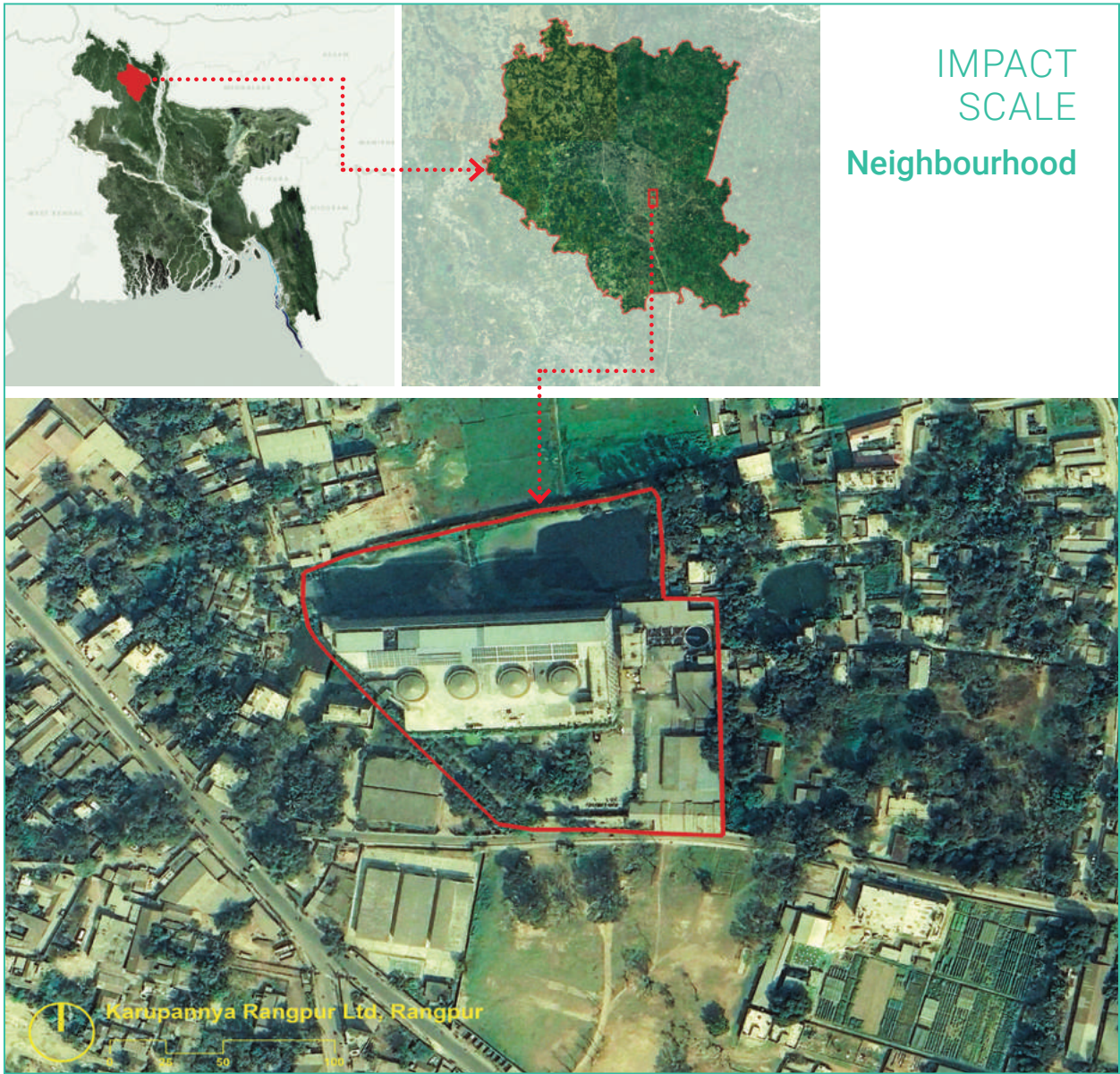
Urban Challenges Addressed



Urban heat that
disrupts production



Need for healthy
workspace



Map 13: Location of Karupannya Factory Ltd, Rangpur



Photo 32: Main entrance portal to the Factory Building

Story of Karupannya Rangpur Ltd, Rangpur

Founded in 1991 in Rangpur, Karupannya aims to revive the ancient Bengal art of Satranji (jute rugs). The industry and its entrepreneurs overcame many challenges to establish the business. Now part of the BGMEA group, Karupannya employs over 7,000 people across five factories nationwide, including Rangpur.

The Greenfield factory, designed by Nakshabid Architects, covers a site of 14,170 square meters, with a built-up area of 24,850 square meters. The seven-story factory building incorporates a climate-responsive design that maximises natural airflow and daylight while utilising a closed-loop water recycling system. The rectangular structure is framed in RCC with locally sourced, textured brick infill walls. A dense vegetative screen on the southern façade not only filters harsh sunlight and reduces heat absorption but also purifies the air, promoting a healthier, more sustainable indoor environment. The design draws inspiration from rural contexts, integrating courtyards, gardens, and water bodies to strengthen the connection to nature.

With the workers' comfort and well-being at its core, the factory's design fosters a harmonious relationship with nature. The use of natural colours and plant life throughout the building enhances

the sensory experience, providing a soothing and identity-rich environment. Special attention is given to creating a women-friendly space, with 95% of the workforce being female. The factory's design promotes an overall sense of well-being, blending nature and functionality seamlessly. The project's construction phase began in 2013 and the factory began functioning in early 2017. The factory's design process involved a participatory approach, incorporating both the architect's climate-responsive vision and workers' input on key functions and program distribution.



Photo 33: Water spaces integrated into the Factory design to reduce heat and noise

Maintenance

The maintenance is done by the factory authority. The Greenfield Factory uses sustainable maintenance practices, including drip irrigation, collaboration with local nurseries, solar panels, a biogas plant, and a Zero Liquid Discharge system.

Co-Benefits Attained



Boosting urban ecology and biodiversity



Reducing urban heat up to 7 C inside the factory, clean water for bathing and aquatic therapy



Economic gain through better productivity



Communal green spaces for the workers

Critical Reflections

Designing an efficient production flow while integrating climate-responsive features and ensuring a worker-friendly environment presents significant challenges. Despite this, the design has successfully addressed most issues.

Green integration with the built environment as an NbS measure throughout a neighbourhood or city can create beneficial microclimatic impacts not only for industrial or commercial buildings but also for public buildings and private residences.

2.3 NbS for Droughts

Drought is a regular climatic event in Bangladesh, often causing widespread destruction of crops, food shortages, potable water scarcity, and disruptions to public services. It is more prevalent in the northwestern region of the country, which typically receives less rainfall compared to other areas (Habiba *et al.* 2011). Recent trends in climate change and global warming, particularly in South Asia, have exacerbated the situation by significantly reducing precipitation during dry seasons, intensifying drought conditions (Mortuza *et al.* 2019).

In urban areas, the drought-induced water crisis has become a critical issue due to multiple factors. Overexploitation of groundwater depletes reserves faster than they can be replenished. The lack of an efficient water supply system in many city areas further aggravates the problem. Additionally, urbanisation has led to impervious surfaces, hindering natural groundwater recharge, and the loss of freshwater reservoirs, such as wetlands, ponds, and canals, diminishes the availability of alternative water sources. Urban activities also contribute to increased carbon emissions, fuelling global warming and disrupting the hydrological cycle. This cycle disruption worsens water stress in cities, creating a vicious cycle of drought and water scarcity, particularly in densely populated urban Centres.

The following example of a Nature-based Solution portrays how individual efforts to combat drought-related adversities can become an effective solution for the entire community and city at large.

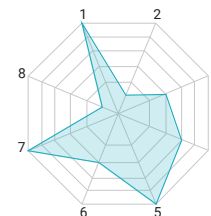
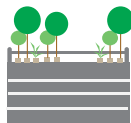


Photo 34: View of the family Dug well, Nilphamari



11 A Family Dug Well (Patkua), Nilphamari

NbS Type: Built Solution



Subjective assessment of NbS using eight IUCN Global Standard criteria

In Masuapara, Ward 5, Nilphamari Pourashava, a family dug well, constructed between 1945 and 1950 by the visionary Sarkar Baruya, continues to stand as a beacon of community resilience and resourcefulness. Sarkar Baruya envisioned the well as a means to provide accessible water for people in the surrounding areas. For decades, it functioned as the primary water source for the community, serving

families from three neighbourhoods who relied on it daily for drinking, cooking, washing clothes, and bathing. Unlike many regions in northern Bengal, where declining water tables have caused scarcity, this well remains a reliable source of water. It exemplifies the role of simple, nature-based solutions in uniting communities and becoming integral to their traditions.



Photo 35: An aerial view of the dug Well, Nilphamari

Stakeholders

The Baruya Family

Cost of Project

Cost provided by Baruya Family

City Profile



26.0°C



402.54mm



Flat, low-lying
plains of the
northern region
of Bangladesh



Soils found
in floodplain
regions
composed of
silt, clay, and
sand



85,700

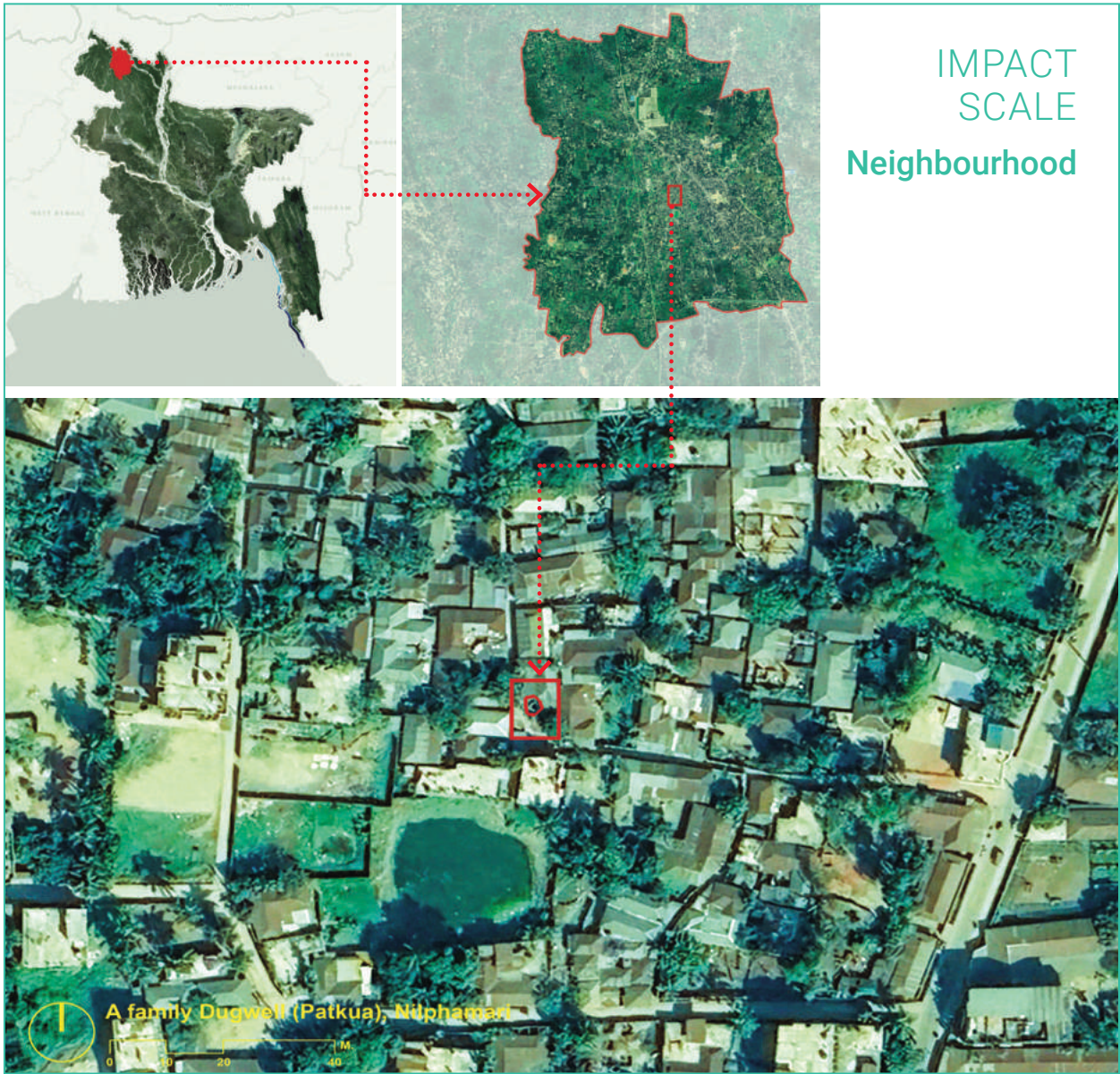


Primarily
based on
agriculture
and some
small-scale
industries and
trade

Urban Challenges Addressed



Water scarcity and
water contamination
due to drought



Map 14: Location of the Dug well, Nilphamari

Story of the dug well at Nilphamari

When Sarkar Baruya constructed the dug well between 1945-1950, tube wells were rare, and people travelled long distances to access water, making the well a central feature of the local landscape. Over time, it became a communal hub, serving up to 70 households for drinking, washing, and religious rituals. Initially, the well was rudimentary, lined with large red bricks. Privacy concerns led the family to request a wall, which was built in 2015-16. Sarkar's descendants continue to honour his legacy by maintaining the well, and investing in its upkeep rather than selling the land, now valued at about 1.5 million takas.

The dug well stands as a testament to the family's enduring commitment to the community. Even in an era dominated by electric-powered pumps, the well continues to serve as a reliable water source, especially during power outages. While the area has seen growth and the introduction of new water sources, the well still benefits around 20 households. Its sandy soil helps maintain clean water, and traditional arsenic checks confirm its safety. Though no longer used for drinking due to nearby drainage, the family has diligently maintained the well, even clearing sediment five years ago to restore its depth.



Photo 36: An aerial view of the dug well



Photo 37: The dug well still in use

Maintenance

The operation and maintenance is done by the Barua Family.

Co-Benefits Attained



A reliable and sustainable source of water, helping to maintain the local water table and reduce the strain on other water resources



Communal and religious services

Critical Reflections

Maintaining the historical dug well is challenging, requiring labor-intensive and costly upkeep while ensuring water quality amidst contamination risks and changing water tables.

Sustaining the well as a functional resource, rather than a relic, is difficult due to the availability of modern water sources.

Despite the land's value, the family continues investing in its maintenance instead of selling, though this may not be financially sustainable long-term.

Although a private venture, a network of small, nature-friendly initiatives like the dug-well by individual families can enhance sustainable living quality for a community.

2.4 NbS for Cyclonic Winds, Storm Surges, and Coastal/Tidal Floods

Cyclones represent one of the most destructive natural hazards for low-lying deltaic environments such as Bangladesh. Nearly every year, the coastal regions of Bangladesh are impacted by cyclones, resulting in severe damage to lives, livelihoods, agriculture, natural resources, infrastructure, and settlements, along with significant disruption to communication networks (Quader *et al.* 2017). Storm surge flooding in coastal Bangladesh, associated with tropical cyclones, primarily occurs during the pre-monsoon (April-May) and post-monsoon (October-November/December) seasons (Liu *et al.* 2023). The rising mean sea level, driven by global warming, is expected to exacerbate storm surges, creating an emerging crisis. These events remain an ongoing threat to the expanding urban settlements in Bangladesh's coastal areas. Historical experience suggests that solely relying on constructed solutions is insufficient to mitigate such powerful natural forces. Therefore, integrating nature-based and nature-empowered solutions is a more appropriate and sustainable approach to addressing the challenges faced by these vulnerable regions.

The following examples of Nature-based Solutions try to mitigate the adverse impacts of these coastal calamities through gradually thriving living organisms that can be easily coupled with built protections to strengthen coastal defence.



Photo 37: An aerial view of the Coastal afforestation, Sandwip



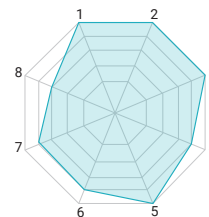
12 Coastal Afforestation, Sandwip

NbS Type: Coastal Plantation



The recent mangrove plantation along the coastline of two Mouza zones in Sandwip Island serves as a notable example of how coastal afforestation can mitigate climate-induced coastal disasters while enhancing the livelihoods of local communities. Implemented under the Sustainable Forests and Livelihoods (SUFAL) project, the initiative ensured

the active involvement of local stakeholders in both the planting and management of the forested areas. Following the plantation, these mangrove zones have successfully acted as protective barriers during recent cyclones, demonstrating their efficacy. This simple yet sustainable nature-based solution holds potential as a model for other coastal zones in Bangladesh.



Subjective assessment of NbS using eight IUCN Global Standard criteria



Photo 38: An aerial view of the Coastal Afforestation at Sandwip

Stakeholders

World Bank, Local Residents, and Bangladesh Forest Department (BFD)

Cost of Project

Per-hector nursery and planting cost was 19,100 taka (including VAT and IT); Funded by the World Bank.

City Profile



26.84°C



2,948
millimetres



Low-lying, flat terrain with sandy coastal areas and a network of tidal rivers and mangroves.



Sandy, with areas of saline and alluvial soils



327,564



Primarily based on agriculture, fishing, and trade, with a growing focus on tourism

Urban Challenges Addressed



Climate Change-induced coastal disasters destroy lives and livelihood assets



The disaster-prone community needs livelihood support



Map 15: Location of the coastal afforestation site at Sandwip



Photo 40: View of the Coastal Afforestation

Story of the Mangrove Plantation at Sandwip

The plantation sites were inherently barren coastal land areas outside embankments and roads, where the embankment alone could not protect the locality from cyclonic winds and tidal surges. To address this vulnerability, a natural protection layer of self-sustaining and regenerative mangrove trees was introduced, providing an affordable and effective solution for coastal protection.

Bangladesh has been a pioneer in coastal afforestation, with the National Forest Department planting over 200,000 hectares of mangroves since the 1960s. The mangrove plantation scheme at the Mukdara and Chokatoli Mouja areas was carried out under the Sustainable Forests and Livelihoods (SUFAL) project, implemented by the Bangladesh Forest Department (BFD) from 2018 to 2023. The project aimed to create coastal protection barriers, promote collaborative forest management and offer alternative livelihoods for marginalised coastal communities.

The plantation covered approximately 1550 hectares, with around 4500 trees planted per hectare, totalling nearly 70,00,000 plants. The primary species included Kewra (*Sonneratia apetala*), Baen (*Anguilla bengalensis*), and Gewa (*Excoecaria agallocha*). Temporary nursery shades

were constructed to ensure a higher survival rate for saplings, with 5000 saplings raised per hectare. Local stakeholders, especially affected community members, were involved in consultations and awareness activities, ensuring their active engagement in the plantation and management, which also provided alternative livelihoods for the community.



Photo 41: Native Mangrove plant saplings thriving in the project area

Maintenance

The planted forest zones are regularly maintained by local residents involved in the project, alongside forest department officials who conduct inspections and plant new seedlings to fill any gaps.

Co-Benefits Attained



Boosting local ecology
with the planted
coastal forest



Carbon sequestration,
water purification and
natural cooling



Alternative livelihood
opportunities
for marginalised
population



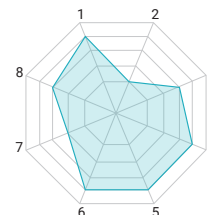
Healthy Urban Space

Critical Reflections

Ensuring the survival of mangrove plants until maturity is challenging, as cyclones and tidal surges can damage seedlings in their early stages.

Regular maintenance, community engagement, and close monitoring are essential to sustaining the ecosystem and ensuring its effectiveness as an NbS for coastal protection.

13 Ecological Engineering with Oyster, Kutubdia



NbS Type: Bio-Engineering Solution



Subjective assessment of NbS using eight IUCN Global Standard criteria

The ecologically engineered oyster reef on Kutubdia Island exemplifies an innovative nature-based solution addressing coastal erosion and rising sea levels. Initiated as a pilot study, this project highlights the potential of sustainable coastal protection. The oyster reefs effectively mitigate erosion by dissipating wave energy before reaching

the embankments. Beyond their cost-effectiveness compared to conventional defence methods, the oyster reefs enhance marine biodiversity and ecological balance while offering additional economic benefits, making them a model for integrating environmental restoration with coastal resilience.



Photo 41: An aerial view of the oyster reef

Stakeholders

Researchers from the Institute of Marine Sciences, University of Chittagong, Wageningen University in the Netherlands, and local inhabitants

Cost of Project

Total Cost: 1,85,000 Euros; Funded by the Government of The Netherlands

City Profile



26°C



2,825
millimetres



Flat, low-lying coastal terrain, characterised by sandy shores, mudflats, and mangrove vegetation



Alluvial soil, rich in silt and clay



143,622



Primarily based on salt production, fishing, and agriculture

Urban Challenges Addressed



Climate Change-induced coastal disasters destroy lives and livelihood assets



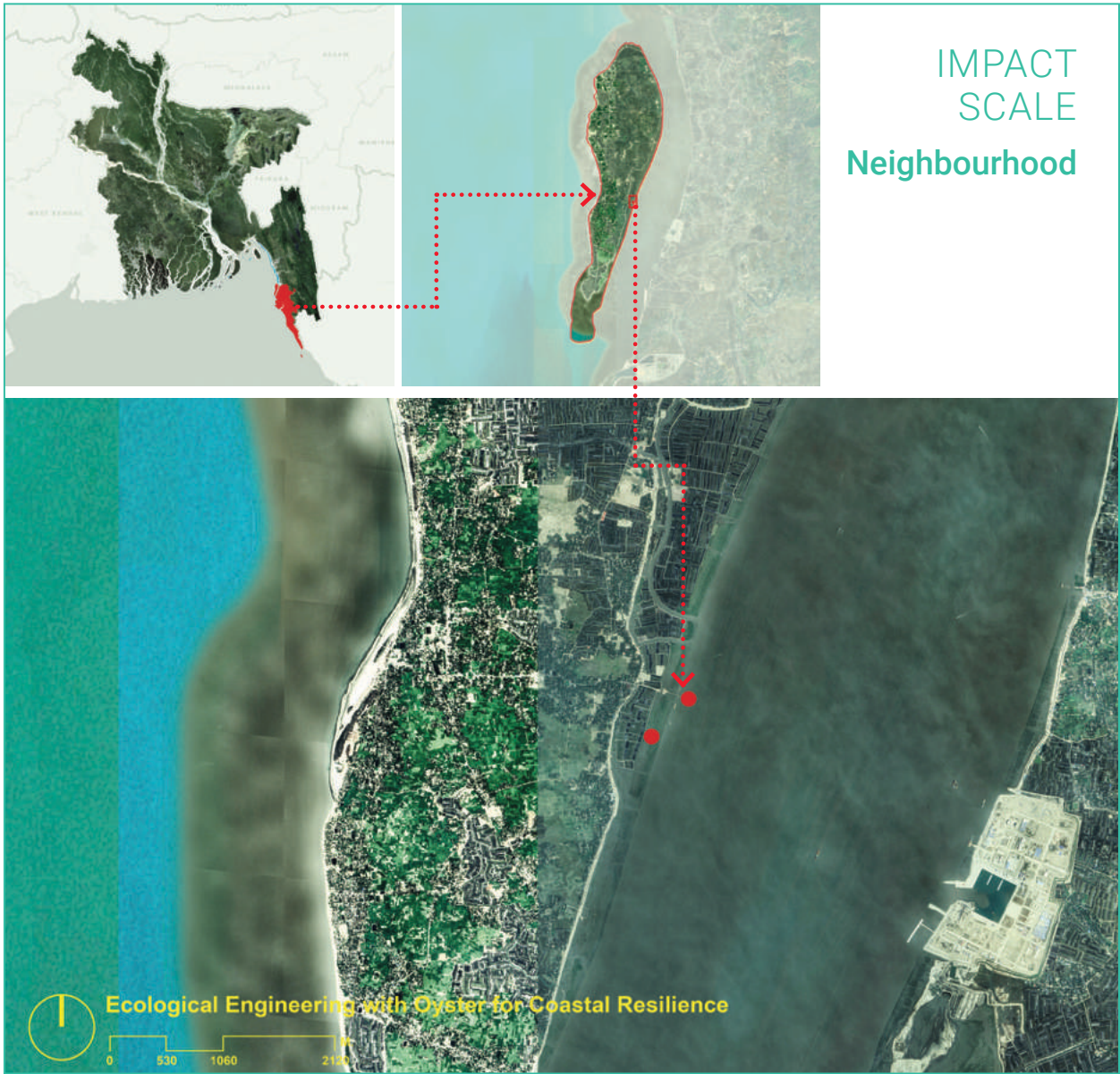
Continuous land erosion of the Island



Salinity intrusion from tidal events



Loss of livelihood, loss due to breakage of embankments



Map 16: Location of Ecological engineering with oyster, Kutubdia



Photo 42: Oysters growing and thriving on the concrete rings

Story of Artificial Oyster Reef

Kutubdia Island, battling relentless erosion over the years, saw many residents displaced, while those remaining faced severe socio-economic hardships due to the prevalent coastal calamities. Traditional embankments consistently failed against rising sea levels and powerful waves, leaving the island vulnerable. In response, researchers from the University of Chittagong, in collaboration with Wageningen University of the Netherlands, introduced artificial oyster reefs as a nature-based solution to combat coastal erosion. These reefs work by calming waves before they reach the shore.

A cost-effective and sustainable alternative, oyster reefs thrive in saline conditions, taking two to three years to establish. Over time, they grow stronger, offering long-lasting protection. Uniquely, as sea levels rise, the reefs adapt and grow, ensuring resilience to climate change impacts. Beyond protection, they also support biodiversity, providing hope for a brighter, more sustainable future for Kutubdia's vulnerable coastline. The initiative offers a model for integrating nature-based solutions into climate adaptation strategies.

The project to establish artificial oyster reefs on Kutubdia Island was carried out in two phases. In Phase 1 (2012-2014), the team assessed optimal conditions for oyster growth, including water temperature, salinity, pH, and dissolved oxygen,

and identified local oyster populations on concrete pillars near the jetty. This laid the groundwork for the reef's design. Phase 2 (2014-2016) focused on reef implementation using locally sourced, durable circular concrete rings, chosen for their resilience during the monsoon season. The coastal community's local knowledge guided the selection of the reef site. By 2016, the reef began showing visible growth within two years, confirming the success of the initiative.

The reefs have significantly impacted coastal protection, accumulating sediment up to 30 meters behind them and stabilizing the silt. They dissipate waves under 50 cm and reduce wave force over 1 meter, even withstanding the impact of tropical cyclone Roanu in 2016.



Photo 43: A closer view of the oyster reef

Maintenance

The oyster reefs, once settled and thriving, are self-maintained. Oyster reefs lower the maintenance costs and improve the sustainability of primary dikes by offering secondary support, strengthening over time, and adapting to rising sea levels for lasting coastal protection.

Co-Benefits Attained



Habitat and resource for aquatic and terrestrial biodiversity



Fish production and livelihood opportunity



Boosting local economy with fisheries

Critical Reflections

The island's monsoon climate, with strong surges, high sea temperatures, and large waves, poses challenges for oyster reef experiments.

Low salinity and heavy rainfall during the rainy season create inhospitable conditions for oysters, leading to death from food scarcity and intensified surges.

High sedimentation can block oysters from filtering phytoplankton, further compromising their survival, making careful observation and continuous monitoring essential for implementing such NbS in coastal areas.

2.5 NbS for Salinity Intrusion

The southwestern coastal region of Bangladesh is frequently impacted by tropical cyclones and storm surges, which inundate the area with saline water. Alongside cyclones and tidal surges, salinity remains one of the primary challenges for these coastal zones. When tidal surge water gets trapped within embankments or polders, it results in long-lasting salinity that severely hampers crop productivity. This not only leads to significant financial losses in agriculture but also adversely affects infrastructure, water supplies, soil quality, ecology, biodiversity, and the overall stability of local communities. Additionally, salinity-driven practices such as shrimp farming in polders further exacerbate the salinity issue. The situation is worsened by the gradual increase in salinity due to climate change, which affects both soil and water quality.

In urban areas prone to salinity, the scarcity of drinkable water is causing long-term health risks for the local population. The unequal distribution of freshwater has led to unrest and tensions among communities. As the demand for potable water grows, access remains limited, exacerbating existing social and health challenges. To address this issue, nature-based solutions such as rainwater harvesting can offer an effective way to combat water scarcity and reduce reliance on saline groundwater. By collecting and storing rainwater, coastal communities can supplement their water supply, providing a more sustainable, equitable solution to the region's growing water scarcity and salinity issues.

The following example of a Nature-based Solution demonstrates how natural resources like rainwater can be harnessed to combat salinity-related water scarcity in coastal cities.

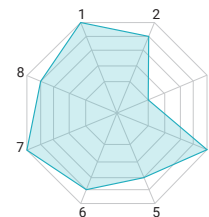


Photo 44: An aerial view of the Water Treatment Plant, Mongla



14 Water Treatment Plant, Mongla

NbS Type: Urban Rainwater Harvesting



Subjective assessment of NbS using eight IUCN Global Standard criteria

The water treatment project in Mongla City serves as a prime example of nature-based solutions addressing salinity in daily water use. The project features two large rainwater harvesting ponds designed to reduce the salinity of river water collected from the Mongla River. Additionally, two

overhead tanks store the treated water before it is distributed throughout the city. This sustainable approach not only mitigates salinity but also ensures a reliable and safe water supply for the community, showcasing an effective adaptation to the region's environmental challenges.



Photo 45: An aerial view of the Water Treatment Plant, Mongla

Stakeholders

Mongla municipality, the Department of Public Health Engineering (DPHE) and residents of Mongla

Cost of Project

Construction cost: 42 Crore Taka (infrastructure + land + digging the pond); Funded by ADB

City Profile



27°C



2,541
millimetres



Low-lying
coastal terrain
with a mix of
riverbanks,
mudflats, and
wetlands



Saline and
clayey soils
and some
sandy soil



42,613



Mainly based on the
port and maritime
industries, along
with agriculture,
particularly shrimp
farming and rice
cultivation.

Urban Challenges Addressed



Freshwater salinization
during high tides and tidal
surges



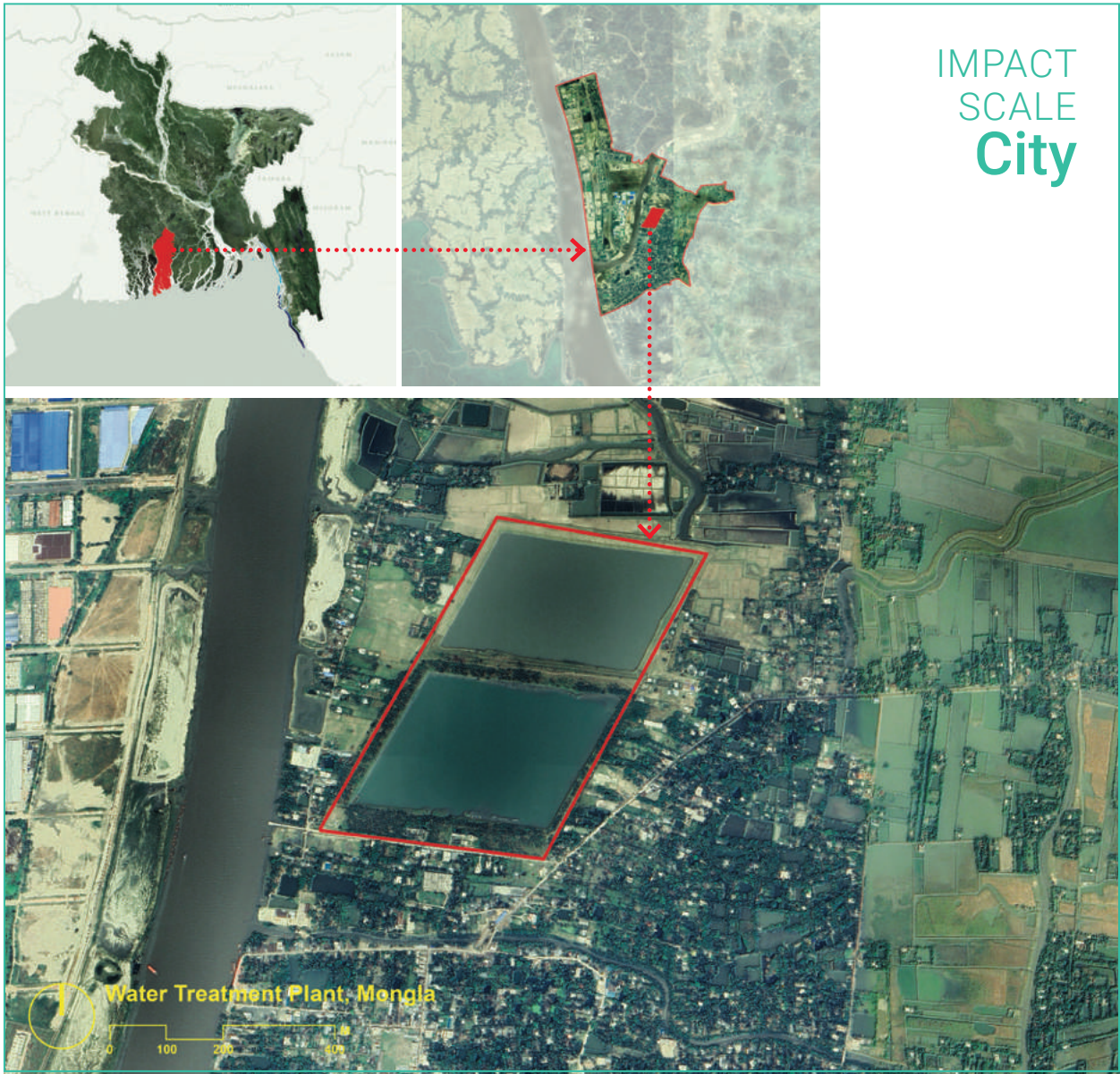
Skin diseases, gastrointestinal dis-
orders, and more acute conditions
such as hypertension and kidney
problems due to salinity



The residents of the city often
engaged in communal conflicts
over the equitable distribution
of water



The cost of the conventional
water supply system is
considerably higher



Map 17: Location of the water treatment project, Mongla



Photo 46: Two overhead water tanks located near the ponds

Story of Water Treatment Plant, Mongla

The main rivers of Mongla Upazila, the Pashur and Mongla, initially supplied water to the city through Mongla Port, with water transported from the Mongla River and distributed by tankers. Due to limited freshwater, rainwater was traditionally harvested using clay pots (“motka”) and ponds were reserved for drinking water, carefully protected from contamination. Residents purified water with tablets or filters. As the demand for potable water grew, the need for improved water treatment plants and a more efficient distribution system in Mongla became evident.

Due to the freshwater scarcity in Mongla municipality, the Department of Public Health Engineering (DPHE) decided to construct new surface water reservoirs, excavating two large ponds, each covering 40 acres. Freshwater is collected from the Mongla River between July and December when monsoon rains reduce its salinity. The water is channelled into the ponds, where the soil acts like a clay pot, absorbing the salt. Additionally, rainwater harvested in the ponds helps further reduce salinity. The ponds are designed with cascading methods for desalination, and apart from the use of RCC for the retaining walls, the construction remains natural.

The project was implemented in two phases. In 2005, DPHE acquired the land, and in 2008, infrastructure

work began. The first phase, completed in 2013, involved building an overhead tank with a capacity of 500,000 litres to supply water to eight wards in the municipality. However, due to inadequate supply, a second phase was initiated in 2014, adding a second overhead tank with a capacity of 450,000 litres. Water is treated at a treatment plant before being distributed to households. The project, encompassing 98 acres, was handed over to the city municipality in 2013.



Photo 47: The edges of the ponds are covered in vegetation

Maintenance

Mongla Municipality is responsible for maintaining the project, with the ponds supporting fish farming that contributes to the annual upkeep. The operation and management costs amount to 6 lakh per month, covering electricity, human resources, and repair expenses.

Co-Benefits Attained



Pond and pond side vegetation boost local ecology and biodiversity



Fish Production and hosting floating solar power plants of 10 KW

Critical Reflections

The water network in Mongla is inadequate, leaving areas like Wards 1, 7, and 9 facing freshwater scarcity and unequal distribution, with the lack of pressure pumps causing social disturbances.

The 24-inch pipe used for water extraction allows fish to contaminate the ponds, affecting water quality.

Ward 4 lacks a water supply due to the Mongla River dividing the municipality area, while desalination water, although chemical-free, is not fully salinity-free.

To become an effective NbS, the city should establish a network of such systems to ensure safe water throughout all neighbourhoods.

2.6 NbS for Landslide and Erosion

In Bangladesh, natural disasters such as flooding, tropical cyclones, tidal surges, river erosion, and drought have traditionally been more prevalent. However, recent years have seen uncontrolled urbanisation expanding into hilly regions, particularly in the Chattogram Hill Districts (CHD). Factors such as population growth, deforestation, hillside excavation, and a lack of local knowledge are contributing to an increasing frequency of landslides in these areas.

Naturally stable hill slopes can become destabilised due to road construction, infrastructure development, or traditional farming practices. One such practice involves clearing slopes by burning trees and vegetation to create arable land. These activities compromise the integrity of the topsoil, leading to erosion. As a result, the hill slopes not only become more prone to landslides but also lose essential nutrients from the soil over time, further degrading the land's fertility (Islam *et al.* 2014).

These landslide events have resulted in significant loss of life, and damage to infrastructure, ecosystems, livelihoods, and the local economy. As a result, landslides have emerged as a national-level threat, further exacerbated by the rising precipitation associated with climate change. Increased precipitation rates resulting from climate change are further increasing this calamity (Shaw *et al.* 2013). The following example demonstrates a bioengineering solution where the built forms and natural organisms can work together to prevent landslides and erosion.

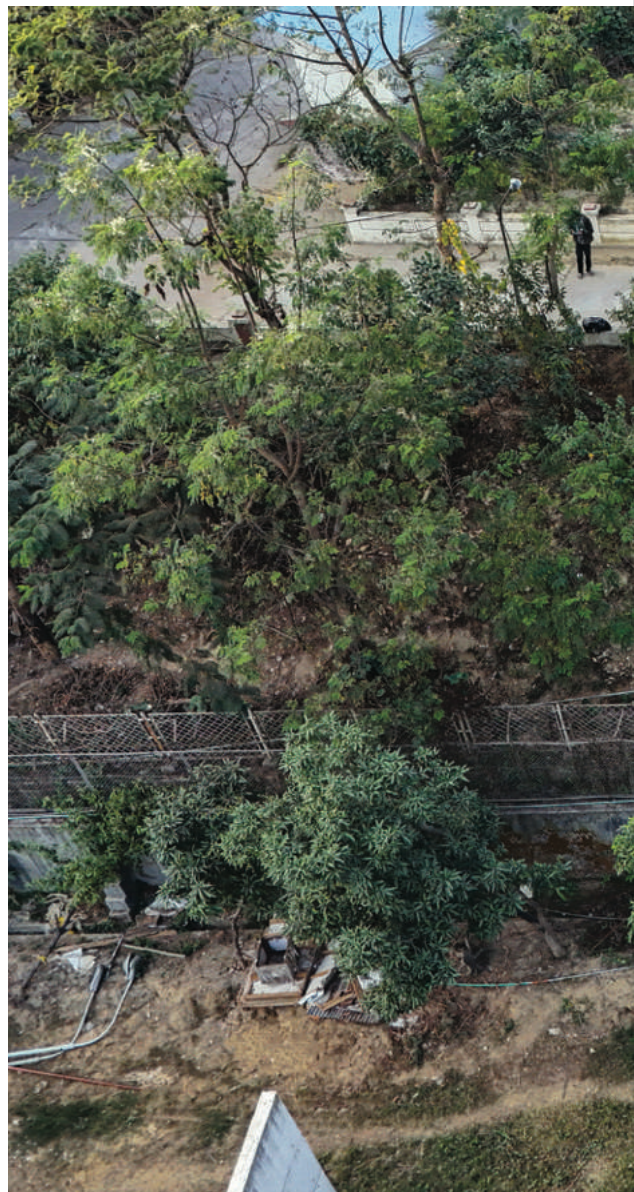


Photo 48: An aerial view of the Hill Retention Project



15 Hill Retention Project, Chattogram

NbS Type: Bio-engineering Solution



The Chattogram division of Bangladesh, known for its hill tracts, faces significant challenges from landslides, primarily due to human activities and natural factors. While retaining walls are used to prevent landslides, they are neither cost-effective nor environmentally friendly. Despite efforts focused on managing aftermaths, there is a growing need

for more sustainable solutions. “The Hill Retention Project”, utilising geo-technology, offers a promising alternative by combining natural methods with technical expertise. This approach can provide a more eco-friendly and effective way to stabilize the hills and mitigate landslide risks while promoting harmony with nature.

Subjective assessment of NbS using eight IUCN Global Standard criteria

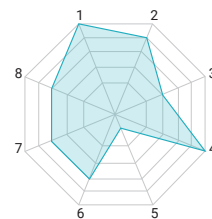


Photo 50: A view of Hill Retention Project

Stakeholders

The Power Grid Company

Cost of Project

Budget 10 crores taka and cost 2 crores.

City Profile



25.3°C



2,777 mm



A mix of hilly terrain, coastal plains, and a natural harbour along the Bay of Bengal



Alluvial soils, saline soils, red and yellow soils, and well-drained hill soils



3,230,507



Primarily driven by the port, shipbuilding, textiles, oil refining, natural gas extraction, and tourism sector

Urban Challenges Addressed



Loss of ecology from the removal of the topsoil of the hill



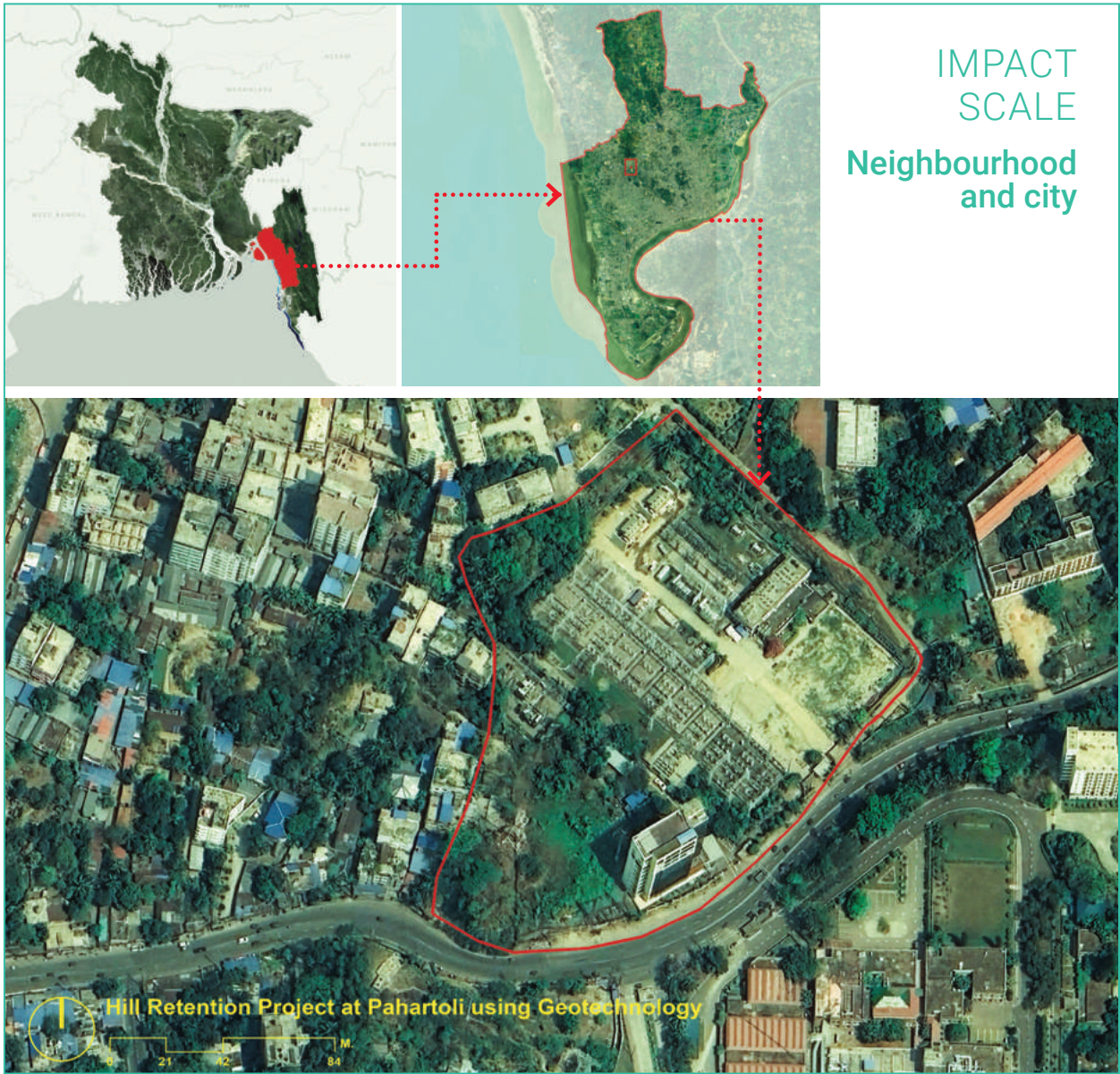
Landslides and erosion by manmade and natural causes



Loss of lives within vulnerable communities due to landslides



Economic losses due to frequent landslide damages



Map 18: Location of the hill retention project area, Chattogram

Story of the Hill Retention Project at Pahartoli , Chattogram

The hills of Pahartoli, Chattogram, composed of unstable silt, become prone to landslides during heavy rainfall. Despite efforts by the Chattogram Development Authority (CDA) to build solid retaining walls, these structures add extra load to the hillside, increasing collapse risk. The city faces a major issue where authorities focus more on addressing landslide aftermath rather than prevention. The unique characteristics of each hill, including its stability and soil quality, are often overlooked, resulting in poorly planned interventions that exacerbate the risk of landslides.

The hill retention project uses vertical and horizontal precast slabs, each 1 foot long and 3-4 inches thick, placed in a staggered pattern at the base of the hill to prevent soil spillage during landslides. The number and spacing of slabs are tailored to the soil type and hill slope. Geotextiles are placed under the slabs with a sand layer to reduce water infiltration, creating a natural drainage system for rainwater runoff. This approach enhances stability, minimises disruption to topsoil, and protects both buildings and residents.

In 2019, the Power Grid Company implemented a 6-month project to restore and Stabilise a vast hill with collapsed sections. A grid system with geotextile reinforcement was used, allowing for



Photo 51: An aerial view of the project depicting the plantation on the slope

vegetation growth and the planting of deep-rooted trees to ensure stability. Shallow-rooted plants were avoided to prevent excess weight, which could trigger landslides during heavy rainfall. The planting plan included shrubs and lighter trees, such as guava, and a solid trench was built to manage the land flow and protect against erosion while maintaining the hill's natural appearance.



Photo 52: An aerial view of Pahartali , Chattogram

Maintenance

The project is maintained by the Power Grid Company.

Co-Benefits Attained



Natural appearance of the hill with planted vegetation



Reducing expenses incurred in the aftermath of a landslide event

Critical Reflections

Fresh layers of soil and sand are used to maintain the hill's proper slope, but uneven sedimentation may occur, causing small cracks where horizontal and vertical components meet. These cracks can allow water infiltration, which may damage the structural elements.

To mitigate this, using concrete and mortar to seal the cracks and prevent water penetration is recommended.

Regular maintenance is essential to ensure the long-term sustainability of the project.

2.7 NbS Addressing Other Urban Challenges

In addition to the typical natural disasters and climatic challenges faced by urban communities in Bangladesh, there are significant socio-cultural and socio-economic issues that undermine the effectiveness of natural green and blue spaces, as well as other natural resources. These challenges adversely affect the quality of life, health, and well-being of urban residents. For instance, while natural resources such as ponds, canals, or forests exist within city areas, they are often subject to illegal encroachment. In some instances, areas near these resources, such as riverbanks or forest edges, become polluted or used as dumping grounds due to a lack of public awareness. Moreover, urban green spaces and water bodies, even when designated for public use, may not be universally accessible or safe, particularly for women and children in the community.

The following examples demonstrate efforts by the local individuals, neighbourhood communities, and also city authorities in overcoming socio-cultural or economic hurdles and employing nature-based solutions to ensure safe and accessible urban public realms and natural resources.



Photo 53: An aerial view of Nagar Park, Narayanganj

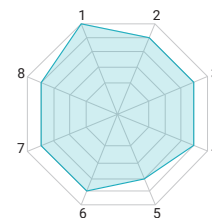


16 Nagar Park, Narayanganj

NbS Type: Urban Waterbody



Subjective assessment of NbS
using eight IUCN Global Standard criteria



The Nagar Park in Narayanganj is a remarkable example of urban revitalisation, transforming from a neglected and encroached space into a vibrant green-blue open public realm. Once deteriorated and inaccessible, the Park has been successfully rejuvenated by the Narayanganj City Corporation

(NCC), overcoming numerous challenges to restore this valuable public space. Today, it stands as a thriving hub for leisure, recreation, and social gatherings, offering residents a much-needed retreat and enhancing the overall well-being of the community.



Photo 54: An aerial view of the Nagar park

Stakeholders

Narayanganj City Corporation, Civil Society and Local residents, Ministry of Railways

Cost of Project

BDT 60 crores taka; Funded by NCC

City Profile



26.6°C



2,004 mm



Predominantly flat terrain with riverbanks and low-lying areas



Primarily alluvial, rich in organic matter and clay



967,951



Textile, shipbuilding, and manufacturing industries, along with trade and commerce

Urban Challenges Addressed



Canal degraded and stagnant, lack of proper sewage disposal system, air pollution, and mosquito infestation



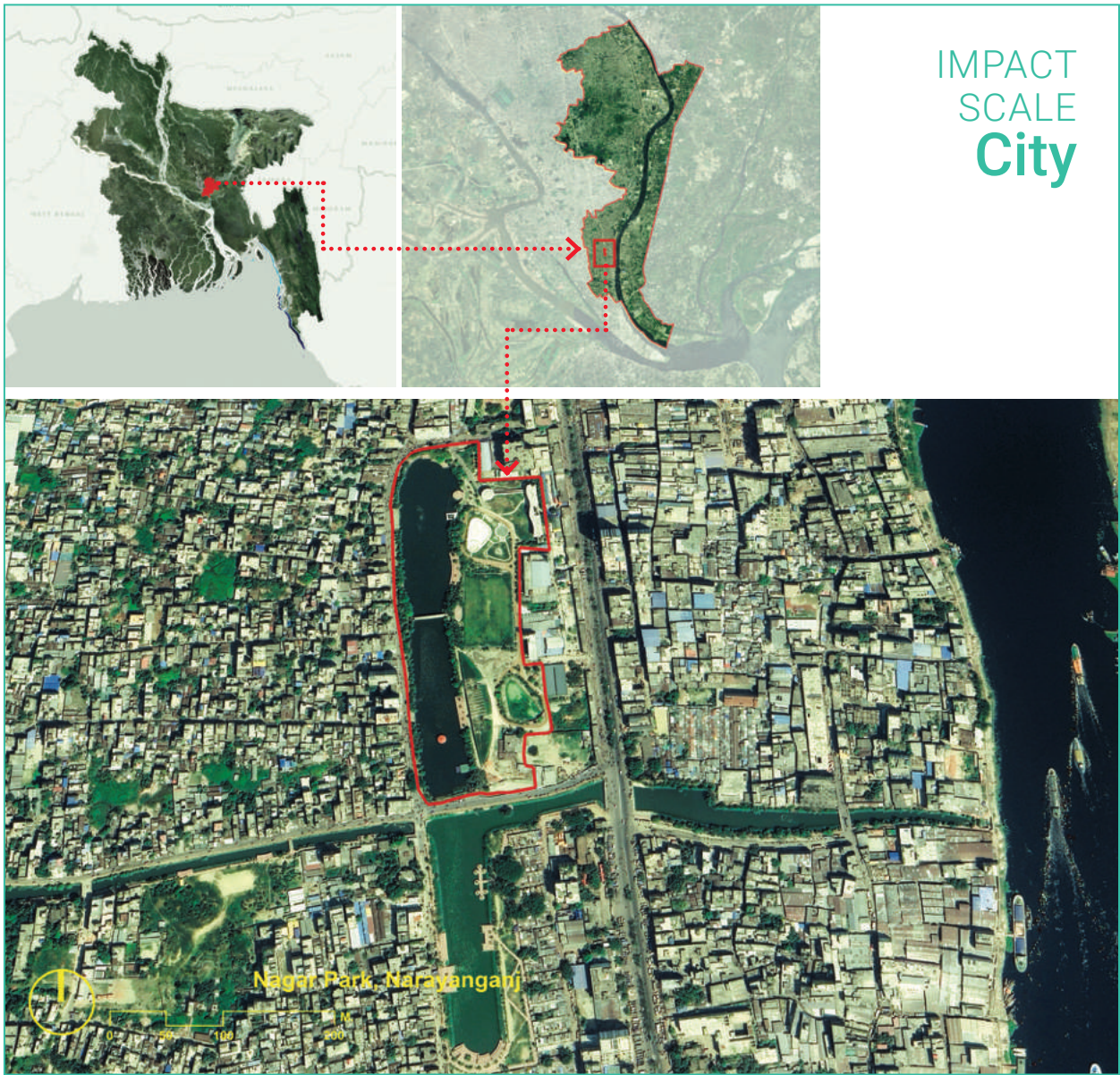
Loss of ecology and biodiversity from the degraded environmental condition



Need of a healthy urban space felt by the NCC and residents



The site became a hub of illegal and antisocial activities



Map 19: Location of Nagar park, Narayanganj



Photo 55: Scenic view of the park with the lake and lake-side plantation

Story of Nagar Park

The park and lake site is connected to the Baburail and Jelepara BanglaBazar Canal, which once played a key role in Narayanganj's trade, linking the city to the Dhaleswari and Shitoloykha rivers. However, over time, siltation, encroachment, and waste dumping narrowed the canal, severing its connection with the rivers. The canal was also connected to Jimkhana Lake, which is now part of the park area. The canal's decline and the surrounding area's deterioration led to environmental degradation and an increase in anti-social activities and crime in the park's vicinity.

The Jimkhana Lake, located within the park, was identified as a recreational space in the 2010 Detailed Area Plan (DAP) by Rajdhani Unnayan Kartipakkha (RAJUK). In response to the area's degradation and to meet the long-term needs of residents, the Narayanganj City Corporation initiated the excavation, renovation, and beautification of the lake in 2011. Vitti Sthapati Brindo Ltd., a renowned architectural design firm, developed a detailed design proposal for the project. The total park area spans 18 acres, with the lake covering 8 acres. The lake is about 405 meters long and 75 meters wide.

The Park features several attractions, including lakeside seating areas under tree canopies, an open-air amphitheatre, a swimming pool, a gym, a café, a boat club, and a light-and-water show. The retaining

wall around the lake is made of hollow concrete blocks, allowing for small grass plants to grow while stabilising the shore against erosion. Some parts of the lake are also utilised for fisheries. The project followed a participatory design approach, with focus group discussions involving the local community and civil society. The project timeline was from 2017 to 2023.



Photo 56: The presence of urban amenities promotes public gathering in the park, Rajshahi

Maintenance

Operation and maintenance of the park are managed by Narayanganj City Corporation (NCC), which has installed waste and recycling bins, with dedicated staff for waste management.

Co-Benefits Attained



Boosting urban ecology through lake, and park vegetation (10,000 native plants planted)



Potentially reducing urban heat



Urban recreational space

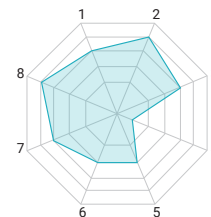


Income generating for temporary and permanent businesses

Critical Reflections

The Nagar Park is a proactive and positive initiative by the NCC, showcasing how city corporations or municipal authorities can effectively reclaim, and maintain a healthy urban environment for its citizens.

17 Pond Restoration Project, Rajshahi



NbS Type: Urban Waterbody



Subjective assessment of NbS using eight IUCN Global Standard criteria

The Rajshahi City Corporation (RCC) has undertaken a commendable initiative to restore and reclaim the neglected and encroached ponds within the city. As part of this project, RCC has successfully restored 19 ponds to date, implementing necessary construction measures to ensure their structural stability alongside plantation schemes for ecological enhancement. To transform these restored ponds

into functional urban public spaces, public amenities have been incorporated into the design of certain pond areas. Beyond serving as vital urban water reservoirs, these restored ponds now offer a range of ecological, social, and economic benefits to the residents of Rajshahi, setting a valuable precedent for municipal authorities across Bangladesh.



Photo 57: A view of the Haji Muhammad Mohsin Government High School Pond, Rajshahi

Stakeholders

Rajshahi City Corporation, Rajshahi Development Authority, Government of Bangladesh, World Bank, ADP, Urban LEEDS, LEGD, PWD, community and individual owner authorities

Cost of Project

273 crores taka

City Profile



28.49°C



94.94 mm;
city affected
by annual
drought



Situated in the
Barind tract
and Bengal
Basin region



Fertile alluvial
soils, lime-
rich Gangetic
alluvium,
clayey Barind
Tract soils



553,288



Agriculture and Agro-
processing, Silk Industry,
Education and Research,
Trade and Retail,
Construction and Real
Estate, Textile and Small
Industries

Urban Challenges Addressed



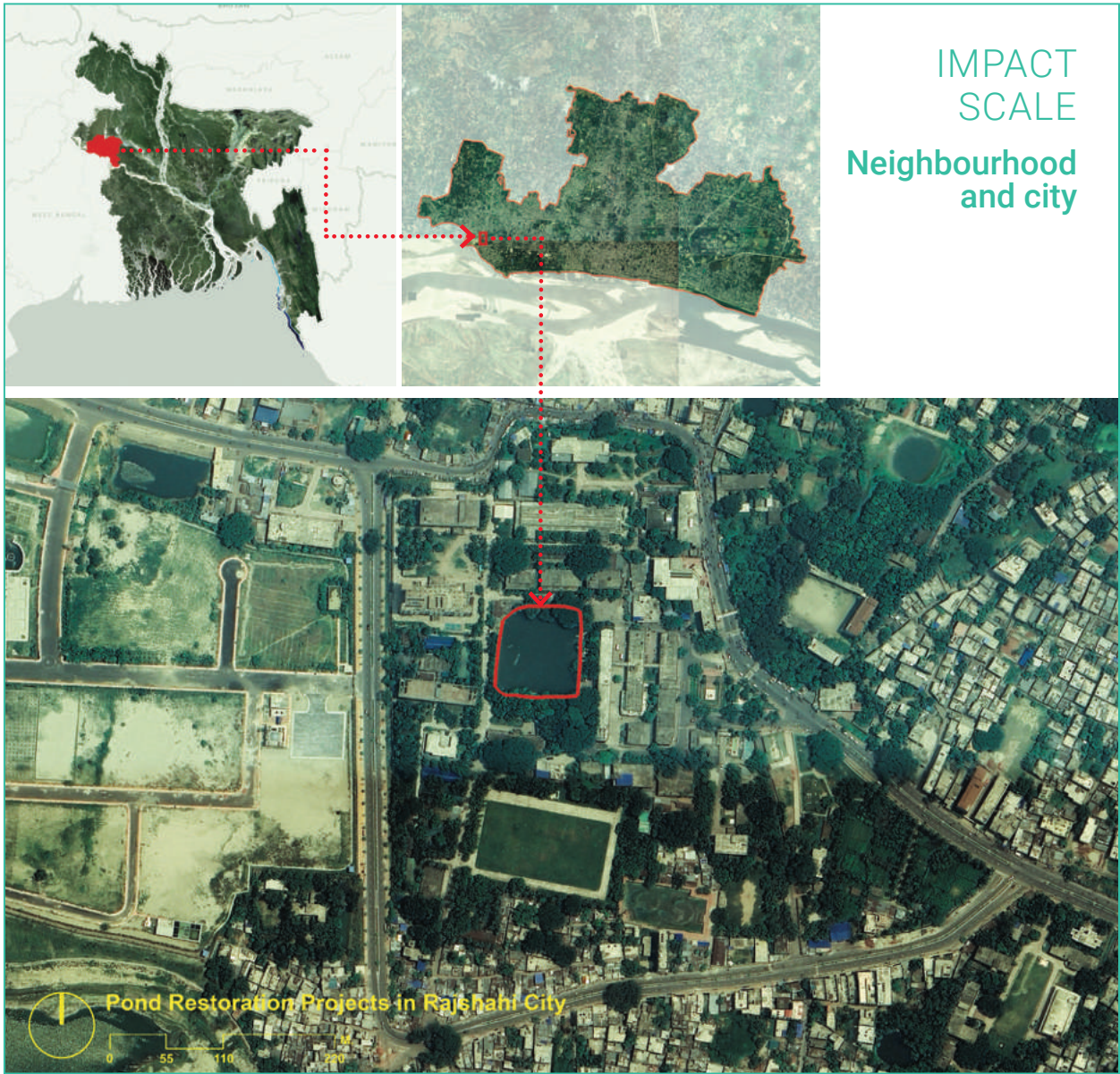
Loss of ecology and
biodiversity



Filling up urban ponds cre-
ates pressure on groundwater



Need for ecosystem services of ponds such as, supply of drinking
water, bathing, other household chores, fish cultivation, urban
aquifer recharge, and irrigation water for agriculture



Map 20: Location of the restored pond at the DC office, Rajshahi

Story of Pond Restoration in Rajshahi City Corporation

Prior to the Rajshahi Pond Restoration initiative, many ponds in the city, both publicly and privately owned, were heavily polluted, emitting foul odours and posing risks to local biodiversity and public health. Some, like the government pond at the DC Office and the Haji Muhammad Mohsin Government High School Pond, faced severe neglect, pollution from waste dumping, and encroachment. These conditions rendered them unusable and unsafe. The restoration project aimed to improve water quality and revitalise these ponds, enhancing urban liveability.

As part of the Rajshahi City Corporation's (RCC) pond restoration initiative, 50 ponds were initially selected, of which 19 have been restored. The restoration works included both structural interventions and environmental upgrades. Retaining walls were constructed 1.5 to 2 meters from the natural slope of the ponds, with walkways added above them to stabilize the banks and prevent erosion while preserving the natural slope to support riparian biodiversity. The pond depths were increased to hold more water during the monsoon, with drainage pipes installed to manage excess water levels. Efforts were also made to restore native flora and fauna, reintroducing plant species to rejuvenate the ecosystem and improve water quality. Public



Photo 58: Steps and walkways constructed at the Haji Muhammad Mohsin Government High School Pond, Rajshahi

amenities, such as concrete steps, benches, and walkways, were constructed to make the ponds more accessible and aesthetically appealing. In some cases, decks were added to facilitate leisurely activities like fishing, transforming these ponds into vibrant, multifunctional public spaces for the surrounding communities.

The Rajshahi pond restoration initiative was executed by the Rajshahi City Corporation (RCC) and Rajshahi Development Authority (RDA), with implementation carried out in collaboration with communities and individual pond owners and supported by key stakeholders.



Photo 59: A view of the restored pond at the DC Office

Maintenance

The ponds are maintained by their respective authorities, with some funded by economic activities like fish cultivation. For instance, the Haji Muhammad Mohsin Government High School Pond is sustained through commercial fish farming. To maintain cleanliness in the pond areas, the Food Carts are given dedicated waste bins and recycle bins from the RCC.

Co-Benefits Attained



Boosting urban ecology through pond, and pond-side vegetation



Potentially reducing urban heat and promoting a healthier urban microclimate



Public accessibility and recreational features of the ponds

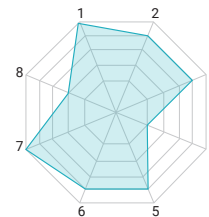
Critical Reflections

In the case of Rajshahi, most ponds were owned by individuals or institutions, with only a few under government authority, creating hurdles for RCC in securing support for the restoration project. Key challenges included legal battles to reclaim encroached ponds, land acquisition, and raising awareness about the importance of water body restoration.

To ensure long-term success, city authorities should establish clear legal frameworks, enhance community engagement, and offer incentives to private pond owners to encourage participation in future restoration initiatives.

18 Uttara Neighbourhood Park, Dhaka

NbS Type: Urban Green Open Space



Subjective assessment of NbS
using eight IUCN Global Standard criteria

Uttara Sector 13 Park serves as a prime example of a successful community-driven green space, designed to be inclusive and accessible. Initially planned with a sports field, the park has evolved through the dedicated efforts of the local welfare society, which successfully resisted commercial

pressures to preserve areas dedicated to the neighbourhood community, especially children and women. Today, the park is a vibrant hub, offering a variety of spaces for recreational activities, fostering a sense of belonging for residents of all ages and genders in Uttara Sector 13.



Photo 60: An aerial view of the Neighbourhood Park at Sector-13, Uttara

Stakeholders

The Uttara Sector 13 Welfare Society, RAJUK

Cost of Project

Development of Cricket/ Football Field by Akij Group costed 5 Lacs Taka
Executive Members provide donations for utility and amenity services, tree plantation, and installation of children's rides.

City Profile



25.3°C



2,085 mm



A combination of flat Madhupur terrace and marshes



Dupi Tila sands aquifer overlaid by Madhupur Clay



10,295,786



Garment manufacturing, trade, and services

Urban Challenges Addressed



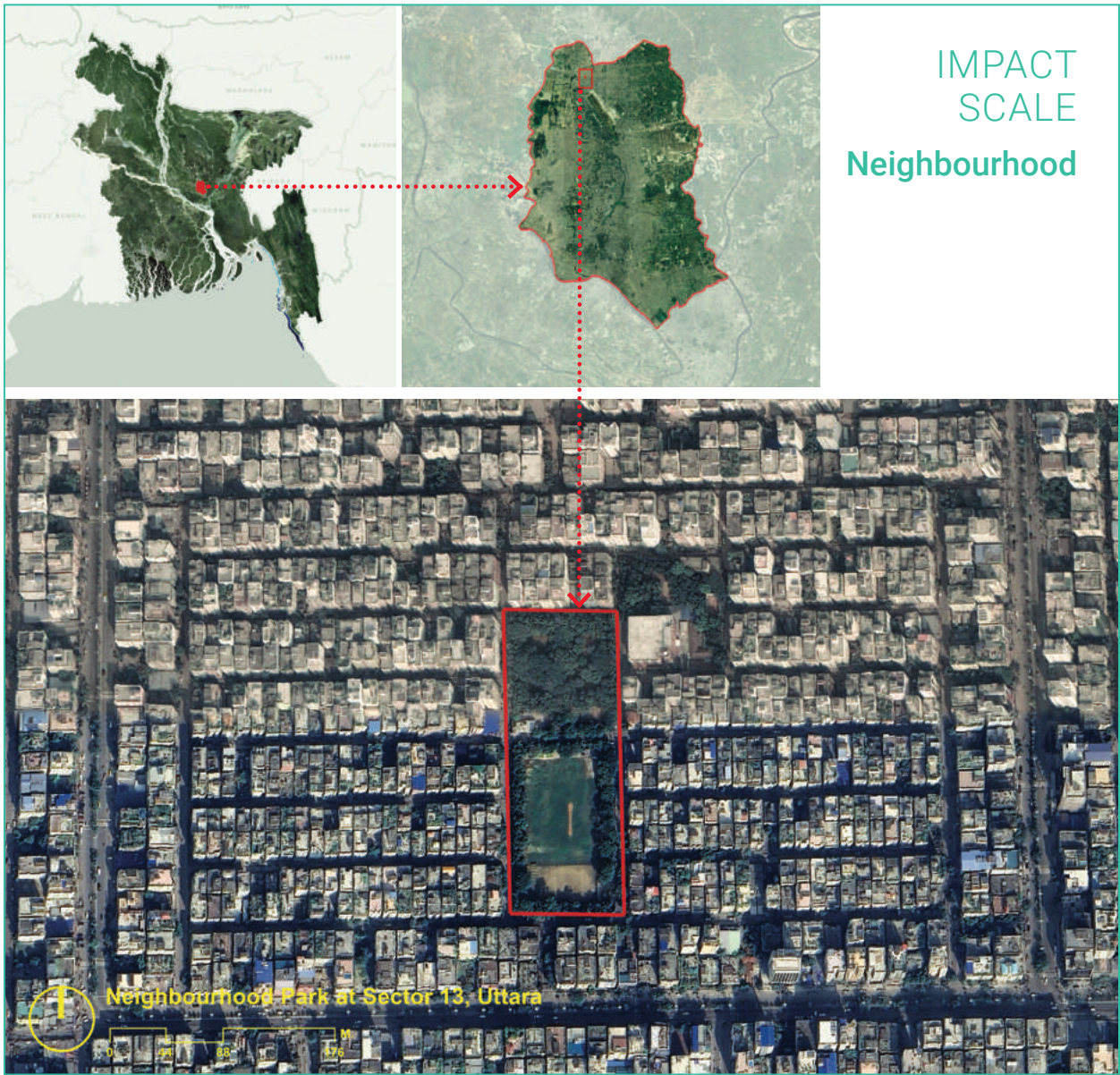
Need to Conserve urban green open spaces to cater for ecology and biodiversity



The site of the park was encroached by informal settlements, illegal activities, and few residential developments



No specific consideration for accessibility in the park for women and children



Map 21: Location of Uttara Neighbourhood Park, Dhaka

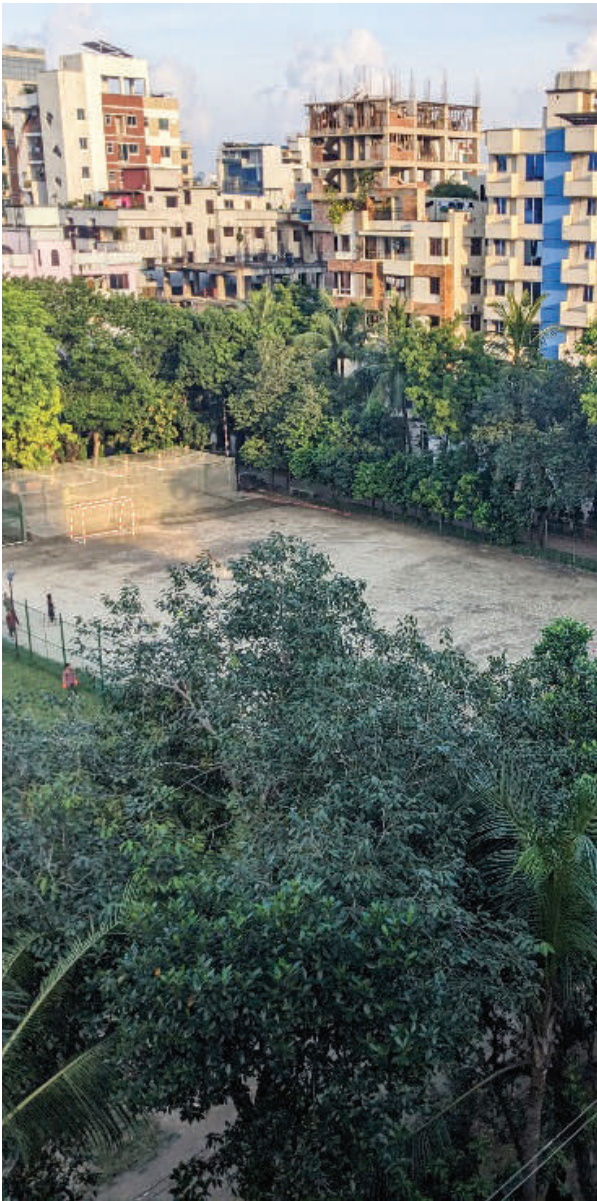


Photo 61: The play spaces of the park are surrounded by dense vegetation

Story of Sector 13 Park, Uttara

The Uttara Sector 13 Welfare Society was established in 2000 to serve the neighbourhood, initially focusing on essential amenities. In 2008-2009, the society requested land from RAJUK for a maintenance office and children's park. Although RAJUK allocated land for the office, much of the designated parkland was converted into residential plots. However, in 2008, with donations from Akij Group, the parkland was reclaimed and developed, including the installation of a walkway.

The Welfare Society also played a crucial role in preserving the women's and children's parks, protesting against their commercialisation. Over time, the park has seen continued improvements, including tree plantations, facility upgrades, and new installations. Notably, between 2024-2025, the focus shifted to redeveloping the women's park and converting the old office into a modern library, demonstrating the society's ongoing commitment to enhancing the public space for the community.

The Park is designed to cater to different age groups and activities. The football/cricket field (148 Katha) is used by male teenagers, young adults, and sports enthusiasts, and features a cricket pitch and football net. A walkway surrounds the field for the elderly and differently-abled individuals. The children's park (25.3 Katha) offers play equipment for children under 10, with safety measures in place. Adjacent

to it is the ladies' park (72.4 Katha), providing a space for women with walking paths, seating, and toilet facilities. The park is a key community space, promoting recreation and social interaction for all residents.

The welfare society of Sector 13 had to pass many hurdles to bring the park to its current state ensuring access and participation from all age and gender groups of the community. As the areas of the current children's park and Ladies' Park were initially aimed for commercial purposes by RAJUK, the welfare society had to protest against this decision along with environmentalists, ecologists, and conservationists to conserve them as accessible urban open spaces for public leisure and recreation.



Photo 62: A view inside the park

Maintenance

The Uttara Sector 13 Welfare Society employs 11 staff members, including gardeners, security guards, and cleaners, to maintain the park. Monthly expenses, funded by member fees and donations, total 148,000 BDT.

Co-Benefits Attained



Boosting urban ecology and biodiversity through the different fruit, flower and medicinal trees in the park



The Park creates business opportunities for mobile vendors and small shop owners

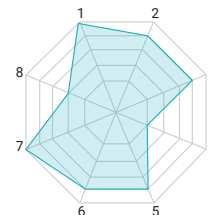
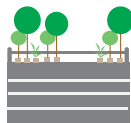
Critical Reflections

The Uttara Sector 13 Welfare Society overcame numerous challenges to transform the park into an inclusive urban space, preserving it as a model of accessible community recreation and environmental stewardship.

A city should ensure all neighbourhoods and residents have access to safe, inclusive green spaces, making them effective urban NbS throughout the city.

19 Urban River Spaces, Jhenaidah

NbS Type: Built Solution



Subjective assessment of NbS using eight IUCN Global Standard criteria

The Urban River Spaces project in Jhenaidah exemplifies a community-driven initiative aimed at revitalizing the city's riverine public spaces through an ecologically and socially inclusive approach. This transformative project addresses the ecological degradation of the riverscape while fostering a harmonious relationship between people and nature. Emphasizing co-creation, the participatory design

process engaged local stakeholders to ensure context-sensitive interventions that prioritised sustainability and functionality. By utilising local materials, preserving existing trees, and involving skilled craftspeople, the project celebrates regional heritage while promoting ecological stewardship. Its innovative approach has drawn nationwide attention, inspiring municipalities to adopt similar models of urban revitalisation.



Photo 63: An aerial view of the Urban River Space

Stakeholders

Residents, Jhenaidah Municipal Authority

Cost of Project

164,280 USD. The municipality contributed 40% and BRAC Urban Development Programme (UDP) contributed 60% of the total cost.

City Profile



22.24°C



1,521.90 mm



Flat and low-lying, characterised by fertile floodplains and interwoven rivers and canals



Clayey, loamy, silty, and sandy soils



140,256



Primarily based on agriculture alongside small-scale industries and local trade

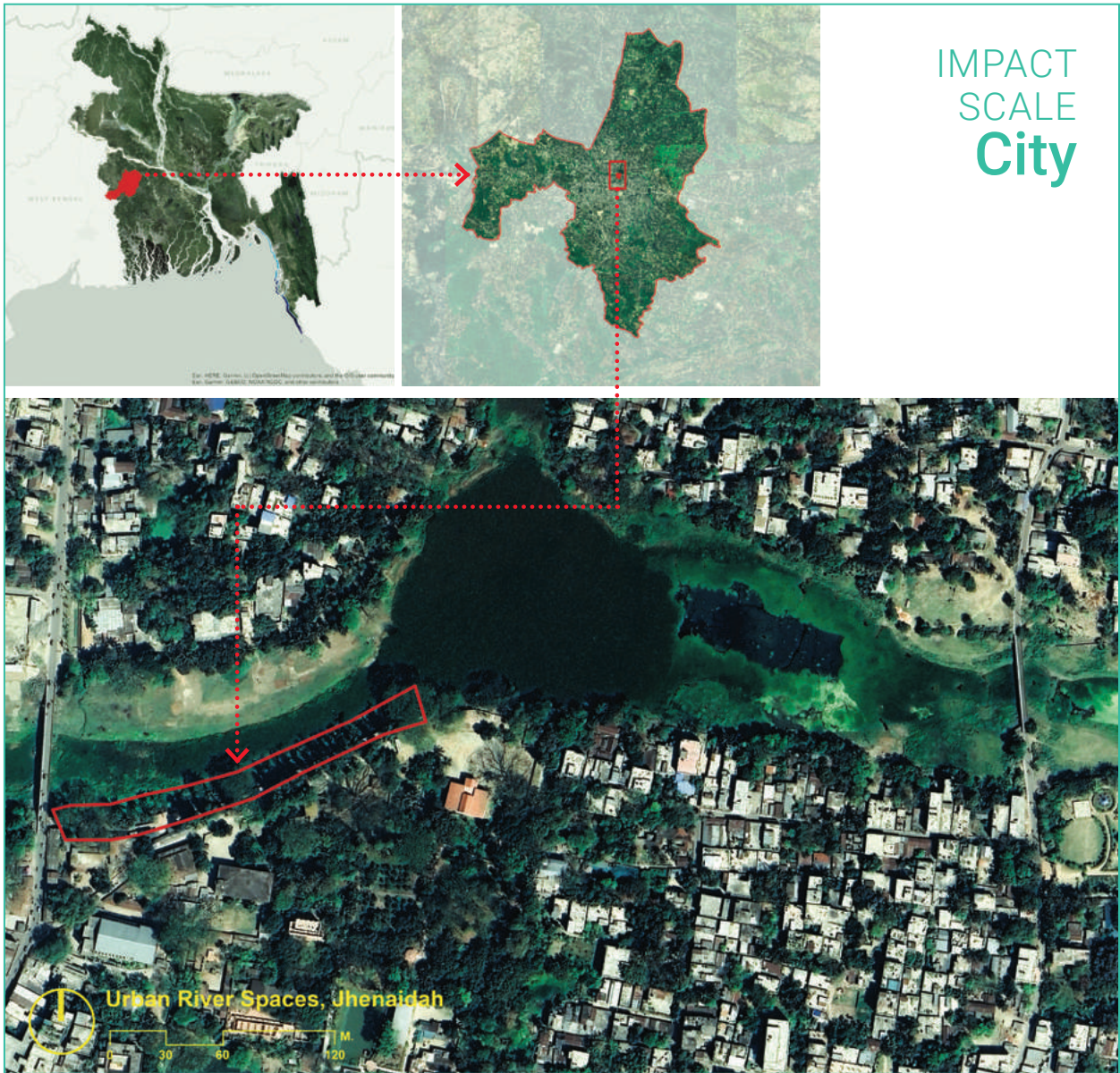
Urban Challenges Addressed



Existing pollution in the river and its banks due to waste dumping



Limited and degraded social spaces along the river edge.



Map 22: Location of the Urban River Space project at Jenaidah



Photo 64: The edge of the Urban space with the river

Story of Urban River Spaces, Jhenaidah

Prior to the Urban River Spaces project, the site in Jhenaidah reflected the typical consequences of unplanned urban growth in Bangladesh. Despite the river's central role in both the geography and culture of the city, it had been overshadowed by road-based and land-focused development. Watercourses became neglected, often used as dumping grounds, while the riverbanks were inaccessible, and access to the Nabaganga River was blocked. This disconnection diminished the river's role as a public space. The project sought to address this issue by reestablishing the river-city relationship, involving the local community and authorities in a collaborative design approach

The Urban River Spaces project was initiated and designed by Co.Creation.Architects and aimed to revitalise the neglected riverbanks of Jhenaidah into dynamic public spaces. The architects conducted a series of "Co-Creation Workshops" to involve local citizens in reimagining their urban surroundings. Officially launched in 2019, the project focused on reconnecting the river with the city, transforming it into a space for social interaction and leisure. The design features ghats, walkways, and restored pedestrian pathways, with the 115-meter-long "public ghat" being a prominent element. This ghat includes two plateaus connected by stairs and a ramp for disabled access, ensuring inclusivity.

The project employed a participatory co-design approach, engaging local communities, marginalised groups, women, and a local workforce. The design respected the natural topography, preserved existing trees, and utilised locally sourced materials like brick and concrete. Executed by local craftspeople under the Jhenaidah Municipality, with architects offering pro-bono consultancy, the project was shaped by diverse stakeholders including community members, environmental and cultural activists, business owners, teachers, and officials. The community-led implementation fostered a strong sense of ownership. The transformation of a neglected dump site into a multifunctional, accessible space reflects the project's blend of ritual, function, and recreation.



Photo 65: Large pre-existing trees preserved within the project area

Maintenance

The Urban River Spaces project is managed through a collaborative framework, with local communities taking on the primary responsibility for maintenance due to a strong sense of ownership. As the architect states, “Those who are the owners (community) of the ghaat, pay for the ghaat.”

Co-Benefits Attained



Boosting urban ecology through the preservation of large pre-existing trees



By working with low-income communities to co-create the public spaces, the project has empowered these groups economically and fosters local businesses

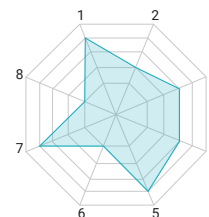
Critical Reflections

Post-implementation, waste management remains a significant concern due to insufficient public awareness.

The participatory approach used in the project provides a model that can be replicated in similar contexts, where natural resources and public open spaces are inaccessible, allowing such ventures to be implemented.

20 Bou Ghat, Bogura

NbS Type: Urban Waterbody



Subjective assessment of NbS
using eight IUCN Global Standard criteria

The Bou Ghat at Santahar is a significant landmark that embodies community heritage and cultural identity. Established and still maintained by the Pramanik family, this historic ghat within a pond has long served as a dedicated bathing space for women, reflecting the Santahar community's progressive

approach to inclusivity at a time when such provisions were rare. While the Pond offers multiple co-benefits as a neighbourhood-scale nature-based solution, the Bou Ghat remains culturally significant, honouring the traditions and identity of the surrounding community.



Photo 66: Aerial view of the Pramanik Family Pond and its Ghats including the Bou Ghat

Stakeholders

Ahsanullah Pramanik's family

Cost of Project

Cost not known

City Profile



29.79°C



1,168 mm



Flat alluvial
plains



Fertile alluvial
soils, including
clay, loam, and
silty soils



35,009



Primarily based
on agriculture
along with local
trade and small
industries

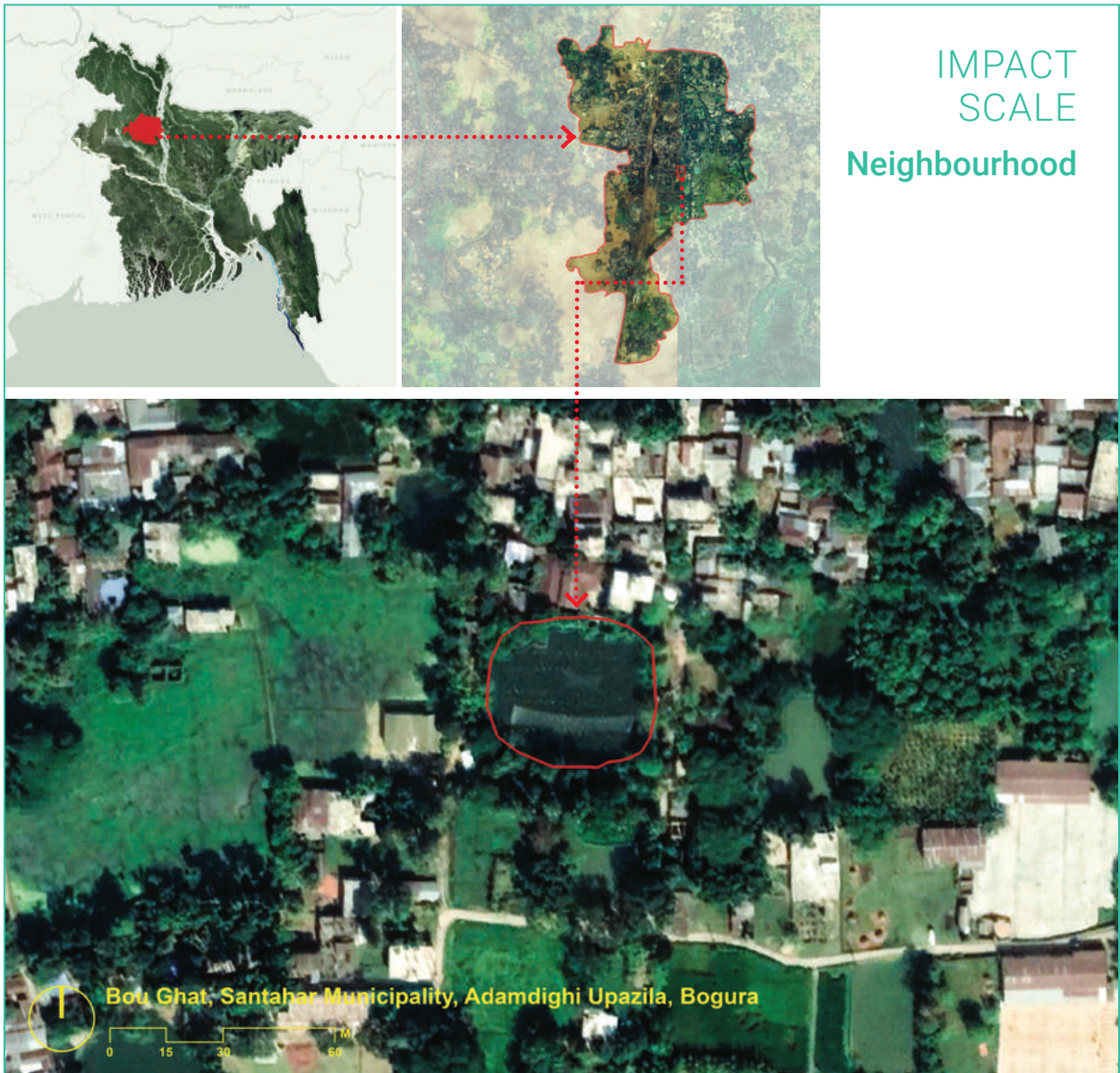
Urban Challenges Addressed



Need for freshwater sources,
aquifer recharge, water sources for
bathing and household chores, fish
cultivation, vegetable production, etc



Female bathing ghats often struggle
to ensure privacy for women com-
promising the dignity and safety of
women in remote regions



Map 23: Location of the Bou Ghat, Bogura



Photo 67: A view of the Bou Ghat within the Pond

Story of Pramanik Family Pond Bou Ghat

Approximately 100 years ago, the land where the pond now stands was part of the Pramanik Family's privately owned rice fields, which were crucial to the local economy, providing sustenance for many families. As the land was transformed, the Pramanik family decided to repurpose a portion of these rice fields into a pond that served multiple purposes, including irrigation, water supply for household activities, and a space for bathing. Syed Ali Ahmed, the youngest son of Ahsanullah Pramanik, initiated the construction of ghats around the pond. The first ghat was built for men, followed by the Bou Ghat, designed specifically for women to ensure privacy, safety, and facilitate their involvement in daily activities.

The Bou Ghat stands as an exemplary example of local architecture and community planning, prioritise both privacy and functionality. To safeguard the privacy of women, high boundary walls were constructed, blocking external visibility, in line with cultural norms that emphasise privacy, especially during bathing. The ghat, with its rectangular dimensions of approximately 20 by 30 feet, is adorned with traditional brick jali work, which not only enhances its aesthetic appeal but also allows for ventilation and light while maintaining privacy. This thoughtful design also ensures that water flows seamlessly between the

male and female sections, preserving water quality in both areas.

Constructed with locally sourced materials, particularly local bricks, the Bou Ghat blends harmoniously with its surroundings. Positioned next to the male ghat on the same pond, it makes efficient use of the water body while maintaining distinct spaces for men and women. The strategic placement of jali work helps regulate water flow between the two ghats, ensuring consistent water levels and quality. This design reflects a deep understanding of hydrology, community needs, and cultural norms, making it both practical and sensitive to social values of the time.



Photo 68: Green spaces around of the pond

Maintenance

Maintained by Pramanik family.

Co-Benefits Attained



Boosting urban ecology and improving local micro-climate by the presence of the pond and pond-side green spaces



The women can carry out their daily hygiene practices with ease in the pond

Critical Reflections

The Bou Ghat demonstrates a thoughtful consideration of women's needs, fostering inclusivity through its design.

Such sensitivity can be applied to all urban public spaces, adapting to different contexts while respecting cultural boundaries.

The Bou Ghat supports the preservation of neighbourhood-scale NbS such as urban ponds that cater to community needs, serving as an effective way to preserve urban waterbodies as a network of blue spaces.

2.8 Analysis of Case Studies Applying IUCN NbS Eight Criteria

Twenty inspirational case examples in this chapter offer valuable insights for addressing water and climate resilience issues in urban areas of Bangladesh. These cases incorporate elements of NbS to varying degrees, providing insights for designing and implementing urban NbS initiatives to tackle floods, heat, riverbank erosion, and water scarcity, while enhancing the urban environment.

Most initiatives are led by the Forest Department, Public Works Department (PWD), and Local Government Engineering Department (LGED). However, the compendium also includes examples led by private individuals, like the family Dug well (Patkua) in Nilphamari. Although not strictly within the scope of NbS, these examples highlighted the role of community-led initiatives in urban planning.

Below is a summary of the analysis of these case studies using the eight criteria prescribed by the IUCN Global Standard for NbS, 2020. Noticeably, the identified cases were either designed prior to the publication of the IUCN Global Standard or were not designed using the NbS criteria. Therefore, they do not fully align with the IUCN global standard for NbS. The purpose of this analysis, therefore, is to reflect on these case studies in a structured manner and capture insights for future urban initiatives that

align better with NbS principles, contributing to biodiversity gain and solving societal challenges in an urban context. The review also highlights issues and priorities at the city, community and neighbourhood levels, and how different stakeholders are addressing these challenges.

Summary of Analysis Using the Eight Criteria of IUCN Global Standard for NbS

NbS Criteria 1: NbS Effectively Addresses Societal Challenges

The initiatives prioritise a wide range of urban challenges, such as waterlogging, pollution, urban encroachment, ecological conservation, urban heat, water scarcity, coastal disasters, and landslides. They aim to improve the quality of life, health, and well-being of urban residents by enhancing wetlands, river connectivity, or tree cover.

Examples include the Kudalichora Canal in Moulvibazar and the Katakhalī Canal in Sirajganj, designed to tackle waterlogging and pollution. The Dhanmondi Lake in Dhaka aims to prevent urban encroachment and pollution while providing recreational space. Barshijora Eco Park focuses on conserving local ecology and creating recreational areas for citizens.

Community engagement varies across initiatives. Projects like the Kudalichora Canal and Urban River Spaces in Jhenaidah actively involve the community in planning, implementation, and maintenance, ensuring local support and participation. In contrast, Barshijora Eco Park initially lacked sufficient public engagement, leading to conflicts and vulnerability to encroachment.

These examples suggest that the success of NbS projects hinges on continuous community involvement and clear legal and regulatory support. Future urban initiatives should prioritise these aspects to build on the successes and lessons learned, creating more resilient, sustainable, and liveable urban environments.

NbS Criteria 2: Design of NbS is Informed by Scale

The case studies demonstrate a range of scales for interventions within city limits, from localised neighbourhood projects to city-wide initiatives. For instance, the Kudalichora Canal in Moulvibazar and the Katakhalī Canal in Sirajganj are city-wide projects addressing significant urban challenges. Dhanmondi Lake in Dhaka serves both city and neighbourhood scales, providing recreational space and environmental benefits. Localised projects like the Miyawaki Forest in Chattogram and Gol Talab in Old Dhaka address specific community needs.

To better align future initiatives with Criteria 2, it is essential to adopt a holistic approach that integrates project interventions into broader watershed and basin-level frameworks. This involves considering the natural features of the urban area and ensuring that interventions contribute to the overall health and functionality of larger ecosystems. By adopting a multi-scale approach and fostering collaboration between local and regional stakeholders, future urban NbS initiatives in Bangladesh can achieve greater impact and sustainability.

NbS Criteria 3: NbS Result in a Net Gain to Biodiversity and Ecosystem Integrity

The biodiversity gains from these initiatives are not well documented, although there are indications of improved ecosystem health and increased local biodiversity. Projects like Barshijora Eco Park, Moulvibazar and the National Botanical Garden, Dhaka are designed to conserve diverse plant species and provide habitats for urban wildlife. The Miyawaki Forest at Chittagong University boosts urban ecology and soil health by planting native species. Coastal Afforestation in Sandwip enhances local ecology and provides alternative livelihoods by planting mangroves. The Ecological Engineering with Oyster project in Kutubdia improves marine biodiversity by creating oyster reefs.

Some initiatives lack clear biodiversity results. To improve biodiversity outcomes, future NbS initiatives

need to incorporate specific biodiversity targets and monitoring plans, including selecting native plant species, creating habitats for local wildlife, and ensuring connectivity between green spaces.

NbS Criteria 4: NbS are Economically Viable

The case studies demonstrate varying levels of economic viability, with several projects showing clear economic benefits. For example, Karupannya Rangpur Ltd., in Rangpur, enhances productivity and provides a healthy workspace, contributing to economic gains. Coastal Afforestation in Sandwip creates alternative livelihoods through mangrove planting. The Ecological Engineering with Oyster project in Kutubdia boosts the local economy through fisheries. The surface water treatment plant in Mongla, addressing decades-long salinity intrusion, ensures year-round domestic water supply for locals while also generating monthly revenue for the Mongla Port Municipality through user connection fees, transforming the concept of water-centric urbanism.

Some projects lack clear indicators of economic viability. To enhance economic viability, future NbS initiatives need to incorporate strategies to generate income and support local economies, such as developing eco-tourism opportunities, integrating NbS with local businesses, and creating job opportunities. Engaging the private sector and encouraging investments in NbS can enhance their economic sustainability.

NbS Criteria 5: NbS are based on Inclusive, Transparent, and Empowering Governance Processes

The case studies indicate varying degrees of inclusivity and transparency in governance. Projects like the Urban River Spaces, Jhenaidah and Nagar Park, Narayanganj, exemplify inclusive and transparent governance, actively engaging local stakeholders through co-creation workshops and community involvement.

Some projects reveal gaps in governance processes. To improve governance, future NbS initiatives should prioritise community participation from the outset, ensuring local stakeholders are actively involved in decision-making and implementation. Transparent communication and regular consultations can build trust and foster collaboration between government agencies, local communities, and other stakeholders.

NbS Criteria 6: NbS Equitably Balance Trade-offs Between Achievement of Their Primary Goal(s) and the Continued Provision of Multiple Benefits

The case studies illustrate different strategies for balancing primary goals with the provision of multiple benefits. Dhanmondi Lake in Dhaka balances preventing urban encroachment and pollution with providing recreational and cultural benefits. Ramna Park in Dhaka provides biodiversity enhancement, recreational space, and cultural activities.

Some projects face challenges in achieving this balance. To improve the balance of trade-offs, future NbS initiatives need to incorporate comprehensive planning that considers both primary environmental goals and the provision of social, economic, and cultural benefits. Engaging local communities in planning and implementation can help identify and address potential trade-offs.

NbS Criteria 7: NbS are Managed Adaptively, Based on Evidence

NbS should be managed adaptively, using evidence-based approaches to ensure continuous learning and improvement. The Kudalichora Canal in Moulvibazar highlights adaptive management through regular maintenance funded by a surcharge tax. The Miyawaki Forest at Chittagong University benefits from regular monitoring and maintenance by students. The Kolpona-Talaimari River Embankment Plantation in Rajshahi is currently under the management of the Rajshahi City Corporation.

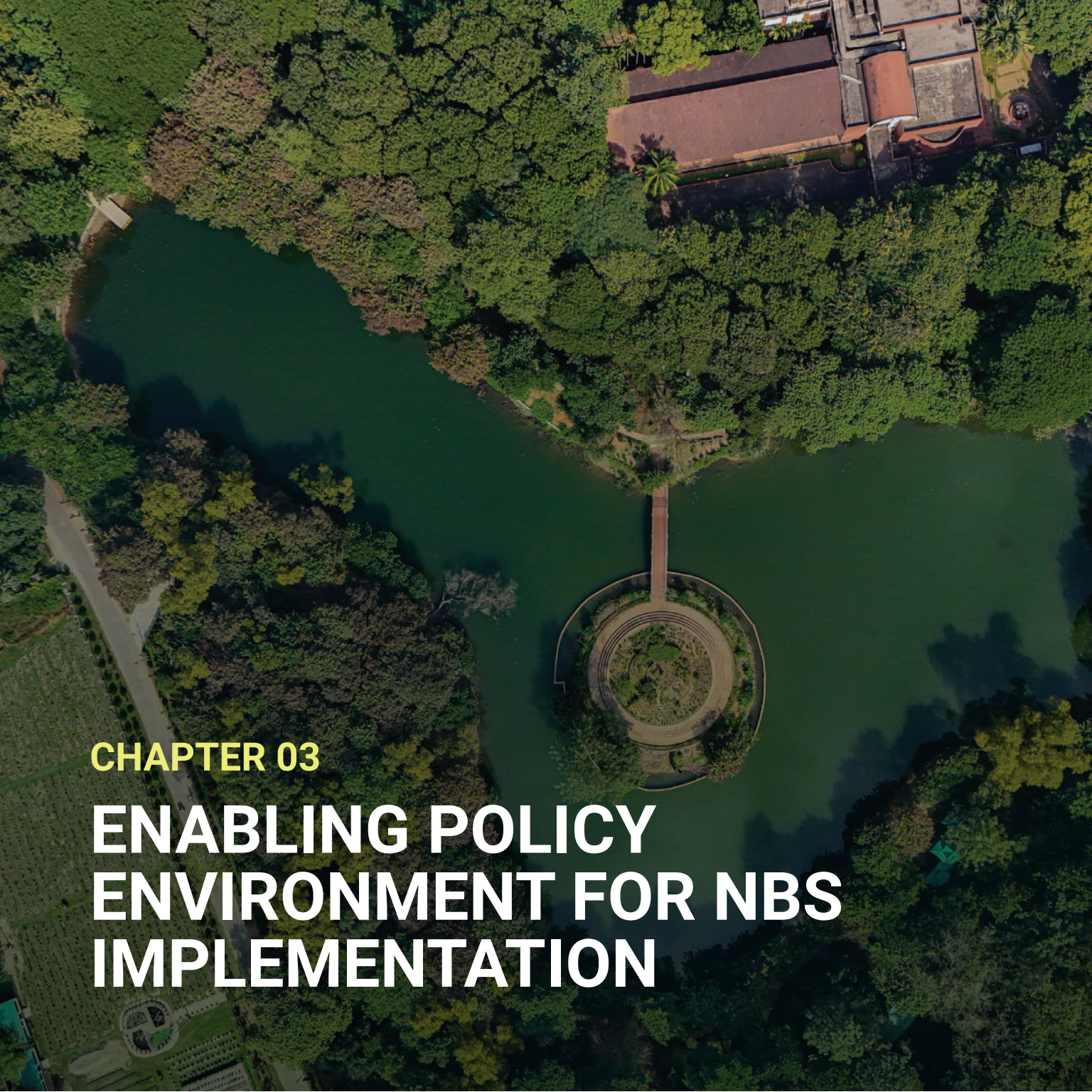
Some initiatives face challenges in implementing adaptive management. To improve adaptive management, future NbS initiatives need to prioritise continuous monitoring, data collection, and analysis to support adaptive management. Establishing

clear protocols and ensuring adequate funding for maintenance can help address emerging challenges and optimise performance.

NbS Criteria 8: NbS are Sustainable and Mainstreamed Within an Appropriate Jurisdictional Context

Projects like the National Botanical Garden in Dhaka and Ramna Park benefit from institutional support and structured management, ensuring long-term sustainability. Nagar Park in Narayanganj is managed by the Narayanganj City Corporation, providing regular maintenance and oversight.

Some projects face challenges in achieving sustainability and mainstreaming. To improve sustainability, future NbS initiatives need to prioritise clear legal and regulatory frameworks that support long-term management and funding. Establishing dedicated departments within local government bodies to oversee NbS projects can enhance their integration and sustainability. Sharing lessons from case studies at the highest level can inform urban policy and planning, supporting the mainstreaming of NbS through better land-use planning and conservation of ecosystem services.

An aerial photograph of a lush green landscape. A large, dark green pond occupies the center-right of the frame. In the middle of the pond is a small, circular island with a tiered, amphitheater-like structure. A narrow, straight path or bridge connects the island to the mainland. The surrounding area is densely forested with various shades of green trees. In the top right corner, a portion of a large, multi-story building with a reddish-brown roof is visible. The overall scene is serene and natural, with a touch of human-made architecture.

CHAPTER 03

ENABLING POLICY ENVIRONMENT FOR NBS IMPLEMENTATION

Important policy implications regarding nature-based solution (NbS) have been studied during this assignment. For better understanding of the same, several interviews have also been carried out with policy makers, officials working in the local government bodies and practitioners. NbS is found to be relatively new in practice and implementation for **policymakers at both national and local levels** and practitioners in Bangladesh. This is due to the lack of standards, technical and operational skills, knowledge and financing for NbS implementation. In this chapter, the discussion centres on the four key areas that could be pivotal for Nature-based Solutions. These are as follows:

1. Governance
2. Policy and Regulatory Framework
3. Funding and Finance Mechanism
4. Technical Capacity

3.1 Governance

The governance of NbS in Bangladesh stands at a critical juncture, marked by decentralised structures and multifaceted challenges. While legal and policy responsibilities are dispersed among various ministries at the national level, the absence of a formal coordination mechanism poses hurdles in scaling NbS interventions nationwide. At the grassroots, district administrations and local government bodies play pivotal roles in implementing policies relevant to NbS, yet systemic issues such as corruption and bureaucratic inefficiencies undermine effective governance. Addressing these challenges demands a comprehensive approach that integrates NbS into broader development strategies, fosters stakeholder collaboration, and strengthens adaptive governance mechanisms to navigate complexities and promote resilience in the face of environmental change.

3.1.1 Key elements of the governance arrangements

In Bangladesh, governance arrangements for NbS are characterised by a decentralised institutional framework. At the national level, legal and policy responsibilities relevant to NbS are dispersed among various government ministries, with significant roles held by the Prime Minister's Office, Ministry of Environment, Forest and Climate Change, Ministry of Agriculture, Ministry of Local Government, Rural Development, and

Cooperatives. Ministry of Housing and Public Works, Ministry of Water Resources etc. However, there is currently no formal structure for coordinating NbS initiatives at the national level.

Bangladesh is administratively divided into 64 districts, each overseen by a Deputy Commissioner. These district administrations, including the offices of line agencies under various nation-building Ministries, are responsible for implementing national policies and regulations within their respective jurisdictions. The district administration covers a wide range of areas relevant to NbS, including land use planning, agriculture, environmental conservation, and disaster management.

Furthermore, local governance in Bangladesh is structured around municipalities, city corporations for urban areas and union parishad, upazila parishad and zilla parishad for rural areas. Municipalities and city corporations, as urban local government bodies, hold significant responsibilities for urban planning, infrastructure development, and service delivery within their boundaries. Meanwhile, upazila and union parishads, as rural local government units, play a crucial role in rural development, agriculture, and community engagement.

Local level coordination in Bangladesh is primarily achieved through horizontal cooperation among municipalities, city corporations, upazila and union parishads. Associations of municipalities and city

corporations facilitate collaboration and resource sharing among local government entities.

3.1.2 Key governance issues

While consulting with the case study cities and agencies as discussed in the chapter 2, we identified different challenges faced by the respective cities during the process of policymaking and policy implementation of urban green spaces, waterbodies, parks. For policymaking, the cities and agencies experienced the following governance challenges:

There is currently no specific document or policy that categorically identifies NbS. This is why most of the government agencies lack the understanding of the NbS concept and associate issues. The concept of water bodies, green space and parks are well known, despite several challenges. A first challenge is to realise that green spaces or water bodies are of low priority for policymakers in the municipalities. In most cases, prioritise have been directed towards the infrastructure of bridge, culver and roads. A second challenge is a low and inconsistent uptake of the NbS concept. Municipalities are not interested in taking on additional responsibilities to understand and implement NbS. Initiative should be taken to incorporate NbS concept into the development context comprehensively.

The challenges that the Municipality of Santahar (Case Study 20) encountered during taking the initiative

to develop an open space since it was not possible to estimate the environmental benefits. Without knowing exactly how much a green space contributes to a certain benefit, it is difficult to have informed considerations and decisions. Furthermore, the limited budgets of the municipality did not help to take the initiative of developing the green space of their own initiatives.

In the capital Dhaka, one of the main challenges is that political interests privilege real estate developments above the environment. The examples presented in Case Studies 5 and 6 are the initiatives by the British and Pakistan Governments to create large open spaces to encounter environmental challenges and provide facilities to city dwellers. There was little consideration for considering the needs of adequate open space and water bodies in the capital. The city authorities like RAJUK and City Corporations had little representation in environmental policymaking. As a result, real estate developers are taking advantage of rapid development without proper consideration of the social welfare, and environmental aspects.

The Municipality of Sirajganj has recently developed the strategy “City Master Plan 2043” and is the first comprehensive municipal document to address green spaces and waterbodies. However, the other departments like Roads and Highways, Local Government Engineering Department do not have a common vision or a common

understanding of the importance and urgency of environmental problems or the benefits that urban green spaces can provide. Moreover, there is insufficient trust between authorities, and local citizens are expressing little interest in the development of the strategy. All this makes it difficult to work together to develop a common strategy.

The main challenge Jhenaidah Municipality faces during application of its Master Plan. The Master Plan classifies the land uses (business, commercial, open space, etc.) and cannot be modified by the Municipality without a revised study and update. This can make new proposals for e.g., new green spaces/water bodies difficult when they do not fit within the land use classification. The Municipality must look for alternative approaches to comply with land use classification. For example, if the riverside like in Jhenaidah Municipality needs to establish as NbS example or classification, it requires the update of the Master Plan. Also, it will require to include this new concept of NBS to include in all municipality’s revised Master Plans.

Apart from the above, the lack of functional coordination among the agencies working at city and municipal level in Bangladesh is one of the major barriers of sustainable development. This is not exception for the case of NbS implementation that requires coordination among various government

agencies tasked with environmental management, climate adaptation, and sustainable development. However, this coordination faces several challenges, including fragmentation of responsibilities, limited communication channels, resource constraints, and competing priorities among agencies. Addressing these challenges is crucial to ensure effective collaboration and maximise the impact of NbS initiatives across the country. Coordination among agencies implementing NbS in Bangladesh faces several challenges:

Fragmentation of Responsibilities: Various government agencies and departments are involved in implementing NbS, leading to a fragmented approach. Each agency may have its priorities, mandates, and funding sources, resulting in duplication of efforts and lack of synergy. For example, while a municipality at city level develops and implements a park, they hardly consult with the Roads and Highways Department (RHD) or Bangladesh Water Development Board (BWDB) about their experiences/lessons learnt on NbS points of view.

Lack of Clear Institutional Framework: There may be ambiguity regarding the roles, responsibilities, and coordination mechanisms among different agencies involved in NbS implementation. Without a clear institutional framework, coordination efforts may lack direction and effectiveness.

Limited Communication and Information Sharing: Inadequate communication channels and information sharing platforms hinder effective coordination among agencies. Lack of timely exchange of information and updates on projects, resources, and challenges can lead to misunderstandings and inefficiencies.

Competing Priorities: Agencies involved in NbS implementation may have competing priorities and objectives, leading to conflicts of interest and difficulty in aligning strategies. Without a shared vision and common goals, coordination becomes challenging.

Political Interference: Political interference or influence in decision-making processes can disrupt coordination efforts among agencies. Political considerations may override technical or environmental considerations, leading to suboptimal outcomes for NbS projects.

Institutional Silos: Siloed organisational structures within government agencies may hinder cross-sectoral coordination. Without mechanisms to bridge these institutional silos, agencies may struggle to collaborate effectively on integrated NbS projects.

Other governance issues hindering NbS implementation

Currently, several policies provide frameworks for identifying and preserving urban green spaces.

However, numerous challenges hinder their effective implementation, primarily due to the low priority given to green spaces by municipal policymakers. Over the years, urban development priorities have been heavily skewed toward infrastructure projects, particularly the construction and maintenance of roads and streets.

For instance, a significant portion of the initiatives led by the Local Government Engineering Department (LGED) has been centred on developing essential infrastructure such as drainage systems, roads, and culverts. While LGED has played a crucial role in strengthening the capacity of municipal officials through technical support in infrastructure development, it has not prioritised initiatives related to blue and green network development. As a result, municipalities have largely adopted a mindset focused on grey infrastructure—concrete-based urban development—rather than integrating ecological or nature-based solutions.

Nature-Based Solutions (NbS) remain a relatively new and unfamiliar concept in Bangladesh, particularly within municipal administrations that lack technical expertise in this field. For example, in Sirajganj municipality, there is neither a designated official nor a dedicated department responsible for overseeing green and blue infrastructure development. This lack of institutional capacity poses a significant challenge to the adoption of NbS.

Additionally, the uptake of NbS remains inconsistent and limited. Without a structured approach, proper

expertise, and clear policy direction, municipalities struggle to integrate sustainable, nature-based strategies into their urban planning processes. Addressing these challenges requires a paradigm shift in policy priorities, capacity building for municipal officials, and greater advocacy for sustainable urban development.

Governance structures affect NbS adoption

Municipalities in Bangladesh are governed by the Municipality Act of 2010, which provides a comprehensive legal framework for ensuring sustainable and environmentally friendly urban development. This framework is further supported by regulatory provisions such as the Building Construction Rules of 1996, the Environmental Conservation Rules of 1997, the Waterbody Conservation Act of 2000, and the Bangladesh National Building Code of 2020, as outlined in Section 1.3. These regulations offer municipalities the necessary tools to promote green development through the preparation and implementation of Master Plans.

However, despite the availability of these legal instruments, the execution of Master Plans is often not prioritised at the municipal level. As a result, cities face unplanned growth, leading to environmental degradation and loss of vital natural spaces. For instance, Satkhira Municipality was unable to preserve water bodies and green spaces in the western part of the town due to the failure to implement its Master Plan. The absence of proper

land-use planning has led to structural deformities in the urban landscape, making it increasingly difficult to incorporate Nature-Based Solutions (NbS). Without prioritising land-use planning, sustainable urban development remains a challenge, and efforts to mitigate environmental impacts become significantly less effective.

The impact of bureaucracy, and enforcement on NbS uptake

Khulna's urban development faces significant challenges due to its complex governance structure, where political interests often prioritise real estate expansion over environmental sustainability. A major issue stems from the overlapping responsibilities of the Khulna Development Authority (KDA) and Khulna City Corporation, which frequently results in inefficiencies and conflicting decision-making processes.

One of the most pressing concerns is the loss of natural spaces, including waterbodies and green areas, which have been sacrificed for development projects initiated by both public and private sectors. Instead of being preserved for future generations, these crucial environmental assets have been repurposed to accommodate urban expansion. This lack of foresight threatens the city's ecological balance and resilience.

Another major drawback is the lack of public participation in policymaking, particularly in the preparation and implementation of city development plans. The perspectives and concerns of residents

are rarely taken into account, leading to decisions that do not always align with community needs or environmental priorities.

Moreover, the development control system is heavily concentrated within the KDA, leaving the City Corporation with minimal authority to influence or enforce sustainable urban planning. This imbalance further complicates efforts to implement Nature-Based Solutions (NbS)—an approach that integrates natural ecosystems into urban planning to enhance climate resilience and environmental health.

As a result of these governance challenges, Khulna struggles to implement effective policies that balance urban growth with environmental protection, hindering its ability to create a sustainable and liveable city for future generations.

Municipal Act, Building Construction Rules and Building Code adequate provisions for guiding NbS inclusive spatial plan preparations and implementation. Most of the municipalities in Bangladesh have Master plan/spatial plan for their respective areas. However, these plans are not keeping the options of NbS as a part of land uses.

Aside from the issues mentioned above, poor governance and corruption pose significant challenges to the effectiveness of interventions. Instances of bias and corruption, such as favoritism towards local elites in forest allocation, highlight the need for stricter implementation of rules and stronger institutions for monitoring and enforcement.

Transparent and fair governance structures are essential to ensure that the benefits of nature-based solutions reach those who need them most. Building robust partnerships between government agencies, civil society organisations, academia, and the private sector is essential for mobilising resources, sharing knowledge, and catalysing collective action towards sustainable NbS solutions in Bangladesh.

3.2 Policy and Regulatory Framework

Bangladesh, under Article 18 A of its Constitution (1972), enshrines the protection, conservation and improvement of the environment and biodiversity for present and future generations. Development plans, climate change strategies, environmental protection and biodiversity conservation offer a framework for NbS. Despite facing hurdles like a lack of specific policies and legal mechanisms, NbS implementation can leverage existing policies and laws in South Asian countries to contribute to the achievement of Sustainable Development Goals (SDGs), Aichi Biodiversity Targets, and the Post-2020 Global Biodiversity Framework (Gain *et al.* 2017). Ultimately, the objective of NbS implementation is to ensure long-term environmental security while aligning with global biodiversity and development goals.

3.2.1 Key policies and legislations relevant for NbS in Bangladesh

In terms of policy and planning, Bangladesh has outlined NbS strategies in various national development plans. The country's Intended Nationally Determined Contributions (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) prioritise ecosystem-based adaptation and community-based conservation, aligning with NbS objectives.

However, there is room for improvement in integrating NbS across different sectors and revising existing plans. The Government of Bangladesh has formulated various policies, legislations and strategies to address environmental challenges and promote sustainable development, including:

- **Environment Policy, 1992:** Drafted after the Earth Summit in 1992, this policy emphasises sustainable management of natural resources to ensure social and environmental well-being.
- **National Water Policy, 1999:** Aims to manage water resources comprehensively and equitably, encouraging private sector involvement and emphasising surface water augmentation.
- **Coastal Zone Policy, 2005:** Focuses on the development of coastal zones for economic and ecological benefits, integrating coastal zone management practices and disaster risk reduction.

- **Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009:** A cross-sectoral plan aimed at building a climate-resilient country, with NbS interventions to combat climate change-related challenges.
- **National Agriculture Policy, 2013:** Aims to increase crop productivity, ensure food security, and promote sustainable agricultural systems for long-term livelihood generation.
- **National Strategy for Water Supply and Sanitation, 2014:** Seeks to provide safe and sustainable water supply and sanitation, integrating integrated water resource management and NbS implementation.
- **Nationally Determined Contributions (NDC), 2021:** Mitigation measures to reduce greenhouse gas emissions, including actions aligned with NbS outcomes.
- **National Forest Policy, 2016:** Supports sustainable forest management and restoration, emphasizing ecosystem services and incorporating NbS principles.
- **National Biodiversity Strategy and Action Plan (NbSAP), 2016–2021:** Identifies conservation priorities and strategies, with NbS implementation at community levels.
- **National Adaptation Plan of Bangladesh (2023-2050), 2022:** aims to reduce risks and vulnerabilities to climate change impact and to enhance resilience through adaptation as well as enhance the resilience of ecosystems for sustainable economic growth.
- **Forest Act, 1927:** Promotes community participation in afforestation and social forestry, facilitating ecosystem-based adaptation and forest restoration.
- **Bangladesh Environment Conservation Act, 1995:** Chief environmental law protecting wetlands and Ecologically Critical Areas, prohibiting deforestation, and promoting ecosystem restoration and conservation.
- **Playgrounds, Open Spaces, Parks and Natural Reservoirs Act, 2000:** Ensures protection of urban green spaces, encouraging NbS implementation and prohibiting actions that disturb ecological balance.
- **Wildlife (Conservation and Security) Act, 2012:** Aims to conserve wildlife and biodiversity, facilitating area-based conservation approaches and special provisions for protected areas management.
- **National River Conservation Commission Act, 2013:** Establishes a commission to oversee river health, address pollution, and ensure sustainable river management.

- **Bangladesh Water Act, 2013:** Provides citizens entitlement over water services, promotes water conservation, and establishes water governing bodies for integrated water resources management.
- **Ecologically Critical Area Management Rules, 2016:** Framed under the Environment Protection Act, these rules establish committees and regulate activities in ecologically-critical areas.
- **Bangladesh Biodiversity Act, 2017:** Facilitates biodiversity conservation, sustainable use of natural resources, and equitable sharing of benefits in line with the Convention on Biological Diversity objectives.
- **Protected Area Management Rules, 2017:** Support coastal afforestation projects, community engagement, and introduce co-management models for protected areas.



Photo 69: An Aerial view of Katakhal Khal, Sirajganj Municipality

Rajshahi City Wetlands and Green Nature Reserve

Area Characterisation

The city of Rajshahi is located on the north of River Padma which is the largest drainage system in the northwestern side of Bangladesh. Being in the dry zone of the country, a major part of the city of Rajshahi experience decade long extreme weather effect such as lowest temperature during the winter and highest temperature during the summer. Moreover, low laying areas of the city is prone to regular flooding during the rainy season.

Objective

To reserve the green and wetland on a brown field site and agricultural land to minimise the flooding risk and mitigate extreme weather effects.

Actions

The City Master Plan which was prepared in 2004 by the Development Authority identified the areas to be reserve as water bodies and green areas. The city dwellers were involved during the plan preparation process and helped to identify the respective areas to be brought under green and water body reservation.

The Development Authority implemented the city Master plan during last two decades. A study by the development authority in 2022 shows that green areas of the city increased by 20% compared to the base year of plan preparation. Moreover, all the demarked waterbodies in the city are as it is during the decades. The city authority used Playgrounds, Open Spaces, Parks and Natural Reservoirs Act, 2000 as regularity tool to safeguard the waterbodies and green areas. As a result of increased green areas and tackling water bodies the air pollution of the city got down significantly to attain as one of the best air quality cities in the world by 2016¹.

¹ <https://www.theguardian.com/world/2016/jun/17/rajshahi-bangladesh-city-air-pollution-won>

Box 1: Regulatory Provision for Ensuring Nature Based Solutions in Urban Context

NbS benefits

- Better protection and restoration of water bodies and green areas
- Improve connectivity and functionality of green and blue infrastructures
- Improve air quality
- Increase accessibility to green open spaces
- Reduce water logging and flooding despite increased trend of urbanisation

Lessons learned

Reservation of wetlands, water bodies and green areas that can help to reduce air pollution and mitigate effect of extreme weather events.



Photo 70: A view of Pond Restoration Project in Rajshahi City (Haji Muhammad Mohsin Government High School Pond)

3.2.2 Key issues related to policies and legislation

The policy gap regarding NbS in Bangladesh stems from the absence of a dedicated and integrated policy framework specifically addressing NbS interventions. While Bangladesh has various environmental policies and strategies, they often lack explicit provisions or guidelines for implementing NbS projects. This lack of a cohesive NbS policy framework leads to fragmentation and inconsistency in the planning, implementation, and monitoring of NbS initiatives across different sectors and administrative levels.

3.2.3 Policy gaps for implementing NbS in Bangladesh

3.2.3.1 National Water Policy, 1999

- Fragmented approaches and insufficient integration between water management, environmental protection, and development planning authorities.
- Limited public awareness and involvement in water management and conservation efforts.
- Limited data on water resources, ecosystem health, and the impact of climate change on water systems.
- Inadequate financial resources and investment in nature-based projects.

- Weak enforcement of existing regulations and insufficient policies supporting NbS.
- Lack of technical expertise and capacity in implementing NbS and managing ecological restoration projects.
- Inadequate adaptation measures to address the impacts of climate change on water resources and ecosystems.
- Conflicts between conservation objectives and other land use priorities, such as agriculture, urban development, and industrial activities.
- Lack of long-term maintenance plans for nature-based solutions and restored ecosystems.
- Insufficient mechanisms for monitoring and evaluating the effectiveness of NbS interventions.

3.2.3.2 Coastal Zone Policy, 2005

- The policy does not propose specific science-based strategies for preserving and managing Critical Ecological Zones (CEZ) resources.
- Insufficient focus on specific adaptation measures to cope with climate change impacts on coastal ecosystems.
- Lack of mechanisms for involving local communities in decision-making and management of CEZs.

- Limited economic incentives and livelihood support are tied to conservation and sustainable management of CEZs.
- The policy may not fully integrate coastal zone management with broader national development and economic policies.
- Lack of a comprehensive framework for managing natural resources within CEZs.
- Limited infrastructure and capacity to support NbS implementation and management in coastal areas.
- Insufficient systems for monitoring and evaluating the effectiveness of NbS interventions.
- Conflicts between conservation goals and competing land use demands, such as urban expansion and industrial development.
- Limited public awareness about the importance of CEZs and the role of NbS.
- Absence of policies regarding Genetically Modified Organisms (GMOs) and their environmental impacts.
- No strategy for managing shared natural resources like the Sundarbans mangrove forest.
- Lack of specific plans for increasing forest cover in diverse areas.
- Insufficient strategies for managing zoological, botanical gardens, and other protected areas.
- Lack of mechanisms for tracking forest cover changes and conservation effectiveness.
- Limited emphasis on community involvement and public education in conservation efforts.
- No clear alignment of forest management with climate change adaptation strategies.

3.2.3.3 National Forest Policy, 2016

- No clear criteria for classifying and managing forest areas.
- Absence of strategies for declaring and managing ECAs.
- No framework for controlling Invasive Alien Species (IAS) impacting biodiversity.

Furthermore, existing policies may not adequately address the multifaceted nature of NbS, which encompasses diverse ecosystems, stakeholders, and socio-economic considerations. This gap results in missed opportunities to leverage NbS for addressing interconnected environmental challenges such as climate change adaptation, biodiversity conservation, and disaster risk reduction.

Additionally, the lack of a dedicated NbS policy hampers resource allocation and coordination among relevant government agencies, donors,

and other stakeholders. This can lead to ad-hoc approaches to NbS implementation, with limited scalability and long-term sustainability.

Addressing the policy gap requires the development of a comprehensive NbS policy framework that integrates NbS principles into existing environmental, development, and climate change strategies. This framework should provide clear guidance on NbS planning, financing, implementation, and monitoring, while also fostering collaboration and coordination among relevant stakeholders. Moreover, enhancing institutional capacity and raising awareness about the benefits of NbS are essential for mainstreaming NbS into policy and practice in Bangladesh.

The National Forest Policy 2016, Coastal Zone Policy 2005, and National Water Policy 1999 in Bangladesh appear to be outdated and in need of revision. Given the increasing adoption of Nature-based Solutions (NbS) across various regions of the country, it is essential to integrate these approaches into national policies. Updating these frameworks will help address environmental challenges more effectively while promoting sustainable development and climate resilience.

Regulatory Issues

For the urban local level, there are several regulatory instruments that provide municipalities with the opportunities to identify the areas for ensuring NbS. Almost all the municipalities have Master Plan which can be used as the strategic instrument for NbS. Other instruments that can be used to implement

NbS are the waterbody conservation act, National Building Code and Building Construction Rules.

The following section presents the sectoral regulations and highlights the key regulatory options for implementation of NbS at urban levels.

Building Construction Rules, 1996 (Act 112 of 1996)

- Width of Road and Distance of Building Construction Provisions [Section-8];
- For Construction of Any Building, prescribed land use in the Existing Master Plan must need to follow [Section 10(1)];
- Building Height: In accordance with the width of the road and the open space in front of the building from the edge of the road [Section- 12];

Environmental Conservation Rules, 2023

- Industrial units and projects are categorised into four major types in order to ensure sustainable environmental development. These types are (a) Green (b) Yellow (c) Orange and (d) Red, [section5]
- Environmental Clearance Certificate shall be issued to all existing industrial units and projects and to all proposed industrial units and projects falling in the Green Category [Section-8];
- For industrial units and projects falling in the Yellow, Orange and Red categories, firstly a Location Clearance Certificate and thereafter

an Environmental Clearance Certificate shall be issued as per other guidance of the rules as applicable [Section-9];

Natural Water Reservoir Conservation Act, 2000

- Garden means the places indicated as park or nursery or as open space in the Master Plan Prepared by the Municipality/City Corporation [section 2(A)];
- Open Space means the places indicated as open space, or being used as Eidgha as indicated in the Master Plan Prepared by the municipality/ City Corporation or through government notification [section 2(B)];
- Playground means the places indicated as open space used for playground in the Master Plan Prepared by the municipality/City Corporation or through government notification [section 2(D)];
- Natural Waterbodies means the places such as river, khal, beel, dighi, fountain, or water bodies indicated in the Master Plan, or the places indicated as flow zones demarked in the Master plan prepared by the municipality/City Corporation [section 2(F)];
- The land use class such as Garden, Open Space, Playground, water bodies indicated in the master plan cannot be changed or leased out for other use [section 5];

Local Government (Municipalities) Act, 2009

- Declaration of Water Bodies: With the prior consent of appropriate authority, the Municipality will declare the sources of water other than owned by government like fountain, river, pond, dighi or part of any of these as government owned waterbodies [Section 16 (1) of Second Schedule].
- Declaration of Fish Habitation: With the prior of government, Municipality will declare waterbodies (such as Government Fishponds and Beels) recognised as sources of fish [Section 18 of Second Schedule]
- Land Development Project: None of the landowner of the Municipality area is allowed to develop land or construct or reconstruct any building other than the recommended use in the Approved (by Appropriate Authority) Master Plan as per section 32 of this Act [Section 33(1) of Second Schedule].
- Ensure Existence of Water Bodies/ Sources: A municipality may, and if so, required by the Prescribed Authority shall, take such steps regarding the excavation and re-excavation of tanks and the reclamation of low-lying areas as it thinks fit, or the Prescribed Authority directs [Section- 55].

Bangladesh National Building Code, 2020

- Building permits within the Municipality Jurisdiction shall comprise of (1) Land Use Certificate; (2) Large and Specialised Project Permits; (3) Building Permit; and (4) Occupancy Certificate. Permit of all or any of these may be necessary for a particular municipality [section 3.2].
- Land Use Classification [section 1.3]: A municipality shall be brought under a structure planning framework including detailed area plan to implement the intended land use pattern, transportation and maintaining environmental conditions proposed by the municipality. This land use classification may divide an area into zones such as residential, commercial, industrial, storage, Green Park, agricultural land, reserved area etc. or any combination of these. The land use zones shall be shown on the approved master plan and the planning regulation shall clearly state the permitted occupancies, restricted occupancies and conditionally permitted occupancies for each zone. Requirement in this regard shall be incorporated in the building construction byelaws/ rules/regulations valid for the municipality. The Land Use classification must also indicate (a) permitted land use (b) Conditionally permitted land-use and (c) restricted land use in the respective zones indicated in the Master Plan [Section- Appendix-A: planning & Development Control – A2].

3.3 Funding and Financing Mechanisms

In Bangladesh, the primary financing for NbS investments predominantly stems from public budgets and international funding sources such as multilateral development agencies and climate funds. However, there is a significant opportunity to augment these resources by engaging the private sector as an additional funding source, thereby alleviating pressure on public budgets for environmental initiatives. To encourage private sector involvement, it is imperative to elucidate the benefits that private actors can derive from NbS implementation. Particularly, industries reliant on natural resources, such as water utilities and beverage companies, are inclined to invest in NbS to safeguard against escalating climate risks and ensure resource sustainability. Moreover, financial and regulatory mechanisms instituted by public authorities play a pivotal role in incentivising private investment in NbS. Corporate environmental responsibility initiatives also serve as a motivating factor for private entities to invest in NbS projects. Although these drivers exist in Bangladesh, there is a critical need for regulatory frameworks and financial incentives to effectively channel private sector investments towards NbS initiatives.

3.3.1 Key elements of the enabling environment of NbS funding

In Bangladesh, the commitment to addressing climate change impacts through substantial investments, totalling Tk 25,000 crore annually (close to US\$3 billion), underscores the government's recognition of the urgency and severity of the issue (Haque *et al.* 2021). However, despite this considerable financial allocation, international

support for climate change adaptation (CCA) remains inadequately low, contributing merely about 20% of the required investments (Haque *et al.* 2021). This glaring disparity between available funding and the estimated overall adaptation costs pegged at US\$42 billion for the period of 2015-2030 according to the Nationally Determined Contribution (NDC), accentuates the challenges faced in financing climate resilience across various sectors of Bangladesh's economy.



Photo 71: Aerial View of National Botanical Garden, Mirpur, Dhaka

Sirajganj City Awarded with Funding for NbS Implementation²

The city of Sirajganj is going to furnish the city's riverbanks by creating a green corridor that will rehabilitate, restore and enhance biodiversity around the river locally known as Kata Khal. The United Nations Environment Programme (UNEP) is funding 100,000 USD for a project in this regard.

Objective

UNEP's Generation Restoration project will run for three years from 2023 until 2025 and aims to implement a package of measures to address selected political, technical and financial challenges to promote restoration at scale, particularly in urban areas. This initiative (1) Encourages and advocates in favour of public and private investment in ecosystem restoration and decent work creation through Nature-based Solutions (NbS) and (2) Empower city stakeholders (governments, private sector, CBOs/ NGOs at all levels) across the globe to replicate and upscale ecosystem restoration initiatives.

Actions

An area of 50 acres on the bank of Kata Khal is selected for the pilot initiatives. This area is identified in the City Master Plan as a green-protected area.

The municipality is planning to plant native plants in the identified area for ecosystem management in a better way. This is going to be a real-scale example of NbS to be implemented in the Municipality of Bangladesh.

Expected NbS benefits

- Better protection and regeneration of green areas
- Improve connectivity and functionality of green and blue infrastructures
- Improve air quality
- Increase accessibility to green open spaces

² <https://www.unep.org/technical-highlight/world-cities-day-unep-announces-19-cities-restore-natures-rightful-place-urban>

Box 2: Provision of NbS Project Can Ensure Environmental Resilience



Photo 72: A view of Katakhlī Khal, Sirajganj

Decision-makers in Bangladesh often grapple with a lack of awareness regarding NbS costs and unique characteristics, complicating the design of effective funding mechanisms. This knowledge gap, exacerbated by data shortages, poses a significant barrier to the prioritisation and allocation of resources towards NbS initiatives, as highlighted in reports from the Prime Minister's Office (2021).

Municipal budgets, pivotal for financing NbS projects at the local level, confront constraints stemming from a decline in revenues relative to Gross Domestic Product (GDP). This downward trend in municipal revenues has prompted increased reliance on public sales, including land sales that often involve areas with existing or potential ecosystem services. Despite efforts to diversify revenue sources, such as local business taxes and property taxes, municipal budgets remain insufficient to meet the burgeoning demand for NbS investments (OECD/UCLG 2022).

3.3.2 Options for NbS Funding

NbS implementation requires significant financial investments, using different types of assets, capital and economic instruments. The required funding for NbS implementation needs a comprehensive analysis at national and local levels. However, based on the case studies, it is understood that most of the initiatives that poses NbS components were implemented from the funds allocated in the development budget. The funding gaps that may appear can only be closed tapping to the sources,

especially from the private sector, as public funding may remain limited. The following are the potential options of fundings for NbS.

Private sector funding for NbS

The private sector consists of many organisations and individuals with very different motivations and expectations when investing in NbS. However, the private sector has the desire to receive returns either in the form of social or environmental impacts. Usually, return expectations concern both financial and other impacts. The initiative by the Pramanik family in Santahar Municipality for example tends to focus on social and environmental benefits.

Several initiatives by private companies are seen in different municipalities across the country. For example, a private park named Mozaffer Garden in Satkhira Municipality is contributing to environmental improvement significantly. If this type of initiative is encouraged, private investors will come forward for NbS-oriented investment gradually.

Domestic and non-government funding

The NbS-related activities in the case study cities are funded by various financial resources. Most of the projects are funded by the government, via bilateral technical and financial cooperation, multilateral funds, and private sectors (Please see chapter 2 for Case Studies). The national Botanical Garden and Ramna Park are funded via domestic funding. Some programs are supported by blended

funding where the initial activity was financed by donors and later, by private sectors.

Based on the Sustainable Finance Initiative, many of the agencies have made a strong commitment to ensure that their financial lending supports sustainable business activities to reduce impact on natural capital. For example, corporate business entities like Grameen Phone took several initiatives for tree plantation by the roadsides while the international NGOs such as the BRAC has taken several such programs through their urban development program.

Bi- and multilateral development cooperation

Technical and financial development cooperation play an essential role in creating the enabling conditions for financing NbS as well as upscaling.

GLZ for example is supporting the mainstreaming of climate change adaptation in development planning through its six city Climate -based Adaptation projects. Similarly, the Asian Development Bank has its several climate-resilient programs through the Local Government Engineering Department for ensuring nature-based solutions in secondary cities and municipalities.



Photo 73 : Aerial View of National Botanical Garden, Mirpur, Dhaka

NbS-related investments by multilateral bodies have been difficult to track as they may have fallen under different categories of investments. However, the situation is expected to change, as at COP26, a coalition of 10 multilateral development banks (MDBs) made a strong commitment to further mainstream nature into their policies, investments, and operations.

Private Sector Investment

- **Public-Private Partnerships (PPPs):** Collaboration between governments and private entities can help finance and implement NbS. Although in Bangladesh there is a dedicated authority for PPP to deal with specific partnership. Currently PPP has been applied in the areas of Transport (e.g. Port, Airport, Highway, Railway, Bridge); Energy (e.g. Power Plants, Transmission Lines); Civil Accommodation (e.g. Economic Zones, Public Buildings, Convention Centres, Sports Facilities, Commercial Development IT infrastructure and Agriculture etc. Although there is no project so far on NbS, but municipalities can explore this option for implementation NbS through PPP.
- **Corporate Social Responsibility (CSR) & ESG Investments:** Companies investing in sustainability can fund NbS as part of their ESG (Environmental, Social, and Governance) strategies. Several Cities in Bangladesh has taken initiatives for engaging CSR for NbS implementation. For example, Rajshahi City

Corporation got funding from different private sector agencies for roadside and road island plantation. Similar partnerships can be explored by the municipalities in their respective cases.

Community & Non-Profit Funding

- **Crowdfunding & Community Initiatives:** Local groups, NGOs, and individuals can raise funds for specific NbS projects through crowdfunding platforms.
- **Cooperative & Participatory Financing:** Local cooperatives can pool resources for urban green spaces and ecosystem restoration.

3.4 Technical Capacity

In Bangladesh, the integration of NbS faces significant challenges due to limited technical capacities within municipal and local organisations. This issue is largely attributed to the small size and limited resources of many local authorities. This section will explore the essential elements of existing technical capacities, key constraints, and recommendations to enhance these capacities and promote the effective adoption of NbS in Bangladesh.

3.4.1 Key elements for effective capacity building

Effective technical capacity building for NbS in Bangladesh requires several crucial elements.

1. **Effective data management:** It is essential to establish centralised and high-quality data repositories that can improve the accuracy and accessibility of environmental data. For example, creating a comprehensive digital map of mangrove forests along the Sundarbans could provide valuable insights for conservation efforts and management (Islam *et al.* 2018).
2. **Capacity-building initiatives:** Capacity-building initiatives are also critical, including structured training programs on NbS methodologies, monitoring, and evaluation. Training local government officials and NGOs on implementing urban green infrastructure could help integrate NbS into city planning more effectively.
3. **Knowledge-sharing and awareness raising:** To address these constraints, knowledge-sharing and awareness raising are crucial elements for building technical capacity. Effective knowledge transfer can significantly enhance the ability of municipalities to implement NbS successfully. In Bangladesh, initiatives such as the development of community-based green spaces and urban wetlands in Sylhet offer valuable lessons for other cities. These projects serve as practical examples of how NbS can address local environmental issues, such as flood management and biodiversity enhancement (Chowdhury 2023). Promoting such successful examples through workshops, seminars, and online platforms helps less

experienced municipalities learn from existing models and integrate similar solutions into their own planning processes.

4. **Establishing knowledge-sharing platforms:** Finally, establishing robust knowledge-sharing platforms is essential for enhancing technical capacity. Online platforms and networks that facilitate the exchange of experiences and best practices among municipalities can drive progress in NbS implementation. In Bangladesh, platforms such as the BRAC Urban Development Program offer opportunities for municipalities to share insights and learn from successful projects (BRAC 2022). Additionally, the Urban Resilience Platform focuses on fostering knowledge transfer and collaboration, helping cities connect with experts and other municipalities to improve their NbS strategies (Sarker 2022). These platforms play a critical role in building a collaborative environment and advancing NbS practices across the country.

3.4.2 Key constraints

1. **Knowledge and expertise gaps:** There is a significant disparity in the availability of NbS expertise across different municipalities. Small towns and municipalities often lack the necessary knowledge and skills to design and implement NbS effectively. The result is that these municipalities may either forego NbS projects or face higher costs due to the need

for external consultancy. There is a shortage of trained professionals with a deep understanding of NbS principles and techniques in Bangladesh.

2. Limited access to information and training:

There is a dearth of targeted training programs and educational resources on NbS for professionals and municipal employees. Although there are some efforts to integrate NbS into academic curricula and professional training, these initiatives are fragmented and lack coordination.

3. Data accessibility and management: In Bangladesh, the availability and accessibility of critical planning data for NbS are limited. Key information, such as local environmental conditions, climate projections, and cost data, is often not freely accessible or is scattered across various organisations. This hampers effective planning and implementation of NbS.

4. Absence of unified guidelines: There are currently no comprehensive national guidelines or indicators for monitoring NbS projects. This absence leads to inconsistencies in data collection, project management, and performance evaluation, affecting the quality and sustainability of NbS interventions.

Recommendations

The analysis of the barriers to NbS policy implementation and the research carried out to identify to move the NbS agenda forward.

Policymakers can play an important role in enabling the conditions to overcome the key issues that can expedite upscaling NbS. The following are the recommendations for policymakers, considering the main challenges and barriers identified.

Invest in increasing knowledge and awareness raising on NbS successful practice by Local Government Bodies

Urban NbS initiatives are relatively new and limited in municipal and urban areas despite increasing urbanisation. Successful urban governance focusing on NbS, in urban areas depends on the awareness and understanding of NbS among their leadership, officials, and stakeholders. Capacity-building initiatives targeting the officials at urban Local Government bodies are essential to plan, design, implement, and monitor NbS projects. This will also help the officials to incorporate the knowledge base into urban development strategies and location-specific plans through participatory approaches.

In many cases, the concept of NbS in urban development strategies is incorporated through the city Master Plans. However, these are not successfully implemented due to a lack of proper dissemination and acceptance by the local communities. It is important to take people's opinions and incorporate them while identifying potential water bodies or green areas during the preparation of the Master Plan. Therefore, community participation is essential for the successful implementation of NbS in urban centres and municipalities.

Supporting targeted Capacity-building initiatives and sharing of NbS best practices

Developing and disseminating clear guidelines and indicators for NbS projects is essential. This should include methodologies for project planning, implementation, monitoring, and evaluation, tailored to the local context and available resources. Initiatives for sharing success stories and practical experiences of NbS implementation in different circumstances also can help increase the inclusion of NbS into national plans, policies and strategies.

Ensure financing resources for NbS interventions

Government and development partners can offer subsidies and grants to support NbS projects. For example, funding could be provided for green infrastructure projects like urban parks and water

body conservation aiming to reduce urban heat and manage stormwater. Such financial support can make these projects more feasible and attractive for local governments.

Collaborative and Sector-Specific Approaches

Government policies can include incentives for the private sector to invest in NbS. For example, financial incentives could be offered to companies that contribute to or develop green infrastructure projects. Businesses can invest in NbS as part of their Corporate Social Responsibility (CSR) efforts. This could include funding green infrastructure, supporting reforestation projects, or participating in conservation programs. These investments not only benefit the environment but also enhance the company's public image and potentially offer financial returns.

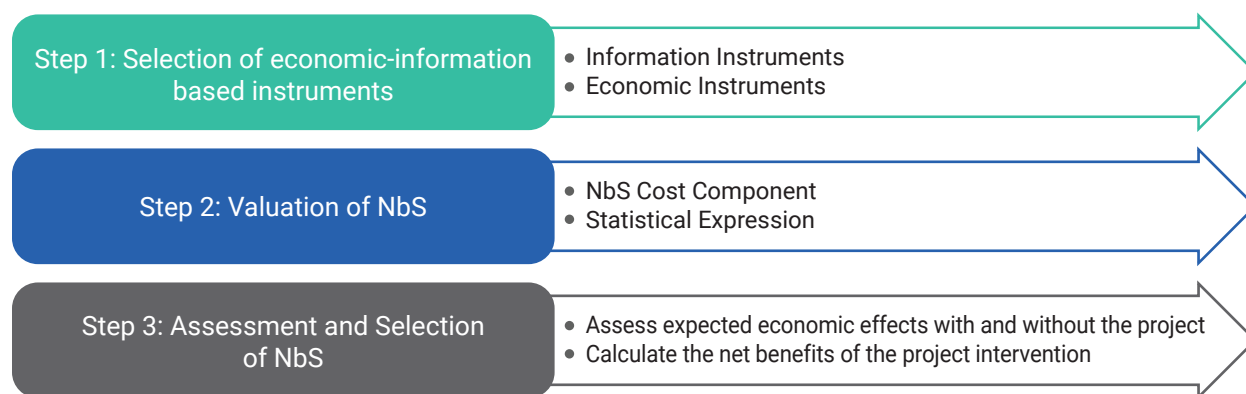
CHAPTER 04

**COST-BENEFIT
ASSESSMENT
FOR NBS**

Cost-Benefit Analysis (CBA) has become a crucial tool for assessing Nature-based Solutions (NbS) projects, particularly in comparison to conventional grey infrastructure. A careful implementation of CBA facilitates the monetary valuation of socio-economic and environmental benefits and costs alongside economic returns of NbS. While various methodologies exist for evaluating a project's performance, a simplified framework of CBA is especially important for Bangladesh to enhance communication with project planners and policymakers.

4.1 Framework for assessing NbS projects in Bangladesh

Drawing from the types of NbS discussed in previous chapters, a general framework is proposed here to evaluate the benefits of NbS and the associated costs. Diagram 4 shows a breakdown overview of the CBA processes.

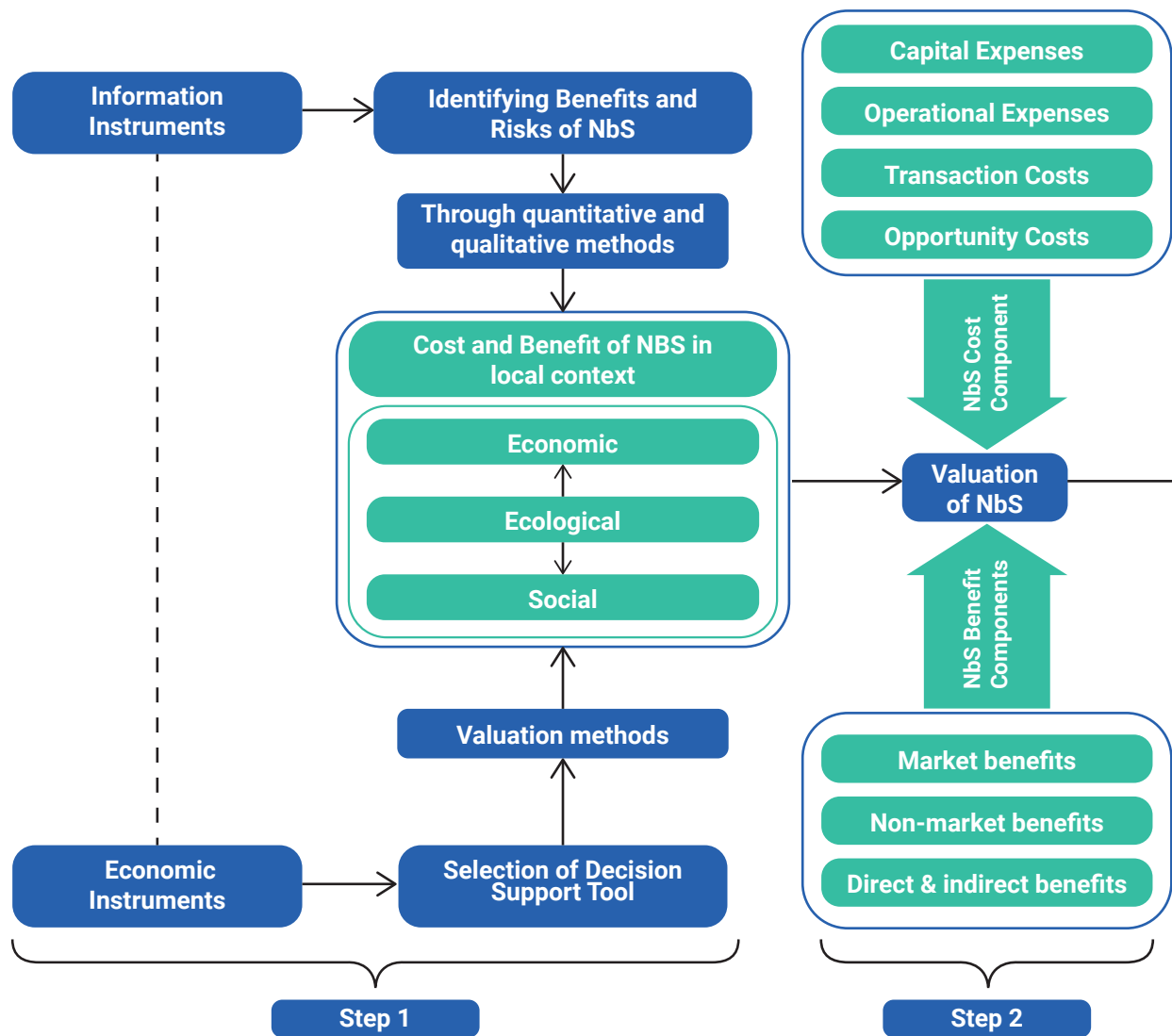


Source: Authors' compilation,

Diagram 4: An Overview of CBA Processes

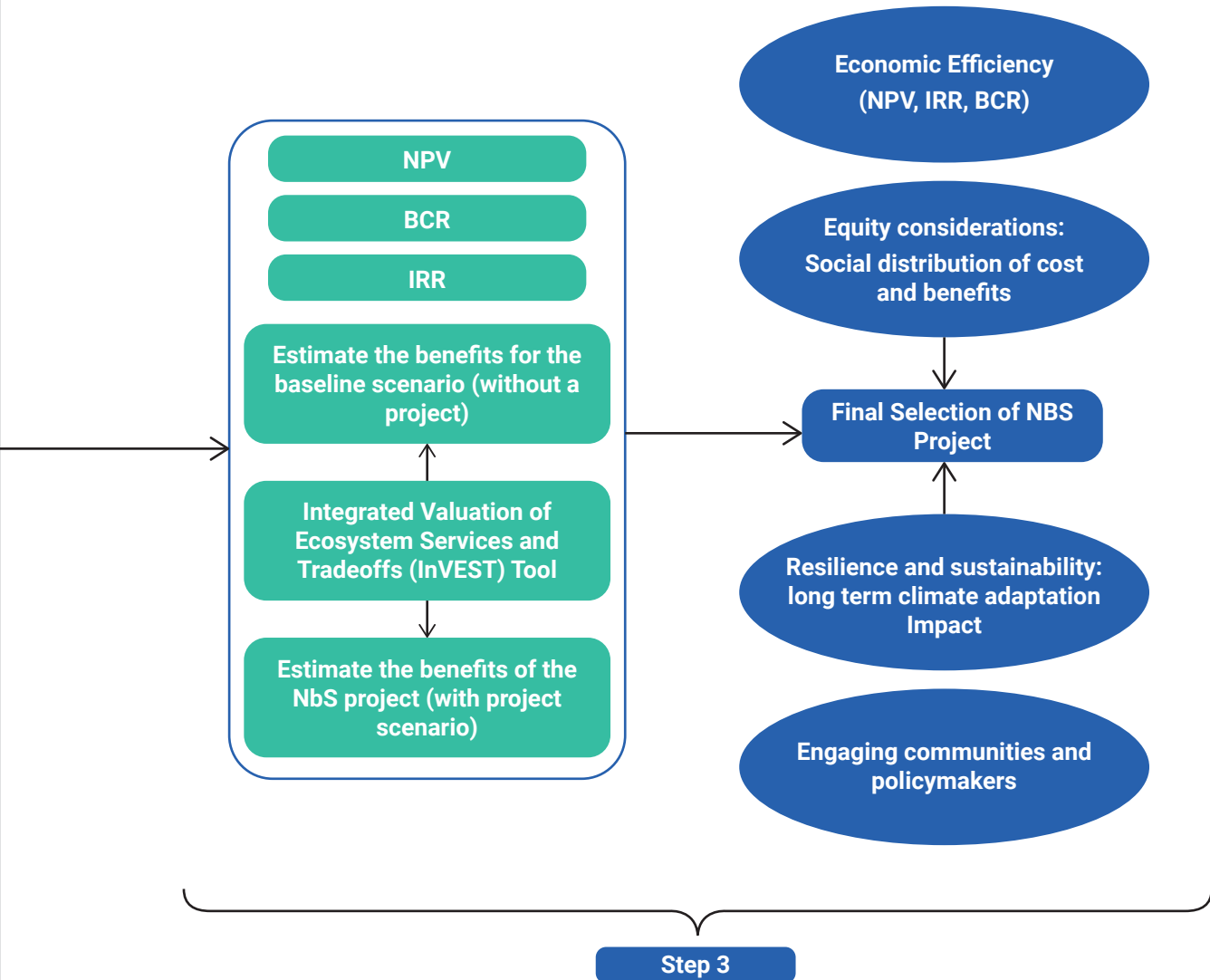
A General framework for the CBA of NbS in Bangladesh

Our proposed framework offers a structured method for evaluating the economic, environmental, and social benefits of nature-based solutions (NbS) projects while accounting for the associated costs and risks. It consists of three steps: selecting Information-Economic based instruments, valuation of NbS, and assessing and selecting the most suitable NbS. The proposed framework for conducting a cost-benefit analysis (CBA) of nature-based solutions (NbS) is illustrated in Diagram 5.



Source: Author's illustration based on Zanten *et al.* (2023), Bridges *et al.* (2021), Wishart *et al.* (2021), Neugarten *et al.* (2018), OECD (2018), Beck and Lange (2016), and GFDRR (2014)

Diagram 5: A General Framework for the Cost Benefit Analysis (CBA) to Nature Based Solution (NbS) in Bangladesh



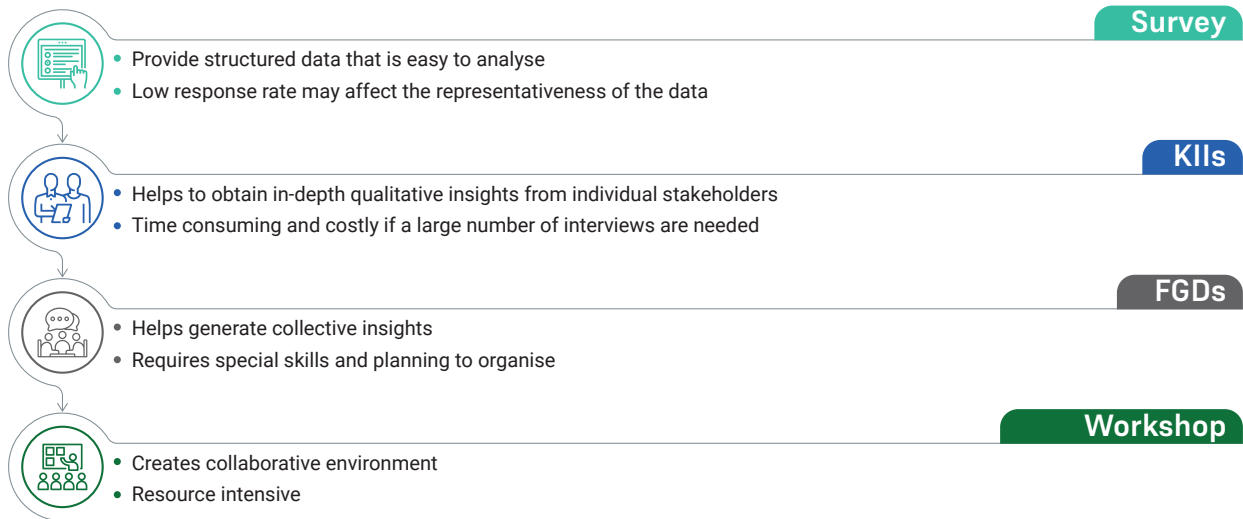
Step 1: Selection of information and economic instruments

The initial step in the proposed framework involves selecting information and economic instruments. This framework aims to identify both the direct and indirect benefits and costs of NbSs and determine appropriate economic tools to quantify the net benefits in monetary terms. In the context of Bangladesh, a combination of economic and informational instruments is particularly suitable for developing a decision-support framework to assess NbS at the local level.

The selection of information instruments can be divided into two key components. First, it is necessary to determine the type of information required, followed by the selection of appropriate methods for data collection. Each NbS may have diverse technical, economic, social, ecological, and environmental impacts, all of which must be considered. For each impact category, key indicators should be identified to guide data collection. The second component of selecting information instruments involves determining suitable data collection methods. Engaging with local stakeholders throughout the process of project identification and development is crucial

to ensuring that NbS initiatives are relevant and effective. This is particularly important as NbS are often designed to address specific local conditions (Sowińska-Świerkosz and García 2022, Albert *et al.* 2021, Seddon *et al.* 2020). Environmental challenges, socio-economic conditions, and ecological factors vary across regions. For instance, in coastal areas, NbS may primarily focus on flood protection, inundation management, and shoreline stabilization (Inácio *et al.* 2020; Pontee *et al.* 2016), whereas, in urban areas, they may be implemented to reduce air pollution and mitigate the urban heat island effect (Simperler *et al.* 2020). Therefore, involving local communities and other stakeholders in identifying the benefits and costs of NbS is essential.

A variety of methods can be employed to collect data related to NbS (Diagram 6). These include surveys at the individual, household, and community levels, interviews, choice experiments, case studies, key informant interviews (KIIs), focus group discussions (FGDs), and consultations with local stakeholders and communities. The Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) tool, developed by the Natural Capital Project, can be used for non-market valuation of NbS impacts on ecosystems.



Source: Author's illustration

Diagram 6: Methodological Approaches to Identify Cost and Benefit Related to NbS

To conduct a comprehensive CBA of any NbS, it is essential to account for all direct and indirect costs and benefits. Evaluating these costs and benefits requires the use of various valuation methods. Therefore, selecting economic instruments for CBA involves incorporating different valuation approaches, including market-based methods (e.g., market price assessment, ecosystem valuation, damage cost approach, job creation value, and avoided cost method), revealed preference methods (e.g., travel cost method and hedonic pricing), and stated preference methods (e.g., willingness to pay and choice experiments). A key consideration in the CBA of NbS is the project's lifespan. All direct and indirect impacts of the NbS should be evaluated

over its full duration, as limiting the time horizon may significantly affect conclusions regarding its effectiveness. Additionally, the selection of CBA economic instruments includes identifying appropriate analytical tools. Several CBA tools, such as Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Internal Rate of Return (IRR), offer distinct advantages and are selected based on the specific characteristics of the NbS under evaluation.

Step 2: Valuation of NbS

This section outlines the process of evaluating the costs and benefits of NbSs and presents a project evaluation checklist to assess their economic feasibility. The primary objective is to quantify the

direct and indirect impacts of NbS using market and non-market valuation approaches identified in Step 1, thereby supporting informed decision-making. Market valuation methods include ecosystem service valuation, the damage cost approach, hedonic pricing, and the travel cost method. Non-market valuation techniques encompass the Contingent Valuation Method, Choice Experiment, Benefit Transfer Method, and the Avoided Cost Method.

NbS cost components include Capital Expenditure (CAPEX), Operational Expenditure (OPEX), Transaction Costs, and Opportunity Costs. Data sources for these valuations may include the Bangladesh Meteorological Department (BMD), the Ministry of Disaster Management and Relief (MoDMR), survey data, NASA, real-time data such as the Air Quality Index (AQI), and relevant government agencies. A summary of these cost components is provided in Table 3.

Table 3: An Overview of Cost Component for Valuation of NbS

Definition	Cost Component	Benefit	Drawback
CAPEX represents the initial investments or one-time costs incurred during the design, construction, and implementation of NbS projects.	CAPEX may involve costs related to activities such as reforestation, wetland restoration, or the development of green infrastructure, including bioswales, urban forests, or permeable pavements.	Analysing CAPEX is essential for understanding the upfront financial requirements of implementing NbS solutions (Ghafourian <i>et al.</i> 2021).	Although these initial costs can be high, they may be offset by long-term benefits, such as lower levels of flood risks, reduced damages and losses, or increased biodiversity.
Operational Expenditure (OPEX) refers to the ongoing or recurring costs required for the operation, maintenance, and monitoring of nature-based solutions (NbS) over time.	OPEX may include activities such as maintaining restored ecosystems (e.g., periodic replanting, controlling invasive species), monitoring ecological health, and ensuring the continued functionality of green infrastructure (e.g., cleaning bioswales or maintaining urban green spaces).	A comprehensive assessment of OPEX ensures that financial planning accounts for the entire lifecycle of the NbS.	While NbS often have lower long-term OPEX compared to traditional "grey" infrastructure (e.g., concrete flood barriers), regular maintenance is crucial for sustaining the ecosystem services provided by these solutions.

Definition	Cost Component	Benefit	Drawback
Transaction costs arise from the coordination, planning, and negotiation efforts involved in implementing NbS, especially in multi-stakeholder contexts (Malekpour <i>et al.</i> 2021).	Transaction costs may include legal fees for securing land rights, administrative costs for coordinating with local governments and communities, and expenses related to stakeholder consultations and conflict resolution.	Proper accounting for these costs is important to avoid underestimating the overall financial commitment.	NbS projects often involve collaboration among diverse stakeholders such as governments, private sectors, and local communities, leading to higher transaction costs due to the complexity of negotiations and the time required to reach agreements.
Opportunity cost refers to the potential benefits or returns that are sacrificed when choosing one investment or project over another.	The opportunity cost may be the potential income that could have been generated from using the land for agriculture or commercial development.	Opportunity costs are a critical factor in the decision-making process for NbS, particularly in areas where land is scarce or highly valuable.	While NbS can provide long-term ecosystem services and socio-economic benefits (e.g., flood mitigation, carbon sequestration, improved public health), these benefits must be weighed against alternative uses of resources to ensure the most efficient and sustainable solution is selected.

Source: Authors' compilation.

Beyond tangible costs and benefits, NbS also generate intangible benefits such as biodiversity enhancement, carbon sequestration, cultural and recreational value, and community resilience to climate change (Viti *et al.* 2022). Various valuation methods capture these aspects, including market-based, revealed preference, stated preference, and ecosystem services valuation approaches. Market-based methods derive value from actual

market prices, making them suitable for resources directly traded, such as timber or fisheries. Revealed preference methods infer value from observed behaviours, providing reliable data but being limited to contexts where such behaviours occur. Stated preference methods estimate willingness to pay for non-market goods, such as biodiversity conservation or air quality improvement, though they rely on hypothetical scenarios that may introduce biases

(Lucchitta and Croci 2021). Ecosystem services valuation frameworks, such as Total Economic Value (TEV) and natural capital accounting, offer a comprehensive assessment by integrating direct, indirect, and non-use values. However, these methods require extensive ecological and economic

data and may pose challenges in scalability and accuracy.

To ensure a robust evaluation of NbS, key metrics should be systematically reviewed by relevant officials. These indicators, which aid in decision-making, are summarized in Table 4.

Table 4: NbS Project Evaluation Checklist

Key Metrics	Criterion
Project Alignment and Feasibility indicators	• Alignment with national policies and plans • Feasibility assessment (technical, financial, social, environmental) • Legal and regulatory compliance • Stakeholder engagement and support
Ecological indicators	• Biodiversity conservation • Ecosystem Services Enhancement (e.g., water quality, carbon sequestration, flood mitigation) • Habitat restoration • Resilience to climate change
Socioeconomic indicators	• Job creation and economic development • Community empowerment and social inclusion • Improved livelihoods • Health and well-being
Financial and Economic Considerations	• Cost-Benefit Analysis • Financial Sustainability • Return on Investment
Additional Considerations	• Identify potential risks and develop mitigation strategies • Ensure the project aligns with long-term sustainability goals • Consider the potential for scaling up or replicating the project • Incorporate traditional knowledge and practices where appropriate

Source: Authors’ compilation.

Step 3: Assessment and Selection of NbS

Once all necessary data for a comprehensive CBA of a NbS has been gathered and its costs and benefits have been estimated over its lifespan, the final step involves evaluating and selecting the most suitable NbS intervention. This phase assesses the benefits of NbS by comparing a baseline scenario—where no NbS intervention is implemented—with the project scenario, following the guidelines established by the Global Facility for Disaster Reduction and Recovery (GFDRR) (Bridges *et al.* 2021, Beck and Lange 2016). By quantifying costs and benefits for both scenarios, the net economic impact is determined, facilitating informed decision-making.

The baseline scenario represents conditions in which the natural or built environment remains unchanged without NbS implementation (Van Zanten *et al.* 2023, Calliari *et al.* 2019). It requires identifying climate-induced hazards—such as flooding, erosion, drought, storms, and heatwaves—relevant to the specific geographical area. Advanced modelling techniques, such as the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST), can simulate hazard intensity and behavior using historical data. These models help assess the severity of risks over time in the absence of intervention. Beyond mitigating climate-related hazards, NbS projects often generate additional co-benefits, including enhanced

biodiversity, ecosystem services, and social well-being. These co-benefits should be incorporated into the overall evaluation, as they significantly contribute to the project's long-term value.

The economic performance of NbS projects is typically assessed using three key CBA metrics: Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Internal Rate of Return (IRR) (OECD 2018). NPV represents the difference between the present value of benefits and costs, with a positive NPV indicating net societal benefits. BCR measures the ratio of benefits to costs, where a value greater than 1 suggests that benefits exceed costs. IRR identifies the discount rate at which NPV equals zero, signalling whether the project's returns surpass the opportunity cost of alternative investments. The choice of metric depends on the project's objectives: NPV is suitable for estimating absolute net monetary benefits, BCR helps prioritise resource allocation when comparing projects of different scales, and IRR is useful for comparing NbS investments against financial alternatives.

Additionally, a sensitivity analysis is essential to examine how variations in key parameters affect the assessment of NbS. Two types of sensitivity analyses can be conducted: (i) Partial Sensitivity Analysis, which assesses how changes in a single parameter impact the results, and (ii) Best-Worst Case Analysis, which assigns extreme values to

key variables to determine whether NPV remains positive across different scenarios. If the NPV remains consistently positive, confidence in the economic viability of the NbS increases. Sensitivity analysis is particularly important for long-term NbS projects, uncertain costs and benefits, policy or market risks, or substantial variability in projected impacts.

4.2 The Application of the Framework to NbS in Bangladesh

The NbS compendium for Bangladesh addresses seven types of natural and climate-induced hazards. For each hazard type, several NbS projects are outlined in Chapter 2. To evaluate the socioeconomic feasibility of these projects, Table 5 presents the relevant steps of our proposed cost-benefit analysis (CBA) framework applicable to each type of NbS. In the following discussion, we will explore the application of this framework to selected NbS projects from the compendium.



Photo 74 : Aerial View of Ramna Park, Dhaka



Table 5: Application of NbS Framework to NbS Projects in Bangladesh

NbS Compendium	Selected Example	Application of Framework			
		Step 1	Step 2	Step 3	
NbS for Floods and Waterlogging	Dhanmondi Lake, Dhanmondi, Dhaka	✓	✓	✓	
NbS for Heat Risks (Urban Heat Island, Heat waves, extreme heat)	Ramna Park, Dhaka	✓	✓	-	
	Kolpona-Talaimari river embankment plantation scheme, Rajshahi City	✓	-	-	
	Miyawaki Forest, University of Chittagong, Chattogram	-	✓	✓	
	Gol Talab, Old Dhaka	-	-	-	
	Karupannya Rangpur Ltd, Rangpur	✓	-	✓	
NbS for Cyclonic Winds, Storm Surges, and Coastal/Tidal Floods	Ecological Engineering with Oyster for Coastal Resilience	✓	✓	Partial	
NbS for Salinity Intrusion	Water Treatment Plant, Mongla		✓	-	
NbS for Landslides and Erosion	Hill Retention Project Utilising at Pahartoli using Geotechnology	✓	✓	✓	
NbS Addressing Other Urban Challenges	Pond Restoration Projects in Rajshahi City	✓	-	-	
	Neighbourhood Park at Sector 13, Uttara	✓	✓	-	
	Urban River Spaces, Jhenaidah	✓	✓	-	
	Boughat, Santahar Union, Adamdighi Upazila, Bogura	-	✓	-	

Source: Author's compilation.

	Application of InVEST for NbS Assessment	Addressed Risks					Benefits and Co-Benefits										
		Flood Risks	Heat Stress	Coastal Risks	Soil Pollution	Land Slides	Flood Risks Reduction	Heat Stress Reduction	Coastal Risks Reduction	Soil Pollution Reduction	Land Slides Reduction	Local Economies and Job Creation	Health	Education	Biodiversity	Social Interaction	Cultural
	√	√	-	-	-	-	√	-	-	-	-	-	√	-	√	√	√
	√		√	-	-	-	-	√	-	-	-	-	√	-	√	√	√
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	√	√	√	-	-	-	√	√	-	-	-	-	-	-	√	-	√

The application of the proposed CBA framework to the selected examples is shown in the table above. Upon detailed evaluation, some projects from the compendium do not fully adhere to the processes and standards established by the GFDRR and IUCN for CBA analysis. Each NbS project in the table outlines the economic, social, and environmental benefits, along with the challenges encountered during implementation. The assessment of most of these projects can be conducted by setting different project scenarios using InVEST model established by IUCN. Some of these projects such as Kolpona-Talaimari river embankment plantation scheme, Rajshahi City; Gol Talab, Old Dhaka; and Family dug well, Nilphamari not be assessed using the InVEST tool since these projects need to have more spatial data in tabular format. The application of InVEST will require appropriate spatial data to assess the different scenarios of these projects.

Adjustment to CBA Framework for specific NbS

In this section, an exercise in adjusting and implementing the CBA framework will be conducted

using a specific NbS example from Bangladesh. The "Ecological Engineering with Oyster for Coastal Resilience," a bio-engineering solution, will be used for this demonstration.

Step 1: Identification of Benefits and Co-Benefits

The first step of the framework is to identify the benefits and co-benefits of the selected NbS project. The benefits achieved following the implementation of the project "Ecological Engineering with Oyster for Coastal Resilience" encompass environmental, social, and economic aspects. However, quantifying these benefits in monetary terms presents challenges due to a lack of real data. To address this challenge, it is recommended that these benefits (Table 6) be identified through stakeholder consultations, employing various methodologies to collect primary data and qualitative insights, as previously discussed. Table 6 outlines the identified benefits and the necessary adjustments. Table 6: Identified Benefits and Adjustment Required

Table 6: Identified Benefits and Adjustment Required

Benefit Type	Identified Benefit	Adjustment
Environmental	Improving water quality, providing nutrients, and protecting natural coastal area	Need to use scientific methods to quantify these benefits into monetary value
Social	Safeguard homes and properties, entrepreneurship development, preventing loss and damage to properties	Needs to quantify these benefits using primary data collection methods
Economic	Increased fisheries production, crab farming, and oyster farming.	It needs to express the monetary value of these benefits.

Source: Authors' compilation.

Step 2: Valuation of NbS

For a hypothetical analysis over a specific time horizon of the NbS lifecycle for the project “Ecological Engineering with Oyster for Coastal Resilience” as mentioned in Table 5, the second step is the valuation of identified benefits generated by this NbS project. Considering the project’s time frame, it is also important to determine the periods during which these benefits will be realised. Following this, the present value of all future benefits is calculated using the applicable discount rate (cost of capital).

For example, if the monetary value of the benefit from the project at the time period t is X_t , the lifecycle of the NbS project spans T time periods, and the discount rate is r , then the present value of the total benefits from the project is $\sum_{t=0}^T \left[\frac{X_t}{(1+r)^t} \right]$. After calculating following this process, we express these benefits in monetary values in Table 7 and Table 8.

To conduct the valuation hypothetically, a baseline scenario without the project is also considered to compare and assess the project with or without NbS project.

Table 7: Quantifying the Identified Benefits (with Project)

Benefit Type	Amount in BDT (present value)
Environmental	12,000,000
Social	23,000,000
Economic	30,000,000
Other benefits include job creation, entrepreneurship development, etc.	20,000,000
Total	75,000,000

Source: Authors’ hypothesised benefits.

Table 8: Quantifying the Identified Benefits (without Project)

Benefit Type	Amount in BDT (present value)
Social	23,000,000
Economic	30,000,000
Total	53,000,000

Source: Authors’ hypothesised benefits.

The cost components of Nature-Based Solutions (NbS) encompass capital costs, operational costs, opportunity costs, and transaction costs involved during the project’s lifecycle. Suppose for this NbS project, the present value of all the costs during the span of the project amounts to BDT 24,368,200. We distribute all these costs across the four abovementioned cost categories, as shown in Table 9.

Table 9: Tentative Cost Component of the Project

Cost Type	Amount in BDT (present value)
Capital expense	10,000,000
Operational expense	7,500,000
Opportunity cost	2,500,000
Transaction cost	4,368,200
Total	24,368,200

Source: Authors’ hypothesised benefits.

Step 3: Assessment and Selection of NbS

The final step of this framework is the assessment and selection of NbS. At this step, assessment of the benefits of the selected NbS project “Ecological Engineering with Oyster for Coastal Resilience” takes place by comparing a baseline scenario—where no NbS intervention is implemented, with the project scenario. By quantifying costs and benefits for both scenarios, the net economic impact is determined, facilitating informed decision-making.

Table 10 below presents the net present value of the NbS “Ecological Engineering with Oyster for Coastal Resilience.”

Table 10: Net Present Value of Costs and Benefits (with Project)

Benefits	Present Value
Environmental	12,000,000
Social	23,000,000
Economic	30,000,000
Other benefits include job creation, entrepreneurship development, etc.	20,000,000
Total benefits	75,000,000
Cost	
Capital expense	10,000,000
Operational expense	7,500,000
Opportunity cost	2,500,000
Transaction cost	4,368,200
Total costs	24,368,200
Net benefit (in present value)	50,631,800
BCR	3.08

Source: Authors’ calculations.

Table 11: Net Present Value of Costs and Benefits (without Project)

Benefits	Present Value
Social	23,000,000
Economic	30,000,000
Total benefits	53,000,000
Cost	
Capital expense	10,000,000
Operational expense	7,500,000
Opportunity cost	2,500,000
Transaction cost	4,368,200
Total costs	24,368,200
Net benefit (in present value)	28,631,800
BCR	1.85

Source: Authors' calculations.

By comparing the quantified benefits with the associated costs of implementing the NbS project (with a NbS project scenario) 'Ecological Engineering with Oysters for Coastal Resilience,' a benefit-cost ratio (BCR) of 3.08 is obtained (Table 10). This indicates that for every BDT 1 spent, a return of BDT 3.08 can be expected in the form of environmental, economic, and social benefits. On the other hand, comparing the quantified benefits without a NbS project, a BCR of 1.85 is obtained (Table 11). In this scenario, no environmental and other benefits

were considered since it was not considered an environmental and ecological benefit. This indicates that for every BDT 1 spent, a return of BDT 1.85 can be expected in the form of only economic and social benefits. Hence, we find that, NbS project gives more benefit than a non-NbS project. The reliability of these calculations should also be ensured by considering varying degrees of damage severity that would occur in the absence of NbS, as outlined in the previous sections.



CHAPTER 05

WAY FORWARD

It is essential to create an environment that supports the integration of nature into policy planning and urban development frameworks must be established to integrate Urban Nature-based Solutions (NbS) into traditional development discourses. Raising awareness at all levels, creating a strategic planning document for the city in question, and taking concrete actions to remove obstacles, build capacity, and engage stakeholders are all crucial.

5.1 Roadmap to Enabling Environment for Urban NbS Implementation

1. Strong Policy and Governance Frameworks

Policy Integration: Ensure that NbS is specifically mentioned as a tool for sustainable urban development in urban planning laws, environmental policies, and urban development policies. In order to address issues such as urban heat islands, biodiversity loss, stormwater and flood management, and climate resilience, policies should support nature-based solutions.

Local Government Leadership: By approving pertinent policies, assigning funds, and establishing an institutional framework for their execution with assistance from Bangladesh's Ministry of Local Government, Rural Development, and Cooperatives (MoLGRD&C), local government institutions (City corporations and Municipalities) play a crucial part in facilitating NbS.

Cross-sectoral Collaboration: Coordination among multiple sectors, including public health, transportation, water management, urban planning, and environmental management, is frequently necessary for NbS. Breaking down silos and coordinating efforts can be facilitated by establishing interdepartmental consensus.

Regulatory Support: Compliance with legal frameworks at the local and national levels necessary to permit NbS inclusion. In particular, having a legally binding master plan or city development plan is essential for creating a basis for development planning and control. This can entail reconsidering construction standards, green infrastructure guidelines, or strategic planning papers at the municipal level.

2. Local Ownership and Buy In

Public Funding and Incentives: Municipalities can explore funding mechanisms for NbS awareness through public budgets, climate adaptation funds, or green infrastructure initiatives. Financial incentives such as grants (may be sourced from development partners), subsidies, or tax breaks for private sector actors or implementers who integrate NbS into their projects can help spur investment.

Private Sector Engagement: Promoting public-private partnerships (PPP) can be instrumental in engaging and scaling up NbS interventions and practices. Businesses can invest in NbS as part of their corporate social responsibility (CSR), sustainability strategies, and developers can incorporate nature-based elements into new developments.

3. Capacity Building and Knowledge Sharing

Technical Expertise and Training: It is essential to increase the technical proficiency of engineers, urban planners, architects, and other pertinent professionals at the city corporation and municipality levels. Purposive training, capacity and awareness-building initiatives may sensitise and equip them with contemporary know-how on urban NbS to render effort on how to incorporate NbS into planning and development processes for a better city future.

Research and Data Collection: Urban NbS ought to be supported by reliable data and facts. In order to track and assess NbS's efficacy, comprehend regional ecological conditions, and modify solutions appropriately, cities should source funds for research. The city can also collaborate with academia, national and international research institutions and development agencies in this regard. This entails evaluating biodiversity loss, flood risk, heat island effects, and ecosystem services.

Knowledge Exchange Platforms: Create regional or national networks to help experts and cities that are already using NbS communicate with one another. By exchanging insights from early NbS pilots, other cities can steer clear of typical problems and expand effective solutions. Sharing national- international best practices is important to stay up-to-date and gain motivation for nature-positive development initiatives. Collaborate with financiers, NGOs and environmental groups that have experience carrying out NbS initiatives. These organisations may offer a wealth of information on sustainable urban planning, technical know-how, and the ability to mobilize the community.

4. Public Engagement and Community Involvement

Inclusive Planning Processes: Public involvement is essential to NbS's success. Involve local

communities in the planning and execution of NbS initiatives to guarantee that the solutions address their priorities and requirements. Addressing issues of social equality requires special attention to vulnerable or marginalised groups.

Raising Awareness: Inform people on the advantages of NbS, including enhanced biodiversity, well-being, and air quality. Public support for nature-based solutions can be strengthened through outreach initiatives, community workshops, and public campaigns.

Co-creation of Solutions: Engage local stakeholders and citizens in the co-creation of rain gardens, green roofs, green spaces, and other NbS features. This encourages long-term stewardship of urban nature projects and a sense of ownership.

5. Urban Design and Planning

Strategic Integration into Urban Master Plans: From the beginning, NbS should be integrated into urban master plans and other city development plans. This entails planning cities with permeable surfaces, green corridors, and multipurpose green areas that support social and ecological purposes.

Design for Resilience: Increasing resistance to the effects of climate change, like excessive heat, flooding, and air pollution, should be NbS's main priority. For instance, wetlands or bioswales can

enhance water management and lower the danger of flooding, while trees and green infrastructure can lessen the effects of heat islands.

Phased Implementation: Begin with modest, pilot-scale initiatives that demonstrate NbS potential in particular districts or areas. These can be used as templates for more extensive implementation.

6. Leveraging Technology and Innovation

Green Innovation: Examine cutting-edge, creative NbS solutions that enhance social and environmental results by utilising novel materials or technology (such as permeable pavements, geo-engineering, biophilic architecture, or green roofs). An example of hill-slope management by using bio-engineering to solve landslide issues in Chattogram is a good case outlined in Chapter 2.

Digital Platforms for Planning: GIS (Geographic Information Systems)-based urban planning tools can be used to predict the impacts of NbS interventions, create more effective systems, and pinpoint urban areas that would most benefit from nature-based approaches. Municipality should have created a GIS section within the existing human resource base (urban planner or engineers) to monitor, and evaluate geomorphological, hydrological, ecological and socio-economic changes, and respond accordingly.

5.2 Key Recommendations for Action

An analysis of the barriers to implementing Nature-based Solutions (NbS) policies, along with the research conducted to advance the NbS agenda, highlights the critical role that policymakers can play in creating enabling conditions. By addressing key challenges and obstacles, policymakers can significantly accelerate the scaling-up of NbS. The following recommendations are proposed for policymakers, based on the main challenges and barriers identified.

Developing clear policy guidelines and governance framework to facilitate NbS implementation in the local government.

Urban NbS initiatives are relatively new and limited in municipal and urban areas despite increasing urbanisation. Successful urban governance focusing on NbS, in urban areas depends on the awareness and understanding of NbS among their leadership, officials, and stakeholders. Capacity-building initiatives targeting the officials at urban Local Government bodies are essential to plan, design, implement, and monitor NbS projects. This will also help the officials to incorporate the knowledge base into urban development strategies and location-specific plans through participatory approaches.

In many cases, the concept of NbS into urban development strategies is incorporated through the city Master Plans. However, these master plans are not successfully implemented in one hand due to a lack of proper dissemination and acceptance by the local communities. On the other hand, municipality authorities are not adequately appraising the document as the document is not legally binding which is crucial for development planning and control. It is important to take people's opinions and incorporate them while identifying potential water bodies or green areas during the preparation of the Master Plan. Therefore, community participation is essential for the successful implementation of NbS in urban centres and municipalities.

Prioritising the Role of Placemaking in Nature-based Solutions (NbS) Projects to Connect People with Place and Natural Amenities.

In many cases, as demonstrated in Chapter 2, urban place-making can significantly contribute to the sustained success of an NbS project. Place-making fosters community ownership and ensures better management, preventing misuse and waste dumping. Successful examples include Dhanmondi Lake in Dhaka, Nagar Park in Narayanganj, and the Urban River Spaces project in Jhenaidah. However, in cases such as the Katakhal Canal and Barshijora Eco Park, the absence of effective place-making resulted in a lack of public ownership,

which ultimately led to the degradation of the site. Municipal authorities should also ensure that NbS sites remain safe and accessible for all community members, regardless of age or gender, to maximize the societal co-benefits of these solutions.

Addressing Illegal Encroachment

In cases of illegal encroachment, municipalities should take proactive steps to reclaim and restore degraded or encroached natural resources along with major urban actors. Advocacy and liaison can be a powerful tool to connect major stakeholders like the District/ upazila administration, Law enforcement agencies etc. Instances such as the reclaimed ponds in Rajshahi and the Nagar Park in Narayanganj, where local authorities stepped in to restore lost or encroached spaces, serve as examples of successful intervention and should inspire other regions to take similar actions.

Ensuring Public Participation is pivotal while implementing Nature-based Solutions (NbS).

Prior to initiating and implementing any NbS project, it is crucial to conduct effective and engaging public awareness campaigns, similar to those carried out during the Kudalichora canal revival in Moulvibazar or the participatory activities undertaken for the Urban River Spaces project in Jhenaidah. Public engagement is vital to ensure

that local communities feel a sense of ownership over the project, as this fosters a sense of belonging and encourages active participation. Without such involvement, people may disengage, contributing to the degradation of the project area rather than its improvement. For instance, in the case of Barshijora Eco Park in Moulvibazar, the absence of public input and engagement resulted in the area becoming more vulnerable to encroachment and pollution.

Planning Realistic Phases for Execution within the allocated budget and timeline.

For the successful execution of an NbS project, it is essential to divide the work into realistic, manageable phases that can be accomplished within the available budget and timeframe. An example of this is the Kolpona-Talaimari river embankment plantation scheme in Rajshahi, where a well-Organised schedule for tree selection and public awareness facilitated the smooth execution and subsequent success of the project.

Ensuring the Maintenance of any implemented NbS project for Longevity is essential.

After implementation, the sustainability and durability of an NbS scheme depend on a carefully planned maintenance regime, supported by a consistent, recurring budget from the executing

authorities. For example, the Kudalichora Canal in Moulvibazar benefits from a periodic surcharge tax for canal cleaning and maintenance, though there remains insufficient manpower to cover the entire canal stretch. Conversely, the Katakhalī Canal in Sirajganj suffers from insufficient funds for regular maintenance, leading to further degradation of the canal even after its revival.

Incentivising and encouraging the Private Sector with small-scale NbS initiatives.

Promoting the adoption of NbS practices on a smaller scale, such as in private residences or other establishments, can also have a positive, holistic impact if widely practised. For example, initiatives like the family dug well in Nilphamari or the Karupannya Factory in Rangpur show how green and blue interventions can make a difference when integrated with the built environment, potentially benefiting entire neighbourhoods or even cities.

Invite donor organisations and development partners to invest in innovative NbS projects at municipality levels

Municipal authorities should encourage and engage prospective donors and development partners to support urban NbS initiatives in addressing urban challenges related to climate change, even when these ventures are new or unprecedented. Pilot projects, such as the Miyawaki forest at Chittagong

University or the Ecological Engineering project with oysters, can serve as test cases that can be studied and refined before being implemented on a larger scale.

Socio-economic feasibility study of NbS projects is pivotal for public and private sector buy-in and to attract international funding.

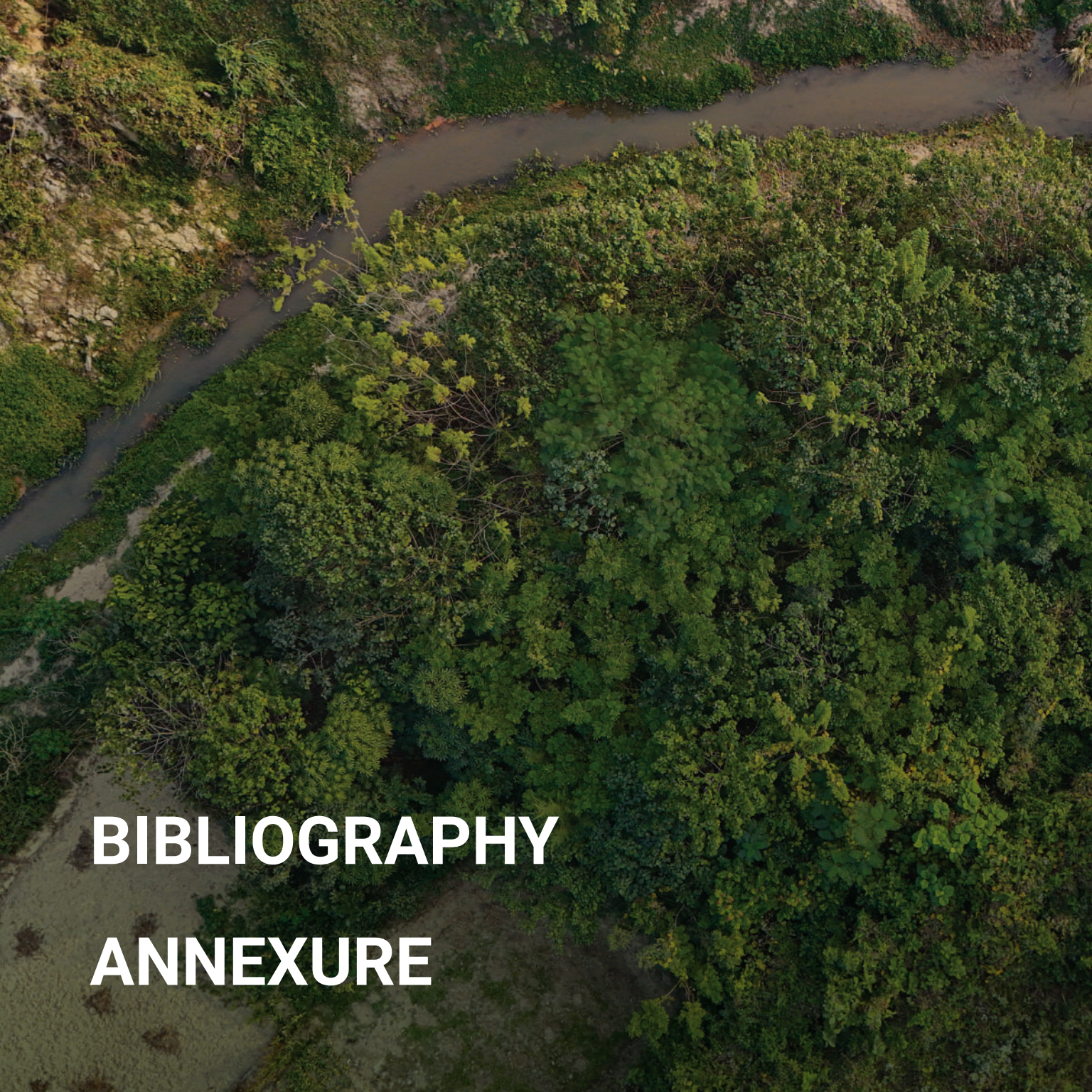
A well-articulated and simple steps of socio-economic pre-feasibility study can contribute to attracting investments to NbS projects. This compendium recommends the process in Chapter 4 in an easy and holistic manner. An indicator and criteria-based project evaluation checklist is discussed for users to understand and qualify for any NbS project and whether to proceed with the project or not in the first hand. If the project qualifies then the proposed steps (section 4.2) of the cost-benefit analysis (CBA) framework are applicable for further assessment of the economic feasibility. The final phase is to identify the benefits and co-benefits for the wider acceptance of the project.

5.3 Endnote

Cities may create an environment that supports Urban Nature-based Solutions (NbS) that benefit the environmental, social, and economic facets of urban sustainability by putting in place the appropriate institutional, financial, and technological

support mechanisms. To ensure the successful implementation and long-term sustainability of Nature-based Solutions, public participation, phased execution, sustained maintenance, and community ownership are key elements. Local authorities must take proactive roles in promoting public involvement, allocating sufficient

resources for maintenance, and encouraging NbS adoption across various scales. With continued collaboration, innovative approaches, and strong municipal leadership, NbS can effectively address urban challenges and contribute to a sustainable, resilient future.

An aerial photograph showing a river winding through a dense, lush green forest. The river is a light brown color, contrasting with the vibrant green of the surrounding vegetation. The forest appears to be a mix of different types of trees and shrubs, creating a textured canopy. The river flows from the top left towards the bottom right, with some bends. The overall scene is a natural, undisturbed landscape.

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ANNEXURE

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Annexure

Annex 01: KII Respondents

- Engr. Md. Abdul Maleque, Assistant Engineer, Moulvibazar municipality
- Sayed Nakibur Rahman, Executive Engineer, Moulvibazar municipality
- Abuhena Mutofa Kamal, Executive Engineer, Sirajganj municipality
- Md. Anisur Rahman, Town Planner, Sirajganj municipality
- Md. Robiul Kabir, Assistant Engineer, Sirajganj municipality
- Architect Iqbal Habib, VITTI Sthapati Brinda Ltd.
- Architect Ishtiaq Zahir Titas, VITTI Sthapati Brinda Ltd.
- Md Jahangir Alam, DFO, Wildlife Management and Nature Conservation Division, Sylhet (Hq-Moulvibazar)
- Shaukat Imran Arafat, Director, NBG
- Md. Jubaer Rashid Country Representative, ICLEI South Asia, Bangladesh
- Mohammad Mosharraf Hossain Professor, Forestry and Environmental Sciences, University of Chittagong, Chattogram
- Architect Bayejid Mahbub Khondker, Nakshabid Architects
- Sarkar Baruya, Member of the Baruya Family, Nilphamari
- Nizam Uddin, Range Officer, Sandwip
- Dr. Mohammed Shah Nawaz Chowdhury, Professor at the Institute of Marine Sciences, University of Chittagong
- Sadeque Mahmud, Project Officer, at ICLEI South Asia, Bangladesh
- Professor Md. Mozammel Hoque, Vice-Chancellor (VC), Southern University Bangladesh (SUB)
- Md. Moinul Islam, Urban Planner, Narayanganj City Corporation (NCC)
- Bony Ahsan, Urban Planner, Rajshahi City Corporation (RCC)
- Ms. Shahnaz Panna, General Secretary, Uttara Sector-13 Welfare Society
- Architect Khondaker Hasibul Kabir, Co.Creation.Architects
- A K M Asadul Haque (Belal), Member of Pramanik Family, Santahar



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