USAID | BANGLADESH
FROM THE AMERICAN PEOPLE

BANGLADESH TROPICAL FORESTS AND BIODIVERSITY ASSESSMENT

MAY 2016

May 2016

This publication was produced for review by the United States Agency for International Development. It was prepared by Integra LLC

BANGLADESH TROPICAL FORESTS AND BIODIVERSITY ASSESSMENT

UNITED STATES FOREIGN ASSISTANCE ACT, SECTION 118/119 REPORT

MAY 2016

Report Authors: Patricia Foster-Turley, Rishiraj Das, Md. Kamrul Hasan, Peerzadi Rumana Hossain

Prepared for USAID Bangladesh

Prepared under the Restoring the Environment through Prosperity, Livelihoods and Conserving Ecosystems (REPLACE) Contract, Award Number AID-388-TO-16-00001

Integra Government Services International
1100 Vermont Avenue NW, Suite 750
Washington, DC 20005
+1 202 898 4110
www.integrallc.com

DISCLAIMER

TABLE OF CONTENTS

TABLE OF FIGURES AND TABLES

LIST OF ACRONYMS

The following list of frequently used acronyms is provided for reference of the reader.

ADB	Asian Development Bank
AF	Arannayk Foundation
Bagh	Bengal Tiger Conservation
BFD	Bangladesh Forest Department
CBD	United Nations Convention on Biological Diversity
CCF	Chief Conservator of Forests (BFD)
CDCS	Country Development Cooperation Strategy
CHT	Chittagong Hill Tracts
CREL	Climate Resilient Ecosystems and Livelihoods
DoE	Department of Environment, under MoEF
DoF	Department of Fisheries, under MoFL
ECA	Ecologically Critical Area
ECOFISH	Ecosystems Improved for Sustainable Fisheries
FAA	Foreign Assistance Act
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIZ	German Corporation for International Cooperation
GoB	Government of Bangladesh

IPAC	Integrated Protected Area Co-Management
IUCN	International Union for the Conservation of Nature
MoEF	Bangladesh Ministry of Environment and Forests
MoFL	Bangladesh Ministry of Fisheries and Livestock
MoL	Ministry of Land
NBSAP	National Biodiversity Strategy and Action Plan
NEMAP	National Environmental Management Action Plan
NGO	Non-Governmental Organization
NRM	Natural Resources Management
TFCA	Tropical Forest Conservation Act
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USG	United States Government
WB	World Bank
WNCC	Wildlife and Nature Conservation Circle (BFD)
WCCU	Wildlife Crime Control Unit (BFD)

I. EXECUTIVE SUMMARY

Bangladesh is situated at the intersection of the Indo-Himalayan and Indo-Chinese sub-regions, is in the transitional zone for the flora and fauna of the Indian subcontinent and Southeast Asia, and is part of the Indo-Burma biodiversity hotspot (Stanford 1991, Feeroz 2013). The country features a great diversity of natural ecosystems, and consequently is one of the most ecologically significant and biologically diverse landscapes in terms of migratory species, stepping stones, staging ground and flyways for wildlife movements of the region. The natural ecosystems of Bangladesh include several types of forests, freshwater wetlands and coastal and marine types, all harboring remaining fragments of important animal and plant biodiversity. Bangladesh features protected areas that have prominent international status, like the World Heritage site in the Sundarbans, and lesser known, but equally critical habitats like the haors (wetland basins) in northeastern Bangladesh and tropical evergreen forests in the Chittagong hill tracts.

Although Bangladesh has a system of protected areas that includes national parks, wildlife sanctuaries and ecologically critical areas, enforcement of protections and protected area management is weak, resulting in severe degradation and loss of natural habitats and ecosystems. High population densities also mean that land resources are scarce, and the protected area network covers an insufficient area for the long-term survival of many species. Bangladesh has a number of policies and institutions to protect and conserve forests and wildlife, and is a party to many major international conventions on protected areas, wildlife trafficking and biodiversity, but political will and enforcement are severely lacking, Most of the natural ecosystems of Bangladesh are managed by the Bangladesh Forest Department (BFD), the Department of Fisheries (DoF), and the Department of Environment (DoE), but these departments are not prioritized or supported well by the Government of Bangladesh (GoB), and many programs that cover biodiversity and forests in Bangladesh are heavily dependent on donor support, with limited follow-through by GoB once that donor support concludes.

This tropical forests and biodiversity assessment was prepared to assist USAID/Bangladesh as it develops a Country Development Cooperation Strategy (CDCS) for the next five-year period, FY 2017-2021. The primary objective of the assessment is to ensure USAID's compliance with the requirements of sections 118 (tropical forests) and 119 (endangered species/biodiversity) of the Foreign Assistance Act (FAA). In order to accomplish this the four person assessment team visited Bangladesh from March 26 to April 13, 2016, interviewed more than 80 entities, absorbed the contents of scores of documents and visited protected and/or ecologically critical areas and surrounding villages and interviewed fisheries and forestry officials during field trips to the northeast and southeast parts of the country.

Like most countries, Bangladesh is faced with many direct threats to biodiversity. With accelerating economic development and a growing population, many of these threats will intensify as well. This assessment team identified eight primary direct threats condensed from country reports to the Convention on Biological Diversity (CBD) and refined through interviews and site visits: 1) encroachment in protected areas; 2) degradation of forests and wetlands; 3) infrastructure development; 4) unsustainable and/or illegal exploitation of terrestrial resources; 5) unsustainable and/or illegal fishing practices; 6) change in hydrological regime; 7) pollution; 8) invasive species. As with reports to the CBD, no attempt was made to prioritize them, as the priority varies with the location, timing and the group setting priorities.

The indirect threats (root causes) are the institutional and environmental conditions that are behind the direct threats visible on the ground. The main indirect threats identified in the assessment include: 1) poor institutional capacity; 2) lack of coordination among different agencies; 3) policy and information gaps; 4) lack of enforcement; 5) inadequate and poorly managed system of protected areas; 6) corruption; 7) lack of political commitment; 8) lack of awareness; 9) climate and biophysical changes and 10) lack of alternate livelihoods in sensitive habitats. As with direct threats these vary in severity from situation to situation and are not prioritized here.

The Assessment follows up the status of tropical forests and wildlife with the "extent to which" USAID/Bangladesh addresses the identified threats and recommended "actions necessary". Biodiversity and tropical forest activities are firmly seated in USAID Bangladesh's Development Objective (DO) 4: Responsiveness to Climate Change Improved. Activities such as Climate Resilient Ecosystems and Livelihoods (CREL), Ecosystems Improved for Sustainable Fisheries (ECOFISH BD) and Bengal Tiger Conservation (Bagh) have strong biodiversity components and address some of the recommended actions. The activities conducted under the mission's three other DOs, democracy, health and education and agriculture were also considered for their possible biodiversity and tropical forest linkages and any ways in which their activities might be harmful to biodiversity and forest conservation in the country.

Finally, this Assessment provides some programmatic recommendations to USAID Bangladesh, based on the background work and country visit, and the analysis within the Assessment report. The Assessment team believes these actions fit into the current (and planned) Mission DOs, and will help the efforts to conserve biodiversity and forests in Bangladesh. The top priority recommendations for USAID include:

1. Continue and increase support for co-management strategies giving communities more control over their resources and alternate livelihoods that replace the unsustainable, and in many cases illegal, extraction of natural resources.

2. Continue to work with GoB on structural changes in how biodiversity and natural resources are managed including institutionalizing of baseline biological data, sorting out discrepancies among agencies and other efforts to bring biodiversity and forest concerns to the forefront and,

3. Develop the capacity of BFD, DoE and DoF to use modern technology and methods to enforce laws against poaching, trafficking, illegal logging and fishing.

In addition this assessment team recommends:

4. Bring stronger focus to the Chittagong Hill Tracts that are part of the Indo-Burma biodiversity hotspot and still contain considerable diversity that could be helped through further co-management and alternative livelihood strategies.

5. Expand support for media programs on well-watched Bangladesh Television (BTV) and other channels, including television, radio, newspapers and magazines that highlight positive conservation activities in Bangladesh to build awareness.

6. Work with neighboring USAID missions to develop transboundary approaches to water management and supply, migrating species and other aspects.

The problems facing the conservation of forests and biodiversity in Bangladesh are large ones, but this assessment team believes there is still hope to preserve key areas of the natural landscape in the country.

II. INTRODUCTION

PURPOSE

This biodiversity and tropical forests assessment was prepared to assist USAID/Bangladesh as it develops Country Development Cooperation Strategy (CDCS) 2017-2021, to replace the CDCS 2012-2016 which currently directs their programming. This assessment was conducted to help ensure compliance with the requirements of sections 118 (tropical forests) and 119 (endangered species/biodiversity) of the Foreign Assistance Act. Both sections of the FAA contain similar language requiring each country plan prepared by USAID to include an analysis of (1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests/biodiversity and (2) the extent to which the actions proposed for support by the agency meet the needs thus identified.

Although this 118/119 assessment relates primarily to the USAID/Bangladesh biodiversity and forest activities conducted under DO4: Responsiveness to Climate Change Improved, the purpose is broader than this. As the new CDCS is developed the recommendations from this report may also encourage the inclusion of crosscutting biodiversity related elements in democracy, health, education and agriculture as well.

METHODS

The assessment team was led by biodiversity specialist Dr. Pat Foster-Turley and included Dr. Rishiraj Das, environment and global climate change specialist with Integra LLC and two Bangladeshi nationals, wildlife biologist Dr. Kamrul Hasan and climate change specialist Rumana Hossain. The team was supported in Washington D.C. by Integra LLC staff members John Waugh and Miguel Menez. The team member biographic sketches are provided in Annex C.

Work for this assessment was carried out in March and April, 2016 and included one week of pre-trip research and interviews, three weeks in Bangladesh and another week of writing time afterwards. At the start of the project the team studied documents provided by the Mission, conducted internet research and interviewed USAID and other specialists in Washington D.C. that were familiar with projects and activities in Bangladesh. Once in Bangladesh the team interviewed more than seventy government, non-government (NGO), donor and academic specialists with knowledge about fisheries, forests, biodiversity and related programs in the country (Annex D).

After consultations with USAID/Bangladesh officials a field trip agenda was settled to ground-truth the interview findings and to look at areas of special interest to the Mission. The team first flew to Sylhet in northeast Bangladesh and spent four days traveling back to Dhaka by car and visited and talked to villagers and officials at Tilaghar Eco Park, Ratargul Swamp Forest, Baikka Beel wetland, Lawachara and Satchari National Parks and a few other sites along the way.

One day later the team flew to Cox's Bazar in southeast Bangladesh to visit and talk to villagers and officials at Medakaccapia National Park, Dulahazara Safari Park, Teknaf and Chunati Wildlife

Sanctuaries, Inani Reserved Forest, and Arannayk activities at Shafir Beel and Chakma Para. The team also visited a Marinelife Alliance turtle hatchery, and helped release 440 ridley sea turtles that had hatched that morning. Finally the team met with staff of the Bangladesh Fisheries Development Corporation at the fish landing zone in Cox's Bazar, with researchers at the Bangladesh Fisheries Research Institute and with the Department of Fisheries in Cox's Bazar. The full itinerary of these field trips is presented in Annex D.

Back again in Dhaka, the team conducted final interviews and met with officials at the Dhaka National Zoo and the National Botanical Garden before preparing the materials for the Mission debriefing and flying home to finalize this document.

REPORT LAYOUT

Section III of this report addresses the first part of FAA 118/119, the "actions necessary" to enhance biodiversity and forest conservation in Bangladesh. It sets the groundwork with a section on the overall social, economic and political context, the status of biodiversity and forests, the institutional and legal framework, and the key programs addressing biodiversity in Bangladesh. Both direct (on the ground) threats and indirect threats (factors behind these) are next presented using examples from site visits, and results of interviews and research. Finally Section III concludes with a chart of "actions necessary" in Bangladesh by all players to address these threats.

Section IV of this report addresses USAID/Bangladesh more specifically and addresses the second part of FAA 118/119, "the extent to which" USAID meets the needs identified in the previous section. Special attention was made to the biodiversity and forest related activities currently supported by USAID/Bangladesh but those of all the other offices were addressed too based on interviews and materials presented by all DO teams at the Mission. Finally, this section concludes with specific recommendations for USAID as they develop new and continuing activities in the years to come. Annex B contains an analysis of strengths, weaknesses, opportunities and threats (SWOT Analysis) that integrates the direct and indirect threats and an assessment of the strategic areas USAID Bangladesh should emphasize for the next CDCS period.

III. ACTIONS NECESSARY TO CONSERVE TROPICAL FORESTS AND BIODIVERSITY IN BANGLADESH

A. SOCIAL, ECONOMIC AND POLITICAL CONTEXT

Located in the delta region of three of Asia's major river systems – Ganga, Meghna and Brahmaputra, Bangladesh is a nation with a wealth of natural resources and is the world's eighth most populous country (160 million estimated, 2015) while being ninety-second by land area (150 million km2), making it one of the most densely populated countries (1,600 persons/km2 in some divisions). Like most deltaic countries, Bangladesh is characterized by dynamic changes, high vulnerability to natural disasters and hazards, and resilience of human populations and natural ecosystems. Bangladesh achieved independence from Pakistan in 1971, after the war of Independence took a heavy toll on society and political institutions, emerging as a nation in extreme poverty, trailing most of the world on a number of socio-economic and human development indices.

Over the past 45 years, Bangladesh's progress and transformation from an extremely poor and vulnerable fledgling nation to one that surpasses several middle-income countries on indicators of social and economic development stand as testament to the resilience and potential of the country. Some of Bangladesh's significant achievements since independence include the transformation of agricultural production from famines to food surplus, surpassing the rate of population growth, an increase in per capita income over 130% (World Bank, 2015), impressive progress on health outcomes, population growth, access and equity to education, and gender equality. In 1971, Bangladesh ranked well below many South Asian countries on human development indices, but today it ranks higher in most such indicators than many other low- and lower-middle-income countries with similar or better initial conditions in 1971. Rapid economic growth during the 2000s enabled Bangladesh to cross the threshold to lower middle income status in 2014, and per capita income increased to $1220 in 2015, partly due average economic growth of 6.2% since 2010 (World Bank, 2015). Increasing human development and income status remain very high priorities for the Government, with an ambitious target of achieving middle-income status by 2021.

Despite its progress, the sheer scale of rural poverty and unique development challenges of Bangladesh are significant hurdles for the country. Poverty rates remain around 25%, and while this represents a halving of the poverty rate since the 1990s, 65 million people still live below the $1.25/day World Bank standard for poverty, and the poorest groups are severely disadvantaged in terms of access to basic services like healthcare, nutrition, education and financial assistance (World Bank, 2015). 70% of the population remains rural, and the poorest and most vulnerable households are female-headed, located in remote rural areas, and of minority sections of the population (Bangladesh Planning Commission, 2015). Bangladesh

remains one of the poorest countries in the region, with poor public services and institutional capacity to implement a broad suite of policies to ensure the quality of development.

While agriculture remains the primary core of Bangladesh's economy, recent economic growth has been driven by a transition to industry and service sectors. Textile, footwear and leather industries have particularly driven growth in export earnings, and are significant sources of employment. Providing sufficient jobs for the growing labor force – which is growing at 3%/yr – is one of the major concerns for the Government and international donors supporting Bangladesh (World Bank, 2015). Much of the labor force remains trapped in low wage, labor intensive and informal work in agriculture or other economic sectors, and improving the security of livelihoods is a universal concern. Second to the provision of jobs, improving infrastructure is a major development objective for Bangladesh, with public investment in infrastructure lagging behind many other developing nations.

Bangladesh's political system is based on a multiparty parliamentary representative democratic system. After independence, Bangladesh was initially established as a socialist state under a single political party, but the civilian government was unstable, and Bangladesh faced severe poverty and famines during its early years. A series of military coups resulted in military leadership and oversight of the government through the 1970s and 1980s, and a multiparty civilian rule and a parliamentary democracy was restored in 1991. The Bangladesh Nationalist Party and the Awami League are the two major political parties in Bangladesh, and the national economy has gone through structural reforms and liberalization during the 1990s. The Army remains a strong presence in political and government affairs in Bangladesh, and has intervened in periods like 2007 during a state of emergency. The Chittagong Hill Tracts went through an insurgency, with the region's indigenous ethnic groups demanding autonomy, and the Bangladesh Army continues to maintain a strong presence in the region. Southeastern Bangladesh has an influx of Rohingya refugees from Myanmar (Burma), and several hundred thousand refugees have settled in southeastern Bangladesh.

B. STATUS OF TROPICAL FORESTS AND BIODIVERSITY

Bangladesh is located at the cross roads of the Indo-Himalayan and Indo-Chinese sub-regions in the Oriental region and is the transitional zone for the flora and fauna of the subcontinent and that of the Southeast Asia (Stanford 1991, Feeroz 2013). It is one of the most ecologically significant and biologically diverse landscapes in terms of migratory species, stepping stones, staging ground and flyways for wildlife movements of the region and is part of the Indo-Burma biodiversity hotspot demanding conservation priorities (Myers *et al.* 2000).

Bangladesh has been divided into 12 major bio-ecological zones including 25 sub-zones (Fig.1) (Nishat *et al.* 2002). About 80% of the country is floodplain, 12% is hills, and about 8% is terrace or uplifted blocks (BBS 2011). Bangladesh currently has 106,613 square kilometers of marine area including 19,469 sq. km in the Bay of Bengal awarded to Bangladesh in 2014 by a United Nations Tribunal.

The natural ecosystems of Bangladesh can be broadly categorized as 1) forests, 2) inland water ecosystems, and 3) coastal and marine ecosystems (DoE 2015)

1. FORESTS

The small remaining forest ecosystems of the country are biodiversity rich. Presently Bangladesh has 1,429,000 hectares of forest cover which is about 11% of the total land area of the country. Vegetation cover rather than forests (woodland) is about 294,000 hectares (2.3% land area of the country). Forest cover of the country has been declining with the rate 2,600 hectares per year (FAO 2015). Four general types of natural terrestrial forest exist: 1) mixed-evergreen forest, 2) deciduous forest, 3) freshwater swamp forest and 4) mangrove forest. Two other anthropogenic forest types also contain significant biodiversity: 5) homestead forest and 6) village common forest which is natural forest conserved by communities for their uses.

a. Mixed-evergreen forests

Most of the forests in the north-east and south-east are semi-evergreen (Feeroz *et al.* 2011, Feeroz 2014). Some relatively large patches of mixed-evergreen forests still exist in the Chittagong Hill Tracts in the southeast (Khan 2008). Though evergreen plants dominate the mixed-evergreen forests, they also have deciduous plants. The mixed-evergreen forests of Bangladesh support large populations of wild mammals of the country including Asian elephants, Asiatic black bear, hoolock gibbon and other globally threatened species.

b. Deciduous forests

The central part of the country has the largest single mass of moist deciduous Sal (*Shorea robusta*) forest in Bangladesh with an area of about 18,700 hectares of undisturbed forest and about 458 km^2 of scrub forest (Gittins and Akonda 1982). This ecosystem is the home of the largest population of capped langur in the country.

c. Mangrove forests

The mangrove forests (including coastal plantations) cover an area of 710,000 hectares along the coast. Sundarbans, the largest continuous mangrove forest of the world and covers an area of 580,000 ha. This forest includes fairly dense evergreen plant species which are adapted for life under saline conditions and frequent inundation by the tides. It harbors 334 species of plants and 269 species of wild animals. The Sundarbans is currently the last abode of important elements of South Asia's threatened megafauna, including the Bengal tiger, Ganges and Irrawaddy dolphins and saltwater crocodiles, a number of threatened bird species, and at least 176 species of fish. The flagship tree species of Sundarbans, a mangrove *Heritiera fomes*, has also been declared an endangered species in 2010 under the IUCN red list category of threatened species (IUCN 2000).

d. Freshwater swamp forests

Freshwater swamp forest consists of flood-tolerant evergreen trees of about 10 to 12 meters height. These trees have vast rooting system and form a close canopy. The major tree species of this forest are Hijol (*Barringtonia acutangula*) and Koroj (*Millettia pinnata*). Seeds of these trees disperse through water and regenerate in mudflats. The remaining forest is about 204 hectares which is the home of many waders and reptiles.

e. Homestead forest

There are approximately 25.53 million homesteads in Bangladesh (BBS 2011) to fulfill basic needs of the householders such as food, fruits, vegetables, timbers etc. Planting native fruits and timber trees and bamboos near homesteads is a traditional land use system in Bangladesh, but is declining due to planting of exotic plants like Acacia trees.

f. Village common forest

Village common forests are natural forests other than the government reserve forests near the households of the indigenous communities that are managed to fulfill their daily demands (Baten et al. 2010, Roy 2000) and also harbor considerable biodiversity.

2. INLAND WATER ECOSYSTEM

More than 25% (4 million hectares) of the total land surface of the country are freshwater ecosystems including rivers, natural lakes, freshwater marshes, baors (oxbow lakes), beels (floodplain depressions), ponds, one large water reservoir (Kaptai lake) and extensive seasonally inundated floodplains (Feeroz 2013). These ecosystems are a close second in area to the forested area of Bangladesh. Inland wetlands support hundreds of species of plants, fish and wildlife, provide critically important wintering grounds for migratory birds and support an exceptional diversity of shrimps, turtles, snails, and other wetland resources. This ecosystem is also significant for many mammalian species such as Ganges river dolphins, otters, small cats and other small mammals.

3. COASTAL AND MARINE ECOSYSTEM

The main ecosystems of the coastal zone are: (a) coral-associated island, (b) sandy beach, (c) small islets, (d) sand dunes, (e) inter-tidal mudflats, (f) grasslands, (g) reed lands, and (h) mangrove forest. The coast runs from St. Martin's Island in the southeast to the Sundarbans mangroves in the south-west. Bangladesh's maritime boundary has been extended by 106,613 square kilometers comprising 12 nautical miles of territorial sea and an exclusive economic zone extending up to 200 nautical miles into the high seas (DoE 2015).

The eastern coast of Bangladesh is comparatively stable whereas the central coast is very dynamic with highest rate of accretion and erosion. The western coast is dominated by mangrove forest system. The central coast is the staging wintering grounds of more than 100 species of migratory shorebirds belonging to East Asia-Australasian and Central Asian

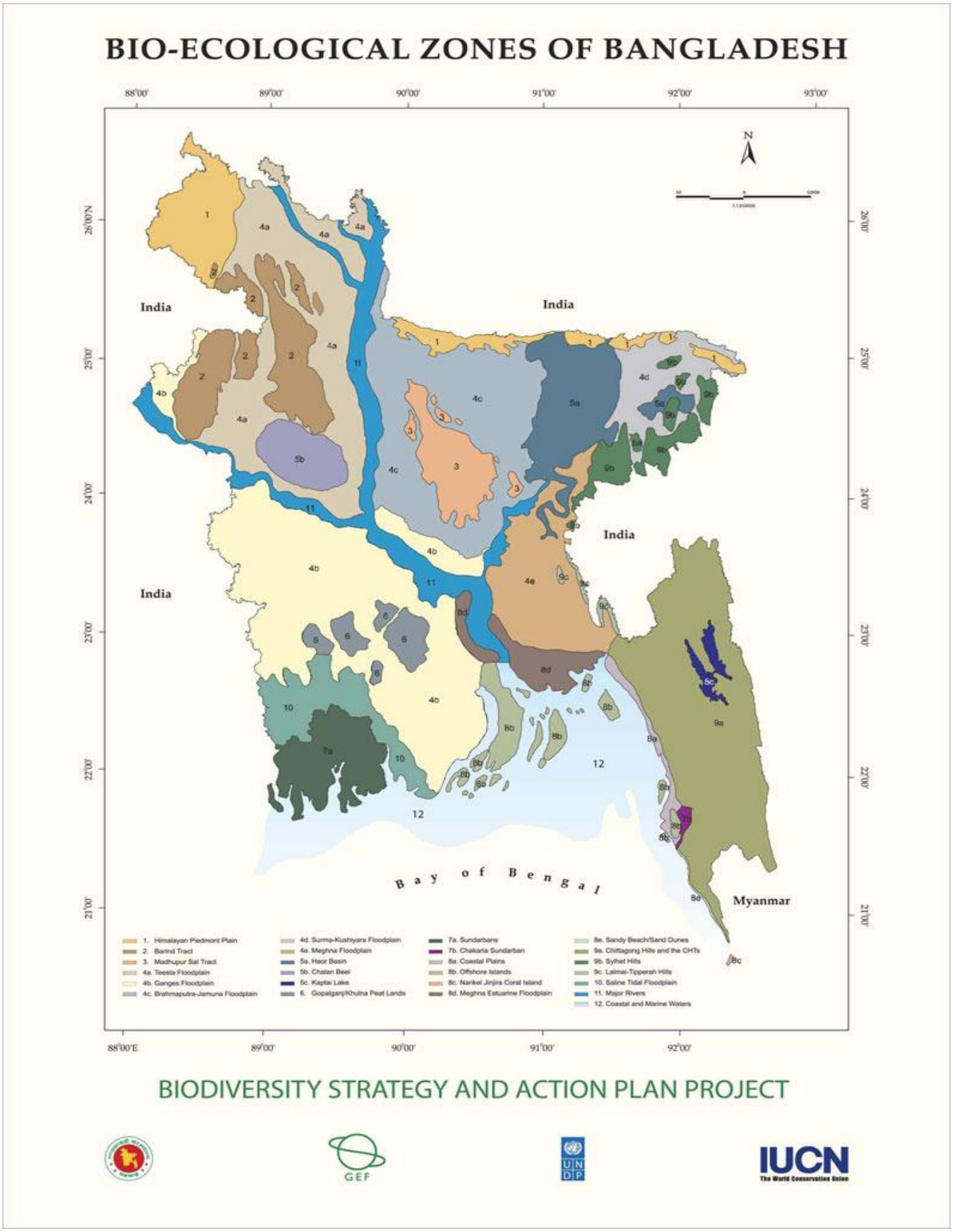

Figure 1. Bio-ecological zones of Bangladesh (Nishat et al. 2002)

flyways including more than 10 globally threatened migratory shorebird species (DoE 2015). The east coast of Bangladesh is an important breeding ground for four species of marine turtles and has the only coral community in Bangladesh. The west coast, on the other hand, supports nesting ground for Batagur terrapin, masked finfoot, saltwater crocodile, king cobra, white-bellied sea eagle, Ganges river dolphin and many other threatened species.

4. BIODIVERSITY OF BANGLADESH

Though Bangladesh is a small and densely populated country it is rich in biodiversity. Presently Bangladesh supports a total of 3813 species of vascular plants of which 486 species are threatened in different categories (Ahmed *et al.* 2008, Irfanullah 2011). Bangladesh is the home of 1,952 species of invertebrates, 653 fish species (251 freshwater; 402 marine (Feeroz 2013) (Fig. 2). Forty-nine species of amphibians and 137 species of reptiles have been recorded but more than 100 species of amphibians and reptiles are estimated to occur in Bangladesh (Hasan *et al.* 2014). There are a total of 690 species of birds including residents and migrants and 121 species of mammals (Khan 2008, Feeroz 2013).

Thirteen species of wildlife have become extinct from Bangladesh over the last century (Khan 2014). Many species such as hoolock gibbon, long-tailed macaque, Malayan sun bear, Asian elephant, and gharial are at the brink of extinction. About 23% of vertebrates found in Bangladesh are facing different level of threats and these threats are increasing (IUCN Bangladesh 2000). The status of plant species is not as well known.

5. PROTECTED AREAS (PAS)

The first declaration of PAs was under the provision of the Forest Act 1927 and Madhupur National Park was the first PA established in 1962. The legal status of the PAs improved considerably after the independence of Bangladesh through the formulation and implementation of Bangladesh Wildlife Act in 1974 and several new PAs were declared after the signing of the Rio Convention in 1992. There are now two types of clearly defined PAs: national parks (17) which correspond to IUCN Category I and wildlife sanctuaries (22) which correspond to IUCN Category IV. There are also two main botanical gardens (Baldha Garden and National Botanical Garden in Dhaka), two safari parks (Dulahazra SP at Cox's Bazar and Bangabandhu SP at Gazipur) and eight eco-parks which are primarily used for recreation but also harbor considerable biodiversity. The present system of PAs is illustrated in Figure 2 with more details given in Annex E. With the recognition that other sites of biological importance are not being protected in this system, Ecologically Critical Areas (ECAs) have also been established under Section 5 of The Bangladesh Environment Conservation Act, 1995.

Three wildlife sanctuaries of the Sundarbans (East, West and South), along with surrounding areas of about 1,400sq km, have been designated as UNESCO World Heritage Sites. The Sundarbans and Tanguar Haor in the north have also been designated as RAMSAR wetland sites (Mukul *et al.* 2008, Feeroz 2013).

Protected areas are the home of many flagship species of global concern. Terrestrial PAs particularly in northeast and southeast regions of the country contain considerable biodiversity and those in the Chittagong Hill Tract (CHT) are part of the Indo-Burma biological hotspot. Mammals, birds and reptiles are the most well-known species in Bangladesh. Many globally

threatened species such as Asian elephant, Asiatic black bear, Malayan sun bear, leopard, clouded leopard, marbled cat, hoolock gibbon, slow loris, Chinese pangolin, and greater hornbill are still found in these PAs. The Sundarbans is the home of the only viable population of Bengal tiger in the country. Many other threatened wild animals like saltwater crocodile, Irrawaddy dolphin, white-bellied sea eagle, lesser adjutant stork, rock python and king cobra are still in good condition in the Sundarbans. PAs in deciduous forests (particularly Madhupur NP) also support a good population of capped langur. Protected areas only partially cover some of the bio-ecological zones illustrated in Figure 1. Fifteen out of 25 bio-ecological sub-zones receive hardly any protection through protected areas. Several bio-ecological zones with a high occurrence of threatened species, such as the Meghna floodplain and coastal plains, have no protection at all (GoB 2015b) (Annex E).

Ecologically Critical Areas along the southeast coast are crucial for the nesting ground of marine turtles. The ECA in Teknaf peninsula (particularly Naaf River bank) is also the critical habitat for the survival of last three individuals of long-tailed macaque (Annex E). The PAs in river systems have been declared for the protection of dolphins as well as for the protection of freshwater fishes and other aquatic animals.

6. VALUES OF BIODIVERSITY AND FORESTS

The biodiversity of Bangladesh has intrinsic aesthetic, cultural, biological and economic values. Many of the mammalian species are involved with the cultural heritage of the nation. The Bengal tiger is the national animal of Bangladesh as well as it is in the logo of our National Cricket Team; Asian elephants have been involved historically with the heritage of kings in Bengal; Hindu people venerate monkeys and langurs because of their connection with the God Rama.

Biodiversity and forests of Bangladesh provide a buffer against climate change and provide sources of natural products of value to both local villagers and in the markets. Forests also serve to hold soil from excessive erosion and to maintain the integrity of watersheds and freshwater supplies. Tourism to natural areas has been advertised for its potential to allow sustainable development of ecosystems and to provide incentives to preserve these areas instead of converting them to other uses. Bangladesh has a great potentiality to develop sustainable ecotourism in protected areas (PAs). The diversity of crop strains in Bangladesh also holds economic potential and may be especially useful as growing conditions are modified due to climate change.

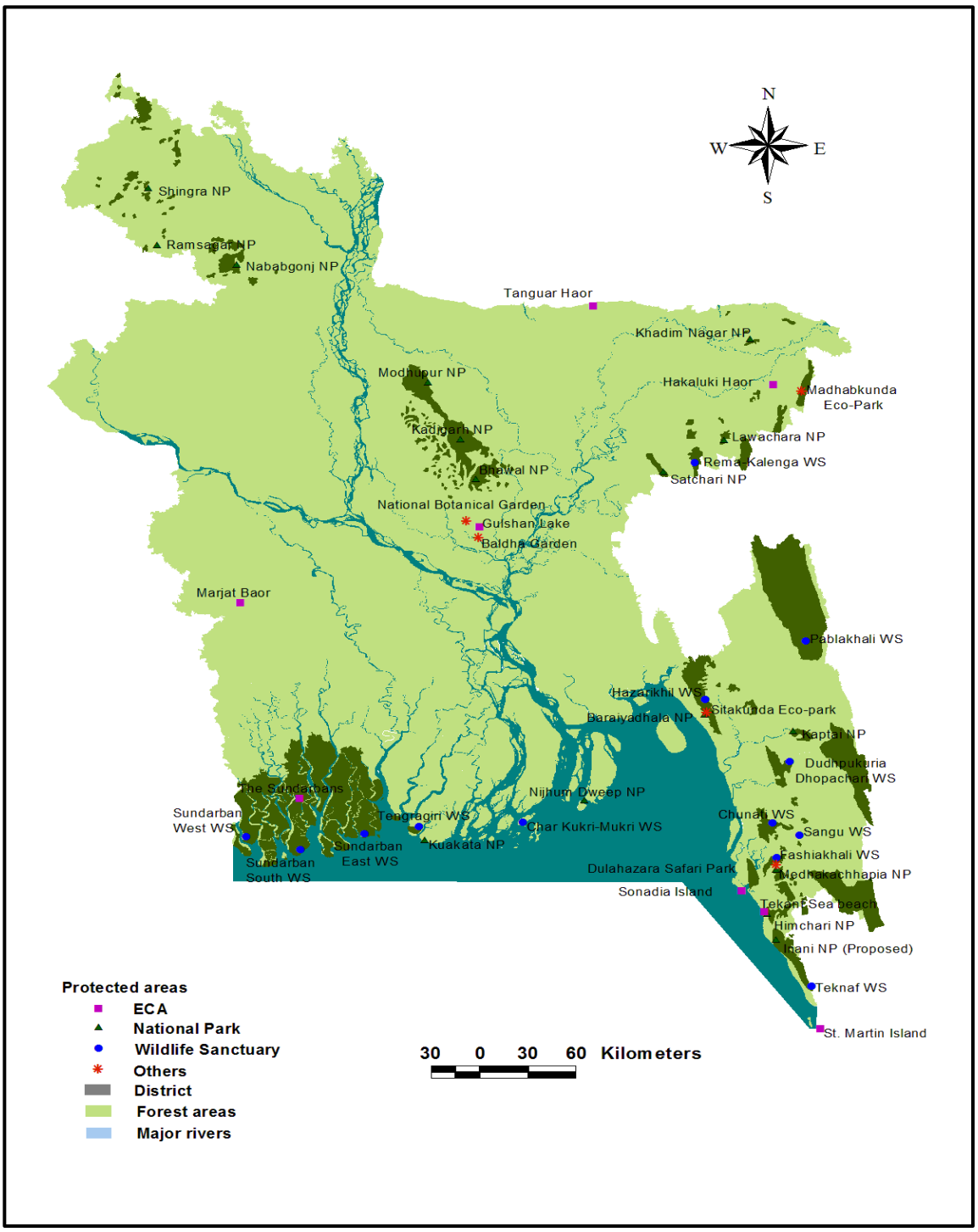

Figure 2. Protected areas of Bangladesh (Feeroz, 2014)

C. GOVERNMENT AND LEGAL FRAMEWORK

The policy and institutional framework in Bangladesh continues to expand and forests and biodiversity are now well covered under existing laws and policies. While Bangladesh has a

strong legal and policy framework, the situation on the ground reflects a lack of capacity and coherent implementation by the government agencies, and a strong dependence on donor funding that results in short-lived gains for forests and biodiversity.

1. GOVERNMENT MINISTRIES AND AGENCIES

Ministry of Environment and Forests (MoEF)

The principal agency most involved in biodiversity conservation is the MoEF, with six different departments but only three of these are concerned directly with forests and biodiversity: Department of Environment (DoE), Bangladesh Forest Department (BFD), Bangladesh National Botanical Garden and Bangladesh National Herbarium (BNH).

The Department of Environment (DoE) has been established with a mandate for enforcement of environmental protection laws, management strategies and policies developed by GoB. DoE implements donor-funded projects like the Coastal and Wetlands Biodiversity Management Project (CWBMP), provides environmental clearance certificates (ECCs) for land development activities, conducts environmental quality monitoring, and management of ECAs. DoE is also responsible for reporting to international conventions and treaties that Bangladesh is party to, such as the Convention on Biological Diversity (CBD). Interviews with DoE officials and field observations by the Assessment team demonstrate that DoE lacks sufficient capacity to sustain the work that is initiated during projects like CWBMP, or manage an expanding network of ECAs. The Assessment team observed unsustainable fishing practices, development of roads and tourist infrastructure and other activities in the Cox's Bazar ECA, and DoE officials confirmed that there is insufficient staffing to monitor or enforce ECA protections, and construction of tourist infrastructure is known to occur without the requisite ECCs. Vehicles and equipment purchased during projects often do not function any longer, and the department lacks the resources and institutional capacity to enforce its mandates on environmental protection beyond short-term projects.

The Bangladesh Forest Department (BFD) is the primary government agency that deals with forests and forest management and monitoring. BFD manages Protected Areas (PAs), forests and most biodiversity activities in the field and operates through three management plan divisions located at the center of the three main forest types: hill forest, plains forest and mangrove forest. The Assessment team visited eight PAs, including a National Parks and Wildlife Sanctuaries, and found that the actual protection status for several of these PAs is largely insufficient to ensure the long-term sustainability of habitat and biodiversity. Satchari National Park has well enforced park boundaries and high habitat quality, but in Lawacchara NP, Medhakachhapia NP, Chunati NP and Teknaf Wildlife Sanctuary, the team observed rampant deforestation, agriculture and non-timber forest product extraction, planting of exotic tree species, and permanent human settlements within the park boundaries. Several other PAs are too small to provide sufficient habitat for most species, making them unviable for conservation of biodiversity. Under the Seventh Five-year Plan the target for the Forestry sector is to increase PA coverage to 15% of the forest area in the country, which will be difficult to achieve unless this is followed by adequate protective measures. BFD's Wildlife Crime Control Unit (WCCU) was established in 2013 with the support of the World Bank, to combat wildlife trafficking and coordinate efforts with other agencies both national and international. Interviews with the WCCU staff revealed several obstacles to successful enforcement of anti-poaching and anti-trafficking measures, including a lack of resources for forest guards, lack of coordination

Laws	Description	Relevance to Tropical Forests/Biodiversity
Forest Act (1927)	Established state ownership of forest areas, rules for use/extraction of forest resources	Legal authority for the Bangladesh Forest Department to gazette forest areas, manage timber and other forest resources
Wildlife (Conservation and Security) Act, 2012 – formerly Wildlife Protection Act, 1974	Provide conservation and safety of wildlife, forests and biodiversity by repealing the existing law relating to conservation and management of wildlife	Ensure protection of wild animals and plants
Brick Burning Control Act, 1989 (Amendment 1995) Preparation of brick and kiln establishment (control) Act, 2013	Prevention of use of wood as fuel for brick kilns and establishment of brick kilns in reserve forests, protected areas, wetlands and agricultural land	These laws were designed to control the exploitation of forests for fuelwood, and development of wetlands and croplands into brick kilns. The 2013 law made stricter regulations and increased penalties, including a provision for trial in regular courts
Environment Conservation Act, 1995 (Revised 2012)	Established legal basis for Environmental Conservation Rules (1997), gives authority to MoEF and DoE to regulate environmental protections	2012 amendment establishes rules for demarcation of wetlands and water bodies, protections for ECAs, hill slopes and mountainous regions
Environment Court Act, 2000 (Amendment 2010)	Established environmental courts, 2010 amendment established courts in each administrative division	Enforcement of protection of ECAs, environmentally important areas like wetlands
Environment Protection Act, 2000 (Amendment 2010)	Deals with environmental pollution, establishes penalties and compensation for pollution, gives individuals/communities rights to file cases in environmental courts	Environmental Clearance Certificates required for industrial development. 2010 amendment increased penalties up to 10 years' imprisonment and increased fines.
Climate Change Trust Act, 2010	Enhances the capability to create climate resilience in the country	Ensure the proper use of climate change trust fund under the MoEF for research and development programme
Biological Diversity Act, 2012 (DRAFT)	Establishes safeguards for environment and biodiversity	Law has not been passed, still open for public comment

Table 1. Major laws in Bangladesh pertaining to Tropical Forests and Biodiversity

with other law enforcement authorities, and the low rate of success in prosecution of wildlife poaching and trafficking.

BFD manages two large safari parks—Bangabandhu Safari Park, Gazipur and Dulahazra Safari Park, Cox's Bazar. These facilities maintain animals in near natural conditions and also serve as a repository for animals that have been confiscated through the illegal wildlife trade. Some

animals, once reconditioned, are released back into the wild. BFD also manages a few botanical gardens around the country and the National Botanical Garden in Dhaka which displays many native and exotic species, sells roses and fruit trees to the public and engages in minor activities in the field; their space limitations prevent the addition of new species that may need *ex situ* conservation.

The Bangladesh National Herbarium conducts botanical surveys and identified, collects and preserves plant species in a facility within the Botanical Garden. Much of their work is conducted by students and academics, and some in collaboration with the National Botanical Garden and NGOs like IUCN. These efforts to document existing flora and fauna have many gaps, and are critical to scientific management and conservation of forests and biodiversity in the country.

Ministry of Fisheries and Livestock (MoFL)

MoFL mainly works to secure the demand of animal protein by enhancing production of fish and livestock products and has two biodiversity related agencies, Department of Livestock (DoL) and the Department of Fisheries (DoF).

Although the Department of Livestock (DoL) is primarily concerned with managing livestock, it is also responsible for the operation of the Bangladesh National Zoo located in Mirpur, Dhaka. The Assessment team observed old-style concrete cages in the National Zoo, and a collection of animals from around the world, sometimes housed inadequately. The Zoo does not belong to any international zoo consortiums and does not engage in scientific or conservation activities. Interviews with the Zoo Director revealed that a rotating

series of zoo curators come from other offices within the DoL and are stationed for three years or less at the Zoo, giving little opportunity for ownership and long-term commitment to zoo projects.

The Department of Fisheries (DoF), under MoFL, is the primary agency for the management of fisheries and fish habitat, as well as the collection of revenue, enforcement of fisheries regulations and research and extension on fisheries and shrimp aquaculture. Although they collect data on the tonnage of fish catches for major species, they have no baseline or monitoring data on the size of fish caught, the range and distribution of these species and other parameters needed to scientifically manage these stocks for long-term sustainability. One exception is the ECOFISH BD project supported by USAID that works with DoF to manage the *hilsa* fish and is collecting this sort of data for this species. Other species, even economically important ones lack appropriate long term data for best management.

Ministry of Land (MoL)

MoL allocates land and land development rights for various purposes including agriculture, industry and infrastructure development and housing. In many cases, MoL allocates development rights without the appropriate ECC process, thus allowing land in sensitive areas like ECAs to be developed. Officials in BFD, DoF and DoE identified the lack of coordination between MoL

and MoEF or other ministries as a significant obstacle to ensuring that the development of land for industry, tourism or agriculture does not harm forests or biodiversity.

The Government also runs several government research institutions in Bangladesh that are concerned with maintaining agricultural biodiversity, gene banks for crop and livestock species and related studies of fish genetics and other programs. Some of these include the Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute, Bangladesh Livestock Research and others that are mentioned in more detail in the Fifth Report to the Convention on Biological Diversity (October, 2015).

2. KEY NATIONAL LAWS AND POLICIES

Bangladesh has several laws, policies and national strategies that address tropical forests and biodiversity, several of which have been amended over the past decade in an effort to increase enforcement of environmental protections. However, environmental laws and policies are not well enforced on the ground, and the assessment team found instances where the agencies described above have little capacity or strategy to enforce these laws and policies. The main laws, policies and national strategies that have been developed to address tropical forests and biodiversity protections in Bangladesh are summarized in Table 1 and 2, and discussed in the section below. For the purposes of the assessment, only the major laws and policies are discussed here, and this list is not exhaustive.

The importance of forests and biodiversity are enshrined in the Bangladesh Constitution. Article 18A safeguards environment protection and sustainable development. As Table 1 indicates, there are laws that protect environmental quality broadly, as well as specific laws for forests, wetlands, fisheries and coastal habitats in Bangladesh. Some laws deal with specific threats to forests, like the Brick Burning and Control Act, 1989, which has been amended in 1995 and strengthened in 2013, to reduce the impact of brick kilns on forests and agricultural land. However, these laws have not been enforced sufficiently to protect forests from being used as a source of fuel wood for kilns, or the growth of the brick-making industry. Bangladesh also has a system of environmental courts, established through the Environment Court Act, 2000, but it is unclear whether these courts are able to enforce penalties or prevent environmental laws from being broken. Several national policies (Table 2) also exist to direct the work of government agencies in the management of forests and biodiversity, but in many cases, the purposes of some policies may run counter to others, or to laws that protect forests and biodiversity. The National Agricultural Extension Policy may encourage the development of marginal forests lands for agriculture, or the National Industrial Policy may encourage industrial expansion and pollution at the cost of forests, wetlands or ecologically sensitive areas. The National Shrimp Policy is an effort to reduce the impact of shrimp farming on coastal areas and mangroves, but may not be sufficient to address unsustainable harvesting of wild shrimp for farms or the destruction of mangroves that occurs on the southeast coast.

Policies	Description	Relevance to Forest and Biodiversity
Forest Policy, 1994	Establishes participatory management of forests with communities and provides opportunities for cooperation between NGOs and government agencies in social forestry	Target to increase forest cover to 20 percent of the total land area by 2015, to maintain the ecological balance and to attain self-sufficiency in forest produce
Environment Policy, 1992	Protection and improvement of environment and promoting long-term sustainable use of natural resources across 15 sectors	Emphasized the need for sustainable ecological balance on existing forests conservation, expansion and tree plantation and took measures to stop shrinkage and depletion of forest lands and resources
Wetland Policy, 1998	Establishes key principles for wetland sustainability	Maintain existing levels of biodiversity of wetlands and actively promote integration of wetland functions in natural resources management
National Fisheries Policy, 1998	Establishes framework for conservation and management of fisheries and conservation of fish populations	All the water bodies suitable for fisheries production and their fisheries resources conservation, development and management are addressed under this policy.
National Water Policy, 1999	Ensures efficient and equitable management of water resources and institutional capacity building for water resource management.	Promotes afforestation and tree planting for watershed protection
Coastal Zone Policy, 2005	Aims to ensure participatory and integrated approach for management and development of the coastal zone	Encompasses both the terrestrial and aquatic environment

Table 2. Key National Policies on Tropical Forests and Biodiversity in Bangladesh

There are also several national strategies and plans that deal with forests and biodiversity in Bangladesh. The National Biodiversity Strategy and Action Plan (NBSAP) provides a framework for conservation, sustainable use and sharing the benefits of biodiversity, by linking biodiversity conservation with social and economic development. National Environment Management Action Plan, 1995 (NEMAP) is a 10-year environmental management plan that contains elements of forest and biodiversity conservation. To address the aim of NEMAP, MoEF launched an umbrella program under five thematic areas of environment and forest which is called the Sustainable Environment Management Programme 1998 (SEMP). SEMP developed a strategic plan for the period 2000-2014, but from interviews it was not clear how DoE is following up to implement

this plan. Several climate change action plans also contain elements of tropical forest and biodiversity protections. Bangladesh Climate Change Strategy and Action Plan (2009-2018) emphasized biodiversity under the "Research and Knowledge Management" pillar, which will monitor and research the impacts of climate change on ecosystems and biodiversity. The Bangladesh Tiger Action Plan (2009-2017) specifically addresses the conservation of tigers. While several of these plans emphasize the importance of forests and biodiversity, others like the Perspective Plan (2010-2021) prioritize economic growth, and make no mention of forests and biodiversity in the Vision 2021. As with laws and policies, there are conflicts between different plans for economic growth and development in Bangladesh, with a lack of clarity on the status of forests and biodiversity across different government ministries and departments.

3. INTERNATIONAL BIODIVERSITY AND CLIMATE CHANGE RELATED CONVENTIONS

Bangladesh is a party to all the major biodiversity related conventions, including the Convention on Biological Diversity, the Ramsar Convention on Wetlands of International Importance, the United Nations Framework Convention on Climate Change, the Convention on the Conservation of Migratory Species and many others. Bangladesh is up to date on the requirements of these conventions and has recently submitted a 2015 update to for the Ramsar Convention, the Fifth Report to the Convention on Biological Diversity (2015) and an update on major sections of the Red Data Book is near completion.

4. ANALYSIS OF GAPS, OVERLAPS, OPPORTUNITIES

Conflicting laws, policies and agencies: At an institutional and legal level in Bangladesh there are conflicts between the MoL, MoEF and MoFL. The leasing of lands that are seen as marginal or degraded by MoL for industrial or commercial uses was observed in ECAs by the assessment team, and interviews with MoEF and MoFL confirm that this is a major institutional driver of the loss of *Sal* forests and wetland and coastal habitats. There are also conflicts between some in the BFD who wish to retain their powers and those who want communities to have a larger role through co-management.

Lack of enforcement of laws and policies: The Assessment team observed illegal construction of a coastline road, infrastructure development on elephant migration corridors, encroachment of forest area by the Rohingya refugees within Teknaf Wildlife Sanctuary boundary area which are punishable offences according to ECA (amend. 2010) and Forest act (1927). The team also noticed a number of brick kilns within the Chunati Wildlife Sanctuary which is also prohibited in the protected area as stated by The Brick Burning Control Act 1989 (amend. 1995) and punishable offence under the Preparation of brick and kiln establishment (control) Act 2013. In many cases, BFD officials either deny that these activities are occurring, and are unable to do anything about illegal human settlements and deforestation within wildlife sanctuaries. At present, only 13.2% of land in Bangladesh has tree cover with canopy cover >30% (Alam, 2014), which is below than the target set for 2015 under the Forest Policy 1994. Moreover, exotic tree species *Acacia spp*. was discovered all over the northeast and southeast which satisfies domestic needs for timber, but results in long-term losses of native forests because exotic species suppress native plant community regeneration. Human settlements within reserve forests like Inani RF have monocultures of betel nut trees as cash crop. In these cases, the implementation

of policies to increase forest cover and forest co-management are not sustaining native forests and reduce biodiversity.

Lack of institutional capacity: The BFD staff is trained to manage forests primarily for timber revenue and commercially important species, and consequently many of their activities, like planting exotic acacia trees in once natural forests, result in biodiversity losses. Similarly the DoF manages fisheries only to the extent of collecting fees from the catches. They have no capacity to actually monitor the fish stocks for size, diversity, spawning locations or other biological parameters necessary to preserve biodiversity and long term stocks. While the DoE does participate in meeting requirements of international biodiversity-related conventions, there are no activities to comply with the needs mentioned in timely updates. DoE has practically no capacity to enforce the regulations associated with coastal or marine ECAs, and consequently there is virtually no enforcement of environmental laws, policies and acts on the ground. Although the Dhaka Zoo and Safari Parks are doing a good enough job holding animals these are not managed scientifically and inbreeding or conflicts between animals is common. The academic institutions in Bangladesh turn out many students but except in a few cases their ecology and conservation curricula are sparse. The Forestry and Fisheries Institutes only train about production and management of economically valuable species, often exotics. Gene banks likewise are only set up for agriculturally important species.

Despite these factors, there may be some opportunities within the institutional as well as legal framework of Bangladesh to make a difference through integration and coordination among the policies to achieve the common goal in respect to biodiversity conservation. Inter-sectoral conflicts still remain as a challenge towards mainstreaming biodiversity in the country.

D. KEY PROGRAMS ON BIODIVERSITY AND FORESTS

Many programs that cover biodiversity and forests in Bangladesh are heavily dependent on donor support and there is limited follow-through by GoB on several of these. Some of the current and recent past programs are described here. Information on the structure of the ministries and corresponding executive agencies of GoB on forests and biodiversity are covered in Section III C.

1. INTERNATIONAL DONOR PROGRAMS

USAID has supported a series of activities since 1997that successively build upon one another, beginning with the Management of Aquatic Ecosystems through Community Husbandry (MACH – 1997-2006) which addressed wetlands issues and extended to the country's terrestrial ecosystems through the Co-management of Tropical Forest Resources in Bangladesh (Nishorgo Support Project – 2003-2008). The Integrated Protected Area Co-management (IPAC – 2008-2013) project focused on developing a protected area (PA) management system covering wetlands, forest PAs, and ECAs. Climate-Resilient Ecosystems and Livelihoods (CREL – 2012-2017) is currently taking the same approach as IPAC, but with more focused attention on climate change adaptation. These programs are centered on PAs with themes of community co-management, stakeholder engagement, nature tourism infrastructure, alternative livelihoods and benefit-sharing, ecosystem restoration and rehabilitation, and institutional capacity development. Co-management activities have established local bodies to patrol PAs, collect visitor fees and other programs. USAID currently also supports biodiversity through a program focused on the

conservation of tigers, Bengal Tiger Conservation (Bagh) that works with the BFD. Another USAID program, ECOFISH BD, works with the DoF primarily on Hilsa (shad), a culturally and commercially important fish species.

The SilvaCarbon program is a collaboration of USG agencies (USFS, USGS, NASA, USAID), academic institutions and NGOs that aims to enhance the capacity of BFD to measure, monitor, and manage forest and terrestrial carbon. Although most of the program is related to climate change and terrestrial carbon assessment and management, the program only deals with information/monitoring of tree cover and carbon stocks, and not biodiversity directly.

The World Bank (WB) and Asian Development Bank (ADB) have included natural resource management (afforestation and other forest management activities), forest and biodiversity conservation in a number of multilateral funding loans and projects over the past 15 years. ADB is not currently funding any projects in the forestry and biodiversity sectors, but past programs include the Forestry Sector Project and the Sundarbans Biodiversity Conservation Project. WB has funded the Strengthening Regional Cooperation for Wildlife Protection in Asia to combat the illegal wildlife trade across four countries in South Asia (Nepal, Bhutan, India and Bangladesh). Other WB funding also supports a variety of forestry and biodiversity activities by NGOs, academic institutions and civil society. WB also supports the GoB Climate Change Strategy and Action Plan with the assistance of other donors. Biodiversity works into this program through afforestation and reforestation, alternative livelihoods and capacity development elements in nine coastal and hilly districts of southeastern Bangladesh.

UNDP/GEF has supported several projects helping GoB participate and implement activities related to UN treaties and conventions such as the Convention on Biological Diversity and the Ramsar Convention on Wetlands of International Importance and supports the work of the IUCN and Bangladesh academic institutions to prepare appropriate documents, update Red Book lists and other necessary activities. The UNDP/GEF project Coastal and Wetlands Biodiversity Project was the first effort to operationalize the ECA concept in the southeastern coastal area but has now ended along with their afforestation projects. UNDP is now working to reducing the impact of brick kilns on forest resources, supported research on river dolphins in the southeast and delta regions, and is currently supporting Bangladesh's REDD[1]-readiness process. USAID is also supplementing the UNDP Chittagong Hill Tracts Watershed Co-management project, which is working on improving forest resource management and reducing deforestation in CHT. FAO has worked closely with BFD to develop a national forest inventory and forest resources assessment in partnership with the SilvaCarbon program supported by USAID and other USG agencies.

Several European bilateral donors have been engaged in work on forests, coastal and wetland biodiversity, and other natural resource management/rural livelihood activities in Bangladesh. Currently, GIZ has a project supporting co-management activities in the Sundarbans and has also supported USAID/CREL work on wetland PA management in Baikka Beel. EU has worked in the past on biodiversity conservation in the Sundarbans, providing support to BFD, but the

[1] Reducing Emissions from Deforestation and Forest Degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

project was suspended due to difficulties in implementation and management of the project in partnership with BFD. DFID is supporting work on fisheries in Bangladesh. The Netherlands Government provides support for the Dutch-Bangla Bangladesh Delta Plan 2100 Formulation Project. This project is led by the Bangladesh Planning Commission and is supported by academic institutions, consulting groups and NGOs from the Netherlands and Bangladesh. The Plan is based on an adaptive delta management approach, which ensures that all sectoral investments take into account the long-term uncertainties related to climate change and growth. The Delta Plan process included a number of assessments on forests, biodiversity, water resources, climate change etc. In addition a Country Investment Plan for the Environment, Forestry and Climate Change sector is being prepared by FAO under the MoEF Support Project funded by USAID which will further address these issues.

2. ACADEMIC INSTITUTIONS/UNIVERSITIES

A number of universities and professional higher education institutions are actively engaged in education, training, research and extension work on forests and biodiversity in Bangladesh. Universities like Jahangirnagar University, Khulna University and Chittagong University conduct research on ecology, forestry, biodiversity at a variety of ecosystem scales, and climate change impacts on different ecosystems. The Wildlife Research Group of the Department of Zoology, Jahangirnagar University has been doing various research projects on wildlife ecology, management and conservation since 1990 and has developed biodiversity monitoring in protected areas of Bangladesh and completed biodiversity monitoring in nine PAs of Bangladesh and published illustrated books on their findings and other activities as well. Apart from training students in academic and applied aspects of forest and biodiversity management, these institutions engage with a wide variety of GoB agencies, donors, NGOs and civil society organizations, and communities engaged in a variety of NRM activities across the country. Some examples of academic institution engagement on forests and biodiversity include watershed management in the Chittagong hills, restoration of native tree species in forests, agroforestry best practices, PA monitoring in partnership with BFD and Arannayk Foundation, development of monitoring and species conservation plans for Bangladesh, and climate change impacts on mangroves forests in the Sundarbans. These institutions have published books on flora and fauna of major ecosystems in Bangladesh, and a wide variety of research articles, books and school-level environmental education curricula.

3. NGO AND CIVIL SOCIETY INITIATIVES

The Arannayk Foundation (AF) is a civil society-led entity established for tropical forest conservation through a unique funding mechanism, primarily from food aid debt relief provided by the USG to Bangladesh and from other donors, both public and private. AF is currently implementing a variety of projects in southeastern Bangladesh including habitat restoration, developing and supporting alternative livelihoods of those living near sensitive habitats, and various training and capacity-building programs.

IUCN is supporting GoB reporting on the Convention on Biological Diversity (CBD), and is engaged in implementing projects like Mangroves for the Future, wetlands conservation in Tanguar Haor, as well as projects on human-wildlife conflict management in the southeast (elephant corridors). IUCN has also been engaged in biodiversity assessment (Red list updated in 2015), as well as ADB supported projects on the Sundarbans. This organization is also

involved with the development of species conservation Action Plan for elephant, vulture, Gharial and others. The Wildlife Conservation Society (WCS) has a project in Bangladesh working on the conservation of river dolphins. WWF does not have an institutional presence within Bangladesh, but WWF-Washington maintains an active interest in threats to high-profile PAs like the Sundarbans, and the programmatic directions of international donors like the World Bank. During the assessment, WWF released a report on the status of major threats like shipping, the Rampal power plant and cement industries to the Sundarbans that received wide media coverage and GoB response.

Bangladesh also has a number of national and regional NGOs working on forest and biodiversity conservation. The Marinelife Alliance is implementing the Sea Turtle Project Bangladesh with assistance from WB to work with local communities on fishing practices and supporting the conservation of species of sea turtles in coastal areas. The Creative Conservation Alliance is newly established but the founders have been working with indigenous people in the Chittagong Hill Tracts to document species through camera-trapping and engage in other biodiversity conservation efforts. The Bangladesh Bird Club conducts bird surveys and monitoring of endangered bird species using satellite tracking and tagging. Other, like Nature Conservation Management (NACOM) and the Center for Natural Resource Studies (CNRS) are also engaged in various donor-funded biodiversity projects in Bangladesh.

4. ANALYSIS OF GAPS AND OPPORTUNITIES

Sustainable Programs on Biodiversity and Ecosystem-based Management within GoB: The Forest Department is still evolving from a colonial-era agency with a single purpose of generating revenue from timber species to a modern agency that sustainably manages an ecosystem of production forests, community-managed forests and a protected area network. DoF has similar issues, with a lack of understanding of how shrimp aquaculture and fishing technologies are driving the overall decline of fish biodiversity, and no long-term management plans outside of commercially important species like Hilsa. The assessment team saw widespread use and promotion of Acacia and Eucalyptus tree monocultures, even within protected areas like Chunati WS, which are non-native and harmful to the long-term biodiversity and native forest ecosystems of Bangladesh. BFD does not have institutional strategic plans or a vision for the management of PAs and wildlife/biodiversity. PAs are currently managed by territorial divisions and do not have individual management plans or objectives. The department lacks competent staffing and equipment and wildlife protection is not widely enforced.

Shifting from donor-driven approach to GoB investment in forests & biodiversity: The assessment team frequently heard the need for GoB to raise the profile of forests and biodiversity as a part of the national heritage and a basis for the long-term prosperity and security of livelihoods in the country. Despite decades of work, protected areas and biodiversity remain largely dependent on donor programs, and GoB agencies revert to old practices after these programs conclude. Infrastructure such as observation towers, interpretive centers and educational signs from the Nishorgo program still remain in a number of PAs but those visited for this assessment were disused and neglected. Donor programs also run the risk of reducing the importance of biodiversity and forest conservation, or even having adverse effects on biodiversity. Growing emphasis on climate change programs has greatly reduced attention to biodiversity concerns. In the case of projects like WB's afforestation project, plantation activities in coastal areas for "resilience" may come at the cost of eliminating mudflats and wetlands that

are an important habitat for migratory waterfowl. The excessive planting of acacias and other non-native species in protected forests is also very problematic to biodiversity concerns.

Supporting national NGO and civil society initiatives: A number of Bangladeshi NGOs (such as those supported by Arannayk Foundation) are creating local awareness and capacity for sustainable forest management, as well as a voice for forest-dependent communities. Organizations like Marine Life Alliance are continuing work on conservation of endangered species and habitat, working with fishermen to reduce the impact of fishing on the ecosystem. A network of citizen groups, academic institutions and local NGOs that participate in implementing various programs and projects on biodiversity represent a critical component of advocating for forests and biodiversity, monitoring the health of these resources, and protecting this natural heritage for the future of the Bangladeshi people.

E. DIRECT THREATS TO BIODIVERSITY AND FORESTS

The direct threats to biodiversity are those most evident on the ground. Many of these are visible from major roads and thoroughfares, and others may be hidden out of sight, but still play important roles in the status of biodiversity in a country. The indirect threats behind them are the most likely access points for donor and government interventions and these are covered in more detail in the following section.

Bangladesh, like most countries, is facing many direct threats to biodiversity. With accelerating economic development and a growing population, many of these threats will intensify as well.

Some major direct threats are summarized briefly here, in no particular order, since the importance of factors varies depending on location, species and other factors. It is beyond the scope of this assessment to prioritize these threats for Bangladesh. Threats were also not prioritized in the 2004 National Biodiversity Strategy and Action Plan and in the 2015 Fifth Report to the CBD which both involved consultation meetings, focus group discussions, people's responses, and regional and national workshops of country specialists held over a period of many months.

1. ENCROACHMENT IN PROTECTED AREAS

Forest, wetlands and other government fallow lands particularly in and around urban areas are being converted to industrial and other commercial uses by the wealthy and politically connected elite. In some forest areas private development occurs inside protected areas. The government has also relocated thousands of people in forests and ecologically sensitive areas, increasing this threat as they clear the land and develop farms, fish ponds and villages. The Chittagong Hill Tracts, Teknaf Wildlife sanctuary and Chunati Wildlife Sanctuary exemplify this trend of settlement followed by degradation. In Chunati WS there are an estimated 800 individual old growth trees remaining on 7700 hectares of land. Although a lack of data exists on the extent of encroachment in the past decades, new encroachment was seen by this assessment team in all PAs visited, including new betel leaf, betel nut and lemon gardens, recent forest cutting in Teknaf WS where Rohingya refugees have been relocated and new brickyards in Chunati WS.

2. DEGRADATION OF FORESTS AND WETLANDS

Shifting cultivation on the hill slopes and in the low-lying areas involves clearing forest vegetation using fire for agriculture, followed by fallow cycles that change natural vegetation of the forest and in some areas like the CHT this remains a problem. Diverse homestead vegetation in rural Bangladesh have also been converted to rapid growing exotic plant species such as Acacia spp. and Eucalyptus spp. in the last two decades. Native animal diversity, most notably birds, insects and frogs in homestead areas have been reduced due to monocultures of exotic species. The diversity of wild plants is suffering as well. Uncontrolled tourist activities also are a threat to wild animals and critical habitats for endangered species. As domestic tourism grows, there is increased tourist traffic in Satchari and Lawachara National Parks in the northeast and Sundarbans East Wildlife Sanctuary in Southwest. This causes disturbances like noise pollution, litter and habitat destruction of major tourist sites, which affects the natural environment and wild animal behavior and movement.

Along the southeastern coast of Bangladesh recent climate change efforts have included planting mangrove trees on mudflats where they never existed previously, thus displacing migrating shorebirds. Shrimp cultivation on Khash lands (state owned lands) in the southwestern part of the country is a big threat for biodiversity and mangroves (Sundarbans). Extensive shrimp culture is expanding severely in the inland side of the coast and the soil is becoming more saline. People cannot grow any homestead vegetables and fruit trees, fresh drinking water has become scarce in some areas and farmers are unable to cultivate paddy in these saline soils. Biodiversity of mangrove forest of Sundarbans is already at risk for salinity increase due to sea level rise and reduced upstream flow and extensive shrimp farming has added more stress on the biodiversity. Freshwater wetlands continue to be similarly degraded by agricultural and fish farming practices on leases granted by the MoL to well-connected outside entities reducing native aquatic biodiversity in these areas.

3. INFRASTRUCTURE DEVELOPMENT

The establishment of roads and other infrastructure in natural areas are increasing people's access and accelerating the forest degradation and fragmentation. As infrastructure like railroads, highways, factories, buildings increase, natural ecosystems are fragmented, blocking traditional wildlife migratory routes especially for elephants and degrading some remaining natural areas. The assessment team observed a new telecommunications facility blocking a traditional and well-documented elephant migration route in southeastern Bangladesh, despite attempts to bring the inappropriateness of this location to the attention of the government before it was constructed. The development of tourist infrastructure is also poorly planned, resulting in direct degradation of protected areas, and disturbance of key remaining wildlife habitat.

The Wildlife Team at Jahangirnagar University has recorded many incidents of animals (including threatened species) killed on the increasing network of roads and railways (Hasan *et al.* 2015). Cetaceans and marine turtles are also killed by impact with boats but no numbers exist as the carcasses are thrown back overboard without recording. Exploration for natural gas in southeastern Bangladesh also comes with a risk of death to cetaceans and other marine life. The development of a large port in Chittagong, increased shipping in the Sundarbans and the newly planned Rampal coal based power plant nearby will only increase the threats to biodiversity.

4. UNSUSTAINABLE AND/OR ILLEGAL EXPLOITATION OF LAND RESOURCES

Natural resources are being heavily exploited to fill the increasing demand of a growing and wealthier human population. Illegal tree felling, fuel wood collection, tree bark extraction, collection of materials for building and fences are responsible for habitat destruction. Production of construction materials like bricks and cement require fuelwood and other forest and mineral resources, adding pressure on remaining forest areas. Due to the harvest of large canopy trees the forest canopy is being fragmented and canopy attachments have been decreasing, restricting the habitat for arboreal animals

Many of the 29 ethnic communities of the country still consume wild prey including wild boar, barking deer, Indian hare, squirrels, small cats, monkeys, mongoose, and bats. In other forest areas amateur and professionals also hunt spotted deer and in the Sundarbans this reduces the available prey for the last tigers. Other animals are killed because of their interactions with people who have moved into their areas.

Tigers, clouded leopards, and many other species are also hunted illegally to fuel the high demand for animal products and trophies in China and Southeast Asia. According to the information from the Wildlife Crime Control Unit (WCCU) of the Forest Department from 2007- 2014 so far 18 mammalian species were involved in wildlife trade. *Rhesus* macaques, pythons and other species are also captured for the pet trade and for use by semi-nomadic groups who make money with performing animals.

5. UNSUSTAINABLE AND/OR ILLEGAL FISHING PRACTICES

To meet the increasing demand for fish, fishermen and local people have been harvesting fisheries resources in unsustainable ways. Fisheries officials say that the fish catches are reduced somewhat, but more importantly the size of fish caught are smaller, a telltale sign of over fishing. However no data exist to substantiate this. Fishermen are also using fine-mesh fixed nets in coastal areas that catch everything in the waterway, including non-target species and juveniles, reducing reproduction rates for all species. The use of gill nets for fishing is causing problem to the movement of dolphins both in freshwater and marine ecosystems. Local people in coastal areas also catch "mother shrimp" and shrimp fry for shrimp farms along with an inordinate amount of by-catch of other species which is just discarded. Catching fish by draining water from the wetlands during winter or pesticide/insecticide for fishing is also causing an adverse effect on fish production and ultimately on animals that feed on fish. There is documented use of banned pesticides like DDT in curing dried fish, with important consequences for health in human populations as well. With no monitoring programs in place there is no data on the extent of these problems but many interviewees talked about them, and examples were seen by the assessment team in the field.

6. CHANGE IN HYDROLOGICAL REGIME

Dams in upstream countries are reducing the flow and seasonal patterns in most of the rivers in the country. As a result, most of the rivers are drying up in winter and suffering from flash floods during monsoon, a problem that is exacerbated by climate change. Hydrologic changes affect fish populations in these rivers, and this affects the entire food web, including endangered species like the Ganges river dolphin and crocodilians. This also hampers the migration and

breeding of fishes in connecting small rivers, canals and wetlands and those bird and mammal species dependent on fish migration patterns for food.

Degradation of hill forests also causes hydrologic changes and siltation of water bodies, with subsequent drying up of dry season water availability in hill creeks. This results in the reduction of essential water supplies for animals in these areas. Salinity changes due to sea level rise and reduced river flow are also impacting coastal environments.

7. POLLUTION

Untreated industrial water, excessive use of chemical fertilizer and pesticides, spillage from industrial shipping are polluting rivers and wetland ecosystems in Bangladesh. This affects reproduction in fish, amphibians and insects that breed in aquatic habitats. These species are highly sensitive to water quality changes, and reproductive organs are very sensitive to pollution. Ultimately the ecological balance breaks down and poses adverse effect to the wetland dependent animal populations. Accidents like the Sundarbans oil spill in 2014, and the coal barge sinking also have devastating consequences for the entire ecosystem, with effects lingering for generations at every level of plant and animal communities. Other forms of pollution like noise and air pollution are also likely to affect forests and biodiversity through a range of effects that is poorly understood due to a lack of study and baseline data.

8. INVASIVE SPECIES

Invasive species are generally introduced for economic or commercial uses, with major consequences for biodiversity. Tilapia from fish farms are now common in water bodies, replacing native species. Acacia and eucalyptus trees, planted by the BFD for timber value have taken over natural forests. These trees have also been planted in coastal areas and other places where they do not belong. These trees, besides being exotics, also do not support an understory of other vegetation, so biodiversity in these areas is lost.

F. INDIRECT THREATS TO FORESTS AND BIODIVERSITY

The direct threats described in the previous section all involve on-the-ground activities and trends that have a negative impact on forests and biodiversity in Bangladesh. These threats all have broader indirect or institutional threats that support and encourage them. It is in the area of indirect threats/root causes that donor, NGO and Government of Bangladesh (GoB) activities can show the most effectiveness. The Bangladesh government produced Fifth Report to the Convention on Biological Diversity (2015) lists five main indirect threats: 1) economic systems and policies; 2) legal and institutional systems; 3) inequality in ownership and benefit sharing; 4) erosion in genetic diversity and 5) knowledge and awareness but these were not prioritized in the report. This biodiversity assessment team has broadened this list to include ten different indirect threats described here, as with the Fifth Report, listed in no particular order of importance as this varies from by situation and habitat.

1. POOR INSTITUTIONAL CAPACITY

The limitations of the natural resource related government agencies include poor institutional capacity, insufficient manpower and lack of logistical and operational support. The Bangladesh Forestry Department (BFD) and the Department of Fisheries (DoF) both have an acute shortage of field level staff to oversee the resources or to enforce laws. Most of the peripheral forest offices have no vehicles or travel allocations to make necessary field interventions and the DoF has lacked its own vessels, but soon will have one research vessel being procured in Malaysia. At the higher levels of BFD and DoF there is little knowledge of the importance of biodiversity; forest officers are trained to manage trees and to create single species (often exotic) plantations. Likewise DoF officials are only trained to handle economic species and collecting license fees. Historically and to present times the BFD and DoF have the mindset to manage for revenue not ecosystem health. Similarly the Department of Environment (DoE), which has jurisdiction over non-forest lands that may contain biodiversity, including many ECAs like wetlands and coasts, lacks the enforcement capacity or interest to effectively manage these resources for biodiversity. DoE activities are largely dependent on donor funding, and there has been no investment since the end of major UNDP/GEF projects on ECAs. Other lands, including extensive wetlands that come under the control of the Ministry of Lands (MoL) are also only managed as a resource to give away to industry or private developers to increase revenue.

2. LACK OF COORDINATION AMONG DIFFERENT AGENCIES

There is no co-ordination among different GoB government agencies in the management of biodiversity and natural forests. At the central government level there are overlaps between the jurisdictions of BFD, DoE and MoL when it comes to certain habitats like trees in forests, and in villages and wetlands. There are also parallel responsibilities between the MoEF and MoFL, and often people seek permits from one or the other depending on which agency is most amenable to the request. MoL also has the power to give leases of freshwater wetland parcels to private individuals for one or two years and these people drain all the resources and move on. Under this system DoF cannot work to manage the resources in an ecological manner or work with local stakeholders to do so. At local levels these problems persist. Although a BFD forest guard might apprehend a poacher or illegal timber harvester there is generally no backup from police, rapid action battalions (RAB), coast guard or other agencies with a presence on the ground. Coordination gaps or overlaps are also found among different projects and among different donor agencies, especially in high profile areas like the Sundarbans. There is also a lack of coordination at the transboundary level, and especially between water rights and usage between Bangladesh and neighboring countries that are the upstream sources of water in the country.

3. POLICY AND INFORMATION GAPS

Although Bangladesh has a number of sound policies regarding biodiversity and environmental protection there are still many gaps. Wetlands, for instance, are scantily covered, and generally only as land that can be converted to agriculture or aquaculture. There are also few single species action plans for endangered species like sea turtles and migratory endangered birds. The long term sustainability of donor initiated projects is a problem, and progress during a 3-5 year period of project activity is not sustained by the government.

Community co-management of protected areas and wetlands is also not supported by national level policies, and often conflicts with the vested interests of BFD. Even in many peripheral forest stations BFD communities do not buy into the co-management process when they see that these committees are taken over by powerful local interests that manage things for their own benefit.

Aside from some modest university efforts, there is also an almost complete lack of baseline surveys of forest, wetland and aquatic species that are essential to effectively manage these resources and there are no monitoring efforts to evaluate progress (or declines) in species occurrence, abundance and distribution.

4. LACK OF ENFORCEMENT

Environmental crime is not seen as being equal to other types of crime either by the communities or by law enforcement entities. Although natural resources related laws exist, there is generally no enforcement on the ground. Poachers are often politically connected through elites, and often are protected by their contacts and corruption in the system. Even when a case makes it into court, there is no salary, fuel costs or logistical support for BDOF forest guards or fishery personnel to appear in court, and prosecutors are poorly trained in how to handle evidence or prosecute cases on poaching or trafficking. According to one estimate, there is only one recent case of a successful conviction of tiger poaching, while there are regular seizures of tiger parts and carcasses. Less prominent species like deer and turtles are hunted and trafficked with impunity at many levels. Environmental laws in Bangladesh are not yet seen as important.

Political unrest restricts the control of law enforcement which give extra advantages to the illegal timber extractors and poachers. This situation is especially critical in the Chittagong Hill Tracts and Cox's Bazar, a remaining stronghold for important biodiversity in Bangladesh. Immigrants and refugees in this area indiscriminately hunt and clear the forests, at the behest of local mafias that trade in timber and wildlife. Military cantonments here have similar effects on the remaining critical biodiversity still found in this border area.

5. INADEQUATE AND POORLY MANAGED SYSTEM OF PROTECTED AREAS

The Declaration of Protected Areas (PA) in Bangladesh often exist in name only; ground realities show very poor realization of protected status. Although there are dozens of PAs in the country many are 500 hectares or less—too small to provide adequate habitat to preserve many species. In addition, the PA system only includes forests, and does not cover some of the most important biodiverse wetlands areas in the north of the country. Even the single Ramsar site outside of the Sundarbans, Tanguar Haor, a stronghold for remaining natural swamp forests and important bird species, has no official recognition as a protected area. Although there are coastal ECAs there are no designated protected areas and the mudflats important for migratory birds and the sandy beaches important for nesting sea turtles and other coastal species.

In the field there is also no distinction between protected and non-protected areas, with boundary areas often not demarcated and with areas of heavy use, like villages, agriculture and even factories located within protected areas or forests. None of the prohibitions for PAs are being implemented properly. Even core areas that are supposed to be protected from most

human activities allow entrance of people, collection of timber, cattle grazing, soil, water and sound pollution and other unlawful activities. There is also a lack of coordination among agencies at all levels with an interest in forests and protected area, a fact reported by a number of government officials interviewed as part of this assessment

6. CORRUPTION

Corruption is evident at all levels of biodiversity and forest conservation activities. In most cases it is expected that those with strong political connections or wealth can circumvent existing laws and policies to obtain individual favors, rights to use even protected land for their activities, and immunity from wildlife crime prevention efforts.

7. LACK OF POLITICAL COMMITMENT

Repeatedly the assessment team was reminded that the "mindset" of Bangladeshi people at all levels is to use natural resources for economic gain, and not to protect or conserve the environment or the country's natural heritage for the future. This is evident in donor funded projects that make some progress, but revert back to original conditions when donor money stops cycling in. In the field this can be seen in the crumpling infrastructures in national parks, which have had no maintenance once projects end. Similarly data collected from a project rarely gets institutionalized and baselines for most natural resources do not exist. Lip service commitment to biodiversity conservation from government higher authorities may be seen for public relations purposes, but is largely absent in practice or beyond the life of donor-assisted programs.

8. LACK OF AWARENESS

Most of the people in our country are not aware of the necessity of biological diversity and the importance of conservation. City residents are far removed from biodiversity concerns, and even at local levels misconceptions about wild animals and natural resources leads to indiscriminate killing of some animals, destructive and unsustainable fishing practices and degradation of key remaining natural habitats.

This problem is also evident in the field. For instance military cantonments and telecommunication facilities in Teknaf wildlife sanctuary block traditional elephant migratory routes, brickyards are placed near protected forests where wood is used for fuel, and encroachment into natural areas is escalating. On the marine side fisherman remain unaware of the overall long-term consequences of using fine-meshed nets and routinely catch and dispose of large quantities of by-catches including young of target species.

9. CLIMATE AND BIOPHYSICAL CHANGES

Climate change is being recognized as a global crisis threatening human survival and biological resources. The biophysical changes in the environment like rainfall variability, frequent natural disasters, increase in temperature, sea level rise, reduced upstream flow, salinity increase, sedimentation etc. have an underlying effect on present and future biodiversity in Bangladesh. Already it has been found that the Sundarbans are getting more saline closer to the land area

and the natural areas of less salty water which harbor the most biodiversity, are shrinking as these areas cannot expand due to human settlements and infrastructure here. Although the southern parts of the country are more vulnerable to biophysical climate change effects, crops throughout the country also are subjected to unexpected weather that influences yields and conditions for different species. Native animals and plants face similar situations and as their habitats continue to shrink and with no corridors for travel many species are unable to adapt to these changing conditions.

10. LACK OF ALTERNATE INCOME GENERATING ACTIVITIES IN SENSITIVE HABITATS

Most people living in and around PAs and ECAs support themselves through resource extraction from these areas. With a large population and scarcity of land for agriculture, forested or natural areas like southeastern Bangladesh, where the government has resettled many thousands of people. In recent years this problem has intensified and the presence of large refugee camps of Rohingya people from Myanmar in areas like Teknaf wildlife sanctuary. With no other options these people engage in unsustainable practices in both the forests and along the coast, and populations have grown, driving a vicious cycle of degradation and deforestation. Although a few donor programs have provided training in other income generating activities, the need for more such programs is critical and growing.

G. ACTIONS NECESSARY TO CONSERVE BIODIVERSITY AND FORESTS

There are a myriad of direct threats to biodiversity and forests in Bangladesh, but these all stem from various institutional deficiencies that are described here. The key to success of these activities, however, is to find ways to institutionalize these actions within GoB agencies to encourage their ownership of project results and their actions to sustain them when the projects depart. The following chart suggests some recommended actions for the country based on the analyses of this biodiversity assessment team. Although similar actions are mentioned in GoB reports and updates to international conventions and in strategic plans outlined in Chapter III C, implementation is still lacking. A major problem identified throughout this assessment is this: although there are ample and updated strategies, laws and policies these exist only on paper without the necessary follow through needed to accomplish them.

Root Causes/Indirect Threats	**Actions Necessary**
1.Poor institutional capacity	1.1. Strengthen the institutional capacity of BFD, DoF and DoE especially the Wildlife, Nature Conservation Circle and Wildlife Crime Control Units with more resources, tools and training.
	1.2. Follow up on successful donor-supported projects to engrain these results within the institutional mandates of the DoE, BFD and

	DoF.
	1.3. Support a National Wildlife Advisory Board that coordinates species conservation activities, including migratory birds, forest wildlife, and freshwater/marine species
	1.4. Support and encourage exchange programs at regional and international levels, professional studies and trainings, and cooperation with similar institutions in foreign countries.
	1.5. Support the placement of national and international experts in key natural resources and conservation institutions.
2. Lack of coordination among different agencies	2.1. Strengthen mechanism where international donors and project implementing agencies in the environment field gather regularly to share ongoing project results, data, lessons learned and information on planned projects.
	2.2. Support shared wildlife crime and natural resources trafficking training for police, forest guards, coast guard and other law enforcement agencies.
	2.3. Support joint workshops and regular meetings for government officials in different agencies involved in natural resources activities.
	2.4. Reconcile the overlaps between the Ministry of Land, Ministry of Fisheries and Livestock and Ministry of Environment and Forests in environmental permitting and sensitive land allocation policies.
	2.5. Reduce or stop the system of short term leasing of wetlands by the Ministry of Land to enable the wetlands to be managed by DoF for ecological integrity and long term sustainability of fresh water fisheries and the rest of the biodiversity naturally found in these areas
3. Policy and Information Gaps	3.1. Develop a national biodiversity monitoring system and support its implementation to include collection of baseline data on status, abundance and distribution of species and regular monitoring of changes.
	3.2. Encourage development and implementation of recovery plans for endangered species.
	3.3. Support creation of an Environmental Management Training Center for employees of government agencies, NGOs, academic and

	education institutions and others.
	3.4. Encourage co-management activities that include sound representation from local communities, not only the rich and politically connected.
	3.5. Ensure inclusion of environmental concerns in municipal and regional development plans.
	3.6. Encourage the development of species recovery plans for endangered species beyond tigers: Sea turtles, spoon-billed sandpiper, Ganges river dolphin, etc.
	3.7. Support the development of a special unit, like the wildlife crime control unit, with capable officers and resources to restore and manage wetlands scientifically, and create a model of wetland management that works in the country context.
	3.8. Stop the practice of resettlement of people into areas near PAs and in ECAs.
4. Lack of enforcement	4.1. Provide more support for forest guards, fisheries and environmental officers to follow through on prosecutions of those apprehended through the court system. Develop prosecutorial capacity to increase successful and visible prosecution of poachers/traffickers.
	4.2 Increase the profile of environment and natural resources crimes in all law enforcement institutions (police, forest guards, border guards, rapid action battalions, coast guard, etc.)
5. Lack of adequate system of Protected Areas	5.1. Demarcate boundaries of protected areas, including core areas and place appropriate signage.
	5.2. Create new freshwater wetland protected areas.
	5.3. Strengthen enforcement of PA and ECA laws including resource use, land encroachment, etc.
	5.4. Manage tourism activity to control habitat degradation and spread awareness of the resource. Restrict tourist activities and most human activities in core zones and critical biodiversity areas like Satchari and Lawachara NPs, Sundarbans WS and places harboring remaining patches of important biodiversity in Bangladesh.

	5.5. Expand existing system of PAs to include larger tracts where necessary for science-based conservation of biodiversity.
	5.6.Encourage enrichment planting of native tree species for restoration of habitats and prohibit the planting of exotics like *Acacia spp.* in PAs
6. Corruption	6.1. Conduct institutional and legal reforms to clearly separate the responsibilities and actions of those responsible for environmental law enforcement from those that are involved in daily management of the natural resources.
	6.2. Heighten awareness of the intrinsic value of natural forests and native biodiversity to the local populace and provide and increase successful prosecution of poachers. This requires high-level political commitment and leadership to demonstrate that elites cannot evade the law on wildlife crime.
7. Lack of political commitment	7.1. Perform in-depth economic and intrinsic (cultural, aesthetic) valuation studies of ecosystems and biodiversity to inform decision makers on the necessity to allocate funds for nature conservation.
	7.2. Work with local politicians to raise profile of forests and wildlife and to build public opinion about the value of natural resources to their own future.
	7.3. Help initiate or strengthen standing committees on natural resources concerns at the union parishad level in areas near wetlands or protected forests.
8. Lack of awareness	8.1. Create awareness of such features as traditional elephant migratory routes to avoid placement of cantonments, telecommunication centers and other large infrastructures in such critical areas. Relocate such facilities where they have been poorly placed.
	8.2. Integrate biodiversity and environmental sustainability themes into national education standards and curricula.
	8.3. Support informal learning activities involving nature, like festivals, nature clubs, and school nurseries/forests in villages near PAs and ECAs. Develop and promote "animal characters" that can help teach children about nature. Encourage responsible tourism and use of national parks and protected areas.
	8.4. Enhance the role of NGOs and civil society in conducting

	environment education campaigns.
	8.5. Encourage media attention to the issues of conservation and sustainable use that provide practical approaches that people can implement. Work with prominent leaders or significant public figures on spreading the message on the importance of wildlife and forests in Bangladesh.
	8.6. Highly publicize those convicted of wildlife and natural resources crime, and instances of lack of enforcement as well.
9. Climate and biophysical changes	9.1. Establish baselines to study climate change impacts on biodiversity and establish a monitoring program to track changes.
	9.2. Develop adaptation "best practices' for forest wetlands and other natural resources agencies.
	9.2. Support better transboundary management of rivers and water systems.
10. Lack of alternate income generating activities in sensitive habitats	10.1. Expand upon programs that provide alternative sources of income for those living near forests, sensitive wetlands and ECAs.
	10.2. Encourage the development of such programs for people currently dependent on unsustainable fishing practices like the collection of shrimp fry (and overwhelming bycatches) in coastal areas.

IV. ANALYSIS OF USAID BANGLADESH CDCS IN CONTEXT OF TROPICAL FOREST AND BIODIVERSITY NEEDS

A. OVERVIEW

USAID/Bangladesh is operating under the Country Development Cooperation Strategy (CDCS) FY2011- FY2016, and the next five-year CDCS (2017-2021) is currently being formulated. This 118/119 Tropical Forests and Biodiversity Assessment is part of this process and provides input that will be considered as the CDCS shapes up further. The assessment team was given no information about the potential new CDCS; this analysis concerns only existing programs and activities of USAID/Bangladesh.

The current CDCS goal is for "Bangladesh to become a knowledge-based, healthy, food-secure and climate-resilient middle income democracy." To this end there are four development objectives (DOs):

DO1: Citizen Confidence in Governance Institutions Increased

DO2: Food Security Improved

DO3: Health Status Improved

DO4: Responsiveness to Climate Change Improved

Biodiversity and forest-related activities are firmly seated within DO4 and are supported by Biodiversity ear-marked funds from USAID/Washington, other Mission funds, and some partnerships with other donors and international organizations.

This assessment primarily focuses on the activities covered under DO4 (Section IV B) to determine the "extent to which" the Mission meets the "needs identified" in Section III G.

The programs of the other DOs were also considered for their possible biodiversity and tropical forest linkages and any ways in which their activities might be harmful to biodiversity and forest conservation in the country (Section IV C).

Finally, in Section IV D some programmatic recommendations to USAID are given that this assessment team believes will fit into the current (and planned) Mission portfolio and will help the efforts to conserve biodiversity and forests in Bangladesh

B. ENVIRONMENT, CLIMATE CHANGE AND ENERGY PROGRAMS

1. BACKGROUND

This office works to support DO 4: Responsiveness to Climate Change Improved through at least 19 different activities. Four of these programs have strong biodiversity components: support to the Arannayk Foundation, Climate-Resilient Ecosystems ad Livelihoods (CREL) , Enhanced Coastal Fisheries (ECOFISH), and Bengal Tiger Conservation (Bagh). In addition USAID is working to strengthen the Ministry of Environment and Forests (MoEF), collaborating with UNDP is working to develop watershed management the CHT, and along with the Department of the Interior is working to strengthen ecotourism for achieving climate change resilience. A number of programs are primarily focused on forests and climate change, including SilvaCarbon and support for national forest inventories and REDD+ capacity. Other programs of this office are designed to enhance renewable and/or clean energy initiatives, and to involve more women and young researchers in various programs.

2. PROGRAM ANALYSIS

In the previous section this FAA 118/119 assessment, the status of biodiversity and tropical forests in Bangladesh, the institutional framework and programs, and direct and indirect threats to conservation of these natural resources have been discussed. This information forms the basis of a series of recommended actions necessary to conserve biodiversity and forests in the country. In this chapter, the extent to which the actions supported or proposed by the agency meet the needs thus identified are determined, focusing on programs with the most biodiversity and tropical forest elements. The numbers in the discussion below refer to the list of recommended actions to conserve forests and biodiversity, in Section III G.

Arannayk Foundation (AF): AF was jointly initiated by the Government of Bangladesh and the US government in 2003. USAID provides about $8.5 million to this foundation for the period from 2000 to 2018 and it gets funding from other sources as well. AF is well established in CHT, an area with some of the most biodiversity remaining in the country, around ECAs, and protected areas in other parts of Bangladesh. AF makes loans to civil society organizations that conduct a variety of forest management and alternative livelihood activities to reduce degradation from forest resource extraction (10.1; 10.2), builds awareness about biodiversity (6.2; 8.3), helps develop co-management activities (3.4) and manages a biodiversity database of survey information (3.1) in PAs collected by the Wildlife Team of Jahangirnagar University.

Climate-Resilient Ecosystems and Livelihoods (CREL): CREL has an expansive portfolio of work in and around protected areas, with local communities, and government officials at many levels. Although climate change resilience is the focus, the program also targets the conservation of forests, wetlands and related biodiversity. CREL works at the central government level to increase capacity (1.1), reconcile differences among different agency agendas (2.4), particularly in

the area of co-management, help expand the system of national PAs (5.5), and create new freshwater wetlands protected areas (5.2). Under CREL's awareness and training activities it directly targets recommendations 8.2 at the university level with expanded curricula and 8.3 with programs at the community level. CREL collects baseline data (3.1) for fish and birds in select areas, although not at the national level, and works to develop representative and transparent co-management groups (3.4). Through its economic assessments, CREL addresses the need for environmental economic information to change political commitment at higher levels (6.1), and also local levels (7.2). Much of its work also targets alternate income generation in areas around PAs, wetlands and other sensitive areas and covers both 10.1 and 10.2, primarily in inland freshwater ecosystems.

Enhanced Coastal Fisheries (ECOFISH BD): ECOFISH is focused primarily on the culturally and economically important *Hilsa* (shad) fish but its work is broader than this. The program support for research on the biology, migration and spawning habitats of *Hilsa* are a strong step towards recommendation 3.1 (science-based monitoring). ECOFISH also works to develop alternative livelihood for fishermen and directly addresses 10.1 and 10.2. The work of ECOFISH also serves to build awareness in the Department of Fisheries about the use of biological and ecological knowledge in the management of marine resources.

Bengal Tiger Conservation (Bagh): The Bagh activity focuses on tigers and their habitat but also works to address some of the recommendations of this assessment team. It directly addresses information gaps about tigers and habitat, works to collect survey and monitoring data (3.1), and works with local co-management teams (3.4). Much of its program targets the illegal wildlife trade by providing support for local guards (4.1). Through activities like visibility at festivals and the use of tigers as characters, it directly addresses informal learning activities (8.3).

Chittagong Hill Tracts (CHT) Watershed Co-Management: This activity works to improve governance in CHT at all levels and promote conservation of forests through a watershed management approach. The work at the local level to develop alternative livelihoods for forest-dependent people directly targets recommendations 3.4 and 10.1. At higher government levels, it also works to increase collaboration and increase environmental awareness among government officials (8.5). CHT is seen as the best target for future biodiversity investment in Bangladesh and all programs in this area contribute to this end.

Strengthening the Environment, Forestry and Climate Change Capacities of the Ministry of Environment and Forests: This program, in collaboration with FAO works at the policy level to enhance the environment, forestry and climate change sector's contribution to the Bangladesh Country Investment Plan. Biodiversity concerns can and should fit within this framework. This activity thus addresses overall recommendations regarding poor institutional capacity (1.2; 1.6) and, with a bit of tweaking could also address the lack of information available to the government about biodiversity concerns (3.1).

SilvaCarbon and National Forest Inventory: This is a technical cooperation program between USG agencies, academic institutions and NGOs with the aim of enhancing the capacity of partner country governments to measure, monitor and manage terrestrial carbon. In Bangladesh, USAID supports work on developing the national forest monitoring system, which includes two major components: developing capacity for mapping and monitoring forest cover using remote sensing methods, and developing a national forest inventory (NFI). SilvaCarbon work supports the development of institutional capacity, particularly within BFD (1.1, 1.4, 1.5),

addresses policy and information gaps on the status of forest resources, and supports coordination between donors, particularly FAO, World Bank and other multilateral donor support for NFI.

3. OVERALL CONCLUSIONS ABOUT DO4 PORTFOLIO

The DO4 portfolio is strongly focused on co-management, including local stakeholders and government agencies in many of the programs. The mid-term evaluation of CREL has looked closely at the co-management practices being implemented in Bangladesh (USAID, 2016) and concluded that most of the project indicators are being met but financial sustainability remains a problem. CREL is more focused on management training and not revenue generation but future programs might address this aspect more strongly, in conjunction with alternative livelihood opportunities and maybe ecotourism, if done away from environmentally sensitive areas. The assessment team also heard from stakeholders who felt that in some cases powerful entities were able to usurp co-management committees for their own interests. Safeguards need to be instituted to discourage this outcome.

Alternative livelihood opportunities and strategies that reduce unsustainable extraction or degradation of biodiversity and forest resources is another strong component of this portfolio. The Assessment team documented several examples of the resettlement or migration of marginal populations into forests, wetlands and coastal areas, and the resulting degradation of forests, land and aquatic resources. The provision of alternative livelihoods to these communities, and reducing their exploitation by vested interests has been viewed by many as a critical mechanism for protecting forests, biodiversity and critically endangered habitats in many parts of Bangladesh, but large scale evidence is still lacking. The recent CREL Mid Term Evaluation (USAID, 2016) concluded that men are the largest resource extractors from forests, but women are mostly involved in the small-scale alternative livelihood activities presented to them. The team did visit two villages in the southeast where alternative livelihoods have been advanced by the Arannayk Foundation and there was evidence that the forest nearby has regenerated in recent years from prior destructive practices.

Climate change issues and particularly forests are another strong part of this portfolio, but these programs should not encourage non-native monoculture plantations in remaining natural forest tracts solely for carbon sequestration benefits. Reducing deforestation and degradation of forests, as well as protecting natural mangroves and wetlands has benefits for climate change, resilience and biodiversity, and efforts should be made to align climate change programming to maximize these benefits

The Chittagong Hill Tracts and nearby southeastern coast of Bangladesh are critical areas of remaining forest and coastal habitats that are highly threatened, but receive relatively scant donor programming compared to areas like the Sundarbans. USAID's efforts on increasing awareness, building stronger institutions and engaging communities through alternative livelihoods and co-management activities could greatly benefit biodiversity and forests in these areas. Freshwater wetlands make up about 50% of the land area of Bangladesh but little attention is made in this portfolio to address biodiversity and fishery concerns here. Some of the key challenges for wetlands are restoration of degraded wetlands, and adaptive management in the face of biophysical changes like reduced freshwater flows and pollution. A broadening of activities in this realm could be important to aquatic biodiversity in this country.

C. OTHER USAID OFFICES

Biodiversity and Conservation Aspects in Other Sectors

Although biodiversity and forest conservation activities are not the focus of programs in the Health, Democracy and Agriculture portfolios there are a number of ways that these issues can be addressed in the programs of other disciplines. There may also be some areas where biodiversity and forest concerns may be jeopardized through the actions of other USAID program teams. Other ideas for synergies between various programs and NRM objectives are also discussed on a Development Objective (DO) basis, based on interviews with key representatives of the non-NRM program teams and an analysis of the program materials that were provided.

1. DO 1: CITIZEN CONFIDENCE IN GOVERNANCE INSTITUTIONS INCREASED – OFFICE OF DEMOCRACY AND GOVERNANCE (DG)

Program Summaries: Programs in DG are conceptualized in three main areas: Human rights and justice; political; and good governance encompassing eleven different activities managed by this office. The bulk of these programs have little or nothing to do with biodiversity and forest related matters at the present time.

Where Biodiversity is/could be included: With a bit of tweaking some biodiversity related could be included in some of these programs, especially the Access to Information (A2I) and Local Governance, which has ended but could be reinstated in the future.

1. A2I helps strengthen government transparency by expanding the availability of digital information used in government programming, primarily through assistance of IT professionals and training of service providers to improve their digital literacy. This program also helps digitize relevant information to make this more available to anyone who needs it. The Ministry of the Environment of Bangladesh would benefit from such services in a number of their departments. For instance, the Forestry Department, with FAO support, conducts forest assessments and inventories, but this data is sometimes lost between project cycles. Digitizing past data and incorporating this with present and future data that is obtained would facilitate decision making in this sector. Similarly there is at present no clear way that the data on biodiversity that is collected by college faculty and students throughout Bangladesh is integrated into the planning and management activities of the Forest Department. A21 could help in developing a system to make this information more widely available beyond the academic literature where it now "hides" from government officials.

2. The Local governance set of activities has been completed but there still remains interest in expanding on this project in the future. This could be a strong access point for further biodiversity and forest conservation activities in those areas of Bangladesh that are near protected areas, natural wetlands and other areas of biological significant that remain in Bangladesh. The Bangladesh government already has a system set up at the union parishad level that allows for the development and inclusion of standing committees on various topics of interest to the communities. The Arannayk Foundation has already tapped into this resource and has helped to initiate conservation-related activities in certain areas. The DG office could

work to spread and support this work in other communities where the need exists but nothing has yet been initiated. In concerned communities the development of standing committees that include local people impacted by biodiversity (or the lack thereof) could be a valuable effort not only in teaching democracy, but in helping local people protect the natural resources they may rely on for subsistence and sustainable revenue-making activities like collection, processing and sale of honey, medicinal plants and other non-timber forest products and ecotourism ventures.

Possible negative impacts of DG programs on biodiversity and forests: No negative impacts of these programs are evident.

2. DO2: FOOD SECURITY INCREASED – ECONOMIC GROWTH OFFICE

Program Summaries: The agriculture and nutrition portfolio includes at least 29 different activities managed by a myriad of government, NGO and private sector partnerships. The basic strategy is to work with private sector entities that are country-based and then to have these groups work to influence relevant government agencies and policies. Some of the activities are research focused, others are focused on increasing productivity in existing farms and fish ponds, and others are designed to offer further training to farmers in more sustainable and productive farming techniques. None of these programs directly include biodiversity concerns, and a few may even be counter to biodiversity concepts. It is widely understood that feeding the people is the primary goal, but in some cases it may be possible to mitigate the activities to avoid undue harm to any natural ecosystems remaining in farming areas. In this regard all USAID programs also must comply with the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) which abides by the same EPA regulations that are followed in the United States.

Where Biodiversity is/could be included:

Integrated Pest Management: Biodiversity concerns are only tangentially included in agriculture programming but there are a few programs where it is evident. Funding from USAID/Washington is being used to promote integrated pest management in various USAID/Bangladesh activities. This helps biodiversity by reducing the use of pesticides, while encouraging alternative ways to manage crop pests using biological control like pheromone traps, natural predators of pest species and targeted microbes. The more these activities are spread through USAID programs and agricultural extension activities, the better. Other activities to teach farmers best practices in using environmental friendly and approved pesticides in safe doses will help in this matter too. Widespread and unsafe pesticide use in Bangladesh is a key issue tied to the loss and degradation of many habitats and the species that depend on a healthy food chain and less is better.

Livestock Production for Improved Nutrition: One aspect of this program is to encourage livestock farmers to plant multiple species of forage crops, instead of monocultures of single crops, in their areas. This can enhance biodiversity to some extent, if these are native species. There are also no pesticides used on the forage crop plant plots, and little to no fertilizers are needed, other pluses.

Diversification of Crops: USAID is also working with farmers to help then plant diversified crops instead of primarily rice. By cycling different crops like mung beans, maize and sunflowers in the fields some biodiversity may be enhanced.

Homestead Gardens: Although at present there seems to be no program focusing on homestead gardening, this could be an important area of biodiversity conservation. Homestead gardens are by nature diversified and can produce much of the fruit and vegetables a village needs for good nutrition. In Bangladesh those areas with rich and diverse household gardens are also those with the most visible bird, butterfly and other visible biodiversity elements. Efforts to expand the use of these home gardens throughout the country (and not to discourage them in favor of monocultures of crops for market) can go a long way towards preserving the fragile biodiversity that remains in the country.

Shrimp Farming: USAID works with shrimp farming in the Feed the Future zones which unfortunately do not include southeastern Bangladesh, an area that lags behind the Sundarbans in resources and has a lack of technological input. Because of this, shrimp farmers still rely on collection of fry from the wild, with lots of bycatch wasted and other unsustainable techniques that negatively impact biodiversity. If these programs were extended to this area much could be accomplished that would help the fisheries sector and biodiversity conservation as well.

Possible negative impacts of programs on biodiversity and forests: There are many potential negative impacts on biodiversity possible within agriculture programs and trade-offs are necessary to meet both agriculture and biodiversity goals.

Agricultural Expansion: Great care must be taken that agriculture programs do not encourage expansion into more natural lands for the increased production of crops. Instead efforts need to be contained to increase production within existing cropland and fish/prawn farms, but not to expand them horizontally across the landscape.

Livestock Fodder Crops: The livestock fodder programs, for instance, are problematic if this is encouraging the planting of select grass species in areas that for the moment are full of a much wider diversity of natural plant species—this in effect is expanding into natural areas. If, however, these multiple fodder species are planted where there already are monocultures of single species of fodder grass, then it is not problematic. A case by case basis is needed to evaluate this program in different areas to see the biodiversity impacts.

Shrimp, prawn and fish farms: Similarly work with prawn and fish farms needs to ensure that more ponds are not being dug, but that productivity is encouraged in ponds that already exist. In areas adjacent to saltwater sources where shrimp are raised in ponds the channels from the sea to these ponds also may serve to increase the salinity into the soils further inland, which has an impact on native species. Stock used in shrimp farms should not come from the wild, where by-catch of non-target species is a severe problem. Care must also be taken that the runoff of these ponds containing antibiotics and other chemicals does not make its way into natural ecosystems. The more input to these ponds, the more the runoff may contain hazardous elements that contaminate the natural waterways. It is also important that any fish mills that produce feed for shrimp are not overfishing local fish stocks

Cereal Systems Initiative: This regional program seeks to increase the use of "fallow" land through efficient machineries and surface water irrigation. Unfortunately this "fallow land" "land of use to no one" may contain remaining vestiges of native plant and insect biodiversity that will then be lost.

Conversion of Homestead Forests: Forests near homesteads around the country have always been strongholds for native biodiversity in butterflies, other insects, birds, native plants, etc. Care should be taken to avoid encouraging communities to convert these lands to income generating plants like Acacia, lemon trees and other monocultures that reduce this diversity.

3. DO 3: HEALTH STATUS IMPROVED – OFFICE OF POPULATION, NUTRITION AND HEALTH

Program Summaries: This office includes at least 28 programs focused on reproductive health, nutrition, infectious diseases including a combination of rural initiatives, research, and policy initiatives. A few education programs are also thrown into the mix with the idea that this aspect with increase under the new CDCS. None of these activities have a strong biodiversity component, but in some cases might be modified a bit to incorporate more.

Where Biodiversity is/could be included:

Emerging Pandemic Threat II (EPT II): The most "biodiverse" activity in the mix is one funded by USAID/DC that is managed in collaboration with FAO, DAI and the Ministry of Health, the EPT II program. This interdisciplinary activity looks at, among other things, the incidence and transmission of zoonotic diseases like Avian flu and others that may become an issue in Bangladesh. Veterinarians and health specialists monitor diseases in wild populations of birds, bats, etc. to try to prevent transmission to human populations.

SISIMPUR is a Sesame Street type television program supported by USAID and aimed at young children. Although its primary focus is to teach children proper hygiene and nutrition, with a bit of tweaking it could be expanded to also impart conservation messages.

Interagency Agreement with Voice of America: Weekly programs on health and nutrition are already a part of this activity but it could be expanded to include programs with conservation messages and training of environmental journalists and be included in the NRM portfolio.

Primary Grade Reading Programs: Some programs aim to increase reading skills for primary students, following the government of Bangladesh curriculum. The addition of materials for young audiences prepared by NGOs like Arannayk Foundation, the Wildlife Group at Jahangirnagar University, Center for Natural Resources Studies and the Bangladesh Bird Club could also help students learn a bit about the natural world around them while also enhancing their reading skills.

Possible negative impacts of DG programs on biodiversity and forests: No negative impacts of these programs are evident.

4. FOOD, DISASTER, AND HUMANITARIAN ASSISTANCE (OFDHA)

Program Summaries: Three programs are covered under this office in collaboration with the Bangladesh Office of Disaster Response. No directly related biodiversity programs are included, but biodiversity and forests could be helped by some of these activities.

Where Biodiversity is/could be included:

Strengthening Household Abilities for Responding to Development Opportunities - III (SHOUHARDO) provides assistance to strengthen food security in a number of areas including haors (wetlands) in the north eastern part of Bangladesh where conserving freshwater biodiversity is a strong concern. Such food provisions may help reduce stress on seasonal wetlands used for growing crops. Similarly the Nobo Jatra program in south-west Bangladesh may reduce pressure on natural biodiversity in the project areas.

Sustainable Agriculture and Production Linked to Improved Nutrition Status, Resilience and Gender Equity (SAPLING) works in the Chittagong Hill Tracts, one of the most important areas for terrestrial biodiversity in Bangladesh. One of its three components is focused on livelihoods and agriculture. This project could incorporate biodiversity elements by helping people learn new livelihoods that decrease their reliance on natural resources extraction and by encouraging them to maintain and protect their village common forests that hold much of the remaining biodiversity and also supply indigenous groups with sustainably harvested natural products.

Possible negative impacts of programs on biodiversity and forests: Care must be taken to avoid encouraging alternative incomes that run counter to biodiversity and forest conservation guidelines and to avoid the expansion of agriculture and plantations within natural forests.

D. PROGRAMMATIC OPPORTUNITIES FOR USAID/BANGLADESH

Based on the readings, interviews and field work conducted by this Assessment Team and building on the overall "actions necessary" recommendations in Section III G and the analysis of existing USAID programs in Bangladesh, the following overall program suggestions are listed below with the first three singled out for their importance based on this analysis of USAID programs now and along similar lines in the future. The top three recommendations below are seen by this team as most critical and most in line with current USAID programming.

1. INCREASE SUPPORT FOR CO-MANAGEMENT ACTIVITIES AND ALTERNATIVE LIVELIHOODS

Community co-management and alternative livelihoods that replace the unsustainable and illegal extraction of natural resources should be continued and expanded. Expand co-management activities to develop longer-term planning and options for revenue generation, but include safeguards to ensure that the powerful and wealthy members do not take over for their own personal benefits. Develop more community-based activities in the southeast coastal areas to provide alternative livelihoods that replace unsustainable activities such as the collection of shrimp fry (and associated by-catch) from coastal beaches. Develop the capacity of local communities to maintain visitor facilities like nature interpretive centers, and to autonomously manage micro-finance funds under co-management programs to ensure the longevity of USAID investments. Support and strengthen local civil society and community-based organizations that work to conserve biodiversity and natural forests in their areas. This should be accompanied by an increase in enforcement of existing laws and policies protecting forests, wetlands and coastal areas, as well as flora and fauna.

2. WORK WITH GOB TO INITIATE STRUCTURAL CHANGES IN HOW BIODIVERSITY AND NATURAL RESOURCES ARE MANAGED

Encourage the GoB to take action to remedy the overlaps and discrepancies between the Ministry of Land, Ministry of Livestock and Fisheries and Ministry of Environment and Forests and reduce coordination gaps. Discourage or end short-term leasing of land by MoL in freshwater wetlands and instead enable the DoF to restore and manage these areas for sustainable fisheries and biodiversity. Continue capacity development in BFD and a vision of long-term forest management, along the lines of the Bangladesh Delta Plan, to ensure the survival of the PA network, and forests and biodiversity over longer time horizons. Encourage the GoB to develop and internalize a national biodiversity survey and monitoring program in order to be able to accurately know the condition and status of these resources over time. Increase support to strengthen the research capability of concerned GoB organizations and to encourage collaboration with research institutions and universities.

3. Develop the capacity of BFD, DoE and DoF to use modern technology and methods to enforce laws against poaching, trafficking, illegal logging and fishing. Work with law enforcement agencies to increase coordination with these departments and increase enforcement of protections for wildlife. Develop prosecutorial capacity and foster high-level political leadership to ensure that elites and politically connected actors do not get away with breaking environmental laws.

In addition to these three main recommendations, this assessment team also recommends the following subsidiary actions:

4. The Chittagong Hill Tracts (CHT) should get increased priority for biodiversity conservation programs. CHT contains important remaining terrestrial biodiversity and is included in the Indo-Burma biodiversity hotspot. This area currently faces high deforestation rates and a lack of protection. Alternative livelihoods, co-management and other community-based efforts that USAID is already involved in can be expanded here with a potential large impact.

5. Expand support for media programs on forests and biodiversity on popular Bangladesh television channels, including television, radio, newspapers and magazines. The profile of forests and biodiversity should be raised, highlighting positive conservation activities in Bangladesh, threatened and endangered species, and remaining natural forests, wetlands and coastal areas to build awareness and a sense of pride about their natural resources among Bangladeshis. Support informal education activities like nature clubs, fairs and festivals, and other mechanisms that can spread awareness about conservation in fun, interactive ways.

6. If possible, work with neighboring USAID missions to develop transboundary approaches to water management and supply, migrating species and other aspects needed for more effective biodiversity conservation in the region.

ANNEXES

ANNEX A. REFERENCES & ONLINE RESOURCES

AF (Arannayk Foundation) 2010. Conserving forests for the future: Annual report 2009. Dhaka: Arannayk Foundation. URL. http://www.arannayk.org/docs/af_annualreport_2009.

Ahmed, Z.U., Begum, Z.N.T., Hassan, M.A., Khondker, M., Kabir, S.M.H., Ahmad, M., Ahmed, A.T.A., Rahman, A.K.A. and Haque, E.U. (eds.). 2008. *Encyclopedia of Flora and Fauna of Bangladesh,* vol. 5-12. Asiatic Society of Bangladesh, Dhaka.

Alam, S. 2014. Attaining MDGs: Government-NGO Collaboration. The Financial Express. Published 18 August, 2014. (http://print.thefinancialexpress-bd.com/2014/08/18/50990/print)

Baten, M.A., Khan, N.A. Ahammad, R. and Misbahuzzaman, K. 2010. Village common forests in Chittagong Hill Tracts, Bangladesh: Balance between conservation and exploitation. Dhaka Unnayan Onneshan- The Innovators, 13.

BBS, 2011. Bangladesh Bureau of Statistics, Dhaka, Bangladesh.

Department of Environment. 2015. Fifth National Report to the Convention on Biological Diversity. Department of Environment, Ministry of Environment and Forests, Government of the People's Republic Bangladesh, Dhaka.

FAO 2015. Global Forest Resources Assessment 2015. Food and Agriculture Organization of the United Nations, Rome.

Feeroz MM, Hasan, M.K., Khan, M.M.H. 2011. Biodiversity of Protected Areas of Bangladesh. Vol. I: Rema-Kalenga Wildlife Sanctuary. Bangladesh: BioTrack. Arannayk Foundation.

Feeroz, M.M. (ed.) 2014. Biodiversity of Chunati Wildlife Sanctuary: Fauna. Arannayk Foundation, Dhaka, Bangladesh.

Feeroz, M.M. 2013. Introduction: Protected areas. In: Feeroz, M.M. (edt.) Biodiversity of Protected Areas of Bangladesh, Volume III, Teknaf Wildlife Sanctuary. Arannayk Foundation Bangladesh, pp 11-20..

Feeroz, M.M., Hasan, M.K. and Hossain, M.K. 2012. Biodiversity of Protected Areas of Bangladesh. Vol. II: Dudpukuria-Dhopachari Widlife Sanctuary. BioTrack, Arannayk Foundation Bangladesh.

Gittins, S. P. and Akonda, A.W. 1982. What survives in Bangladesh?.Oeyx. 16: 275-281.

GoB. 1994, Bangladesh Forestry Master Plan (1995-2015)

GoB, 2004, National Biodiversity Strategy and Action Plan.

GoB, 1994, National Forestry Policy.

GoB, 2006, National Fisheries Strategy.

GoB, 2012, Bangladesh Biodiversity Act.

GoB, 2012, Wildlife (Preservation & Security) Acts.

GoB, 2009, Tiger Action Plan (2009- 2017).

GoB, 2009, Bangladesh Climate Change Strategy and Action Plan.

GoB, 2005, National Adaptation Program of Action (NAPA).

GoB, 2015, Background Papers of 7th Five Year Plan (FY15/16-FY19/20)

Hasan, M.K., Khan, M.M.H. and Feeroz, M.M. 2014. Amphibians and Reptiles of Bangladesh-A Field Guide. Arannayk Foundation Bangladesh.

Hasan, M.K., Feeroz, M.M., Kabir, M.M. and Akhtar, S. 2015. Road and Railway mortality of wild animals in a mixed evergreen forest of Bangladesh. *Tigerpaper* (under review).

Irfanullah, H.M. 2011.Conserving threatened plants of Bangladesh: miles to go before we start. *Bangladesh J. Plant Taxon.* 18(1):81-91.

Isaacs, J. C. (2000). The limited potential of ecotourism to contribute to wildlife conservation. Wildlife Society Bulletin, 28(1), 61-69.

IUCN Bangladesh 2000. Red Book of Threatened Mammals of Bangladesh. IUCN-The World Conservation Union. Bangladesh country office. pp: 71.

Khan, M.M.H. 2008. Protected areas of Bangladesh-A Guide to Wildlife. Nishorgo Program, Bangladesh Forest Department, Dhaka, Bangladesh.

Khan, M.M.H. 2014. Introduction to the wildlife of Bangladesh. Monitoring and conservation of wildlife in Kaptai National Park of Bangladesh.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., Da Fonseca G.A. and Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403(6772):853-858.

Mukul, S.A., Uddin, M.B., Uddin, M.S., Khan, M.A.S.A. and Marzan, B. 2008. Protected areas of Bangladesh: current status and efficacy for biodiversity conservation. *Proc. Pakistan Acad. Sci.* 45(2):59.

Nishat, A., Huq, S.M. Imrul, Barua, Shuvashis, P., Reza, A.H.M., Khan, M. A.S. (eds.). 2002. Bio-ecological Zones of Bangladesh. IUCN Bangladesh Country office, Bangladesh. pp xii+141.

Roy, R.C.K. 2000. Land rights of the indigenous peoples of the Chittagong Hill Tracts, Bangladesh. Copenhagen: International Work Group for Indigenous Affairs (IWGIA).

Sharma, R., DeCosse, P., Khan, M., Mazumdar, A. 2005. Co-Management of Protected Areas in South Asia with special reference to Bangladesh. Nishorgo Support Project, Dhaka, Bangladesh.

Stanford CB. 1991. The capped langur in Bangladesh: Behavioral ecology and reproductive tactics: Karger Publishers.

USAID/Bangladesh, 2010. Bangladesh Section 118/119 Analysis.

USAID/Bangladesh, 2011, Country Development Cooperation Strategy (2011 to 2016).

USAID/Bangladesh, 2010, Bangladesh Environment Sector Assessment and Strategic Analysis (2010).

USAID/Bangladesh, 2016. DO1, Citizen Confidence in Governance Institutions Increased Activity Overviews.

USAID/Bangladesh, 2016. DO2, Food Security Increased Activity Overviews,.

USAID/Bangladesh, 2016. DO3, Health Status Improved Activity Overviews.

USAID/Bangladesh, 2016. DO4, Responsiveness to Climate Change Improved Activity Overviews.

USAID/Bangladesh, 2016. Disaster Readiness, Humanitarian Assistance, & Food Security Activity Overviews

USAID/Bangladesh, 2015. Midterm Performance Evaluation Climate-Resilient Ecosystems & Livelihoods Final Report.

USAID/Bangladesh, 2015. Bagh Year Two Quarter 3 Summary of Progress.

USAID/Bangladesh, 2015. Bagh Annual Report 2014 / Year 1

USAID/Bangladesh, 2015. Enhanced Coastal Fisheries in Bangladesh (ECOFISHBD) Annual Report (October 1, 2014 – September 30, 2015)

USAID/DC, 2015. Biodiversity and Development Handbook.

USAID/DC, 2005. Tropical Forestry and Biodiversity (FAA 118/119) Analyses: Lessons Learned and best practices from recent USAID experience.

World Bank, 2015. Bangladesh - Country partnership framework FY2016-2020 : executive summary. Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/2015/10/25223456/bangladesh-country-partnership-framework-fy2016-2020-executive-summary

IUCN Bangladesh / Resources / Publication

http://www.iucn.org/about/union/secretariat/offices/asia/asia_where_work/bangladesh/resources/publications/index.cfm?uPage=1

IUCN Red List

http://www.iucnredlist.org/http://www.iucnredlist.org/http://www.iucnredlist.org/

Ramsar//Bangladesh

http://www.ramsar.org/wetland/bangladeshhttp://www.ramsar.org/wetland/bangladesh

Convention on Biological Diversity (CBD) Bangladesh

https://www.cbd.int/countries/?country=bdhttps://www.cbd.int/countries/?country=bd

Arannayk Foundation / Resources / Books

http://www.arannayk.org/index.php?option=com_content&view=category&layout=blog&id=17&Itemid=174

BioTrack: Biodiversity of Bangladesh Forests

http://www.arannayk.org/biotrack/index.php

Bangladesh Forest Department
http://www.bforest.gov.bd/

ANNEX B. STRENGTH, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) ANALYSIS

SWOT analyses are used for strategic program planning to provide a simple framework for organizations to scan both the internal and external environment. The analysis is intended to match the organization's resources and capabilities to the environment in which it operates. The analysis can also be used to filter information from several sources to the key emerging issues. The four categories (strengths, weaknesses, opportunities, and threats) emerge from the intersection of organizational advantages/disadvantages with the internal and external factors of the organization.

For the 118/119 Assessment, a SWOT analysis was conducted for tropical forests and biodiversity programming of USAID/Bangladesh. Information from document reviews, past program evaluations and key informant interviews with USAID/Bangladesh staff from all programmatic areas were used as the primary sources of information for the SWOT matrix presented below. The four most important factors that emerged within each area were given priority, as they deal with multiple challenges, or address major gaps in funding/programming from USAID for tropical forests and biodiversity.

Table 3. SWOT Analysis

	Advantages	Challenges
Internal Origin	Strengths • Extensive experience on co-management strategies and institutions • Good history of working with key GoB agencies like BFD, DoE • Innovative efforts like support to Arannayk Foundation leverages support from donors and local partners • Broader work on local governance, transparency and community-based development can support forests/biodiversity	Weaknesses • Lack of clarity/information on how co-management committees and alternative income strategies benefit forests and biodiversity long-term • Programs on agricultural diversification, aquaculture and agroforestry may undermine conservation by encouraging forest, wetland or coastal degradation • Forests and biodiversity work is not linked to broader development assistance or engagement with GoB on key issues like deforestation, coastal/wetland degradation, wildlife crime
External Origin	Opportunities • Increasing public awareness and priority for environmental protection and conservation of forests, wildlife and biodiversity • Integrated planning efforts like Bangladesh Delta Plan provide opportunities to engage government planners, donor community for a long-term vision of forests/biodiversity • New technologies and systems for PA monitoring, wildlife protection and biodiversity monitoring • Climate change funding from various sources expected to increase, presenting increased emphasis on ecosystem services like carbon, water etc.	Threats • Lack of GoB commitment to preserve forests and biodiversity, enforce environmental laws • Lack of baseline information on biodiversity, lack of clarity on viability of PA network as currently designed/managed • Natural disasters, internal displacement of communities in PAs or ECAs • Climate and biophysical changes leading to lower viability of wetlands, forest and coastal habitats • Lack of enforcement of wildlife protection, restrictions on human activity/exploitation within PAs

ANNEX C. ASSESSMENT TEAM BIOS

Dr. Patricia Foster-Turley, Team Leader, is a tropical forestry and biodiversity conservation expert with a PhDin zoology from the University of Florida. She is highly experienced in USAID program design,development, and evaluation and has demonstrated strengths in team leadership. She has worked with USAID since 1993, including two years in Washington and two years in Botswana and Tanzania as a AAAS Fellow. She has organized and led multidisciplinary teams on biodiversity, tropical forestry and NRM assessments in over 15 countries for USAID.

Dr. Rishiraj Das, Environment and Global Climate Change Specialist brings deep technical knowledge of sustainable landscapes and forest carbon mitigation, having worked for eight years in GHG accounting and measurement in the forestry and land use sector. For USAID's Forest Carbon, Markets and Communities Program (FCMC), Dr. Das led activities focused on conducting greenhouse gas inventories and strengthening measurement-reporting-verification systems. Several of his activities focused on greenhouse gas accounting in forest conservation. Dr. Das holds a PhD in environmental sciences from the University of Virginia. His extensive written work on forest carbon mitigation and greenhouse gas measurement includes four reports for USAID and several articles for peer-reviewed journals. Dr. Das has worked in community development in South Asia, and is conversant in Bengali.

Ms. Peerzadi Rumana Hossain is a Bangladesh national, and PhD candidate at Wageningen University (Netherlands), presently conducting thesis research on the impacts of climate change on the coastal ecosystems of Bangladesh. Previously she worked as Research Officer at the Bangladesh Centre for Advanced Studies (BCAS) where she specialized in climate adaptation. She will provide policy and gender advice to the team.

Dr. Md. Kamrul Hasan is an associate professor in the Zoology Department of Jahangimagar University. Dr. Hasan earned his PhD at the University of California, Davis. He is an expert on Bangladesh biodiversity who has researched and published on several of Bangladesh's threatened and endangered taxa. Dr. Hasan also has substantial experience in biodiversity monitoring in Bangladesh. He will provide field-based expertise to the team.

ANNEX D. LIST OF CONTACTS, FIELD VISITS AND INTERVIEWS

Name	Position	Organization	Type of Org
Todd Johnson	ESR team	Asia Bureau USAID	USAID HQ
Mary Melnyk	ESR team leader	Asia Bureau USAID	USAID HQ
Alicia Grimes	E3 Forestry and Biod Officer	E3 USAID	USAID HQ
Hadas Kushnir	Co chair 118/119	E3 USAID	USAID HQ
Laura Cornwell	ESR climate change advisor	Asia Bureau USAID	USAID HQ
Sasha Gottlieb	Program Coordinator	USFS-IP	USG/SilvaCarbon
Peter Potapov	Research Scientist	University of Maryland	Academic
Lola Fatoyinbo	Research Scientist	NASA GSFC	Academic
Muhammad Nuruzzaman	Project Manag. Coord.	USAID - Bangladesh	Economic Growth
Dr. Osagle Aimiuwu	Agri. Devel. Officer	USAID-Bangladesh	Economic Growth
Dr. Sukumar Sarker	Snr. Tech and Policy Off.	USAID-Bangladesh	PHNE
Jason Smith	Deputy Director	USAID-Bangladesh	DG
Matt Curtis	Agri. Devel. Officer	USAID-Bangladesh	Economic Growth
Shahnaz Zakaria	Senior Advisor	USAID-Bangladesh	FDHA
Melissa Jones	Office Director	USAID-Bangladesh	PHNE
Catherine Seagraves	Envir, Tech, Science Officer	US STATE Dept	
Iqbal Hussain	Program & Partnership Management Specialist	Bagh Project (USAID)	Wild Team

Dr. Md. Golam Mustafa	Scientist-Co-management and Livelihood	ECOFISH	CGIAR
Paul Thompson	Snr. Co-Mgt Advisor	CREL project (USAID)	Winrock International
Ruhul Chowdhury	Mgr. Monitor and Eval	CREL project (USAID)	Winrock International
Kevin T. Kamp	Deputy Chief of Party	CREL project (USAID)	Winrock International
Iqbal Hussain	Program and Mgt Spec	Bagh Project (USAID)	Wild Team
Sandeep Sharma	Wildlife Technical Specialist	Bagh Project (USAID)	Smithsonian Conservation Biology Institute
Md. Zaheer Iqbal	Deputy Conserv of Forests	Bangladesh Forest Department	GoB
Md. Yunus Ali	Chief Conservator of Forests	Bangladesh Forest Department	GOB
Rukshana Sultana	Country Coordinator	SilvaCarbon Bangladesh	GOB
Matieu Henry	Chief Technical Advisor	Food and Agriculture Org	GoB
Mariam Akhtar	Forestry Officer	Food and Agriculture Org	GOB/UN
Md. Modinul Ahsan	ACF, Wildlife Crime Unit	Bangladesh Forest Department	GOB
Md. Abdur Rob Mollah	Professor, Zoology	NACOM/University Of Dhaka	Academic
M. Mokhlesur Rahman, PhD	Executive Director	CNRS	NGO
M. Abu Sarwar	Field Supervisor	Arannayk Foundation	NGO
Dr. Shafiqur Rahman	Senior Scientific Officer	Bangladesh Fisheries Research Institute	GoB
Moin Uddin Ahmed, PhD	Senior Upazilla Fisheries Officer	Department of Fisheries	GoB
Md. Soriful Islam	Manager	Bangadesh Fisheries Development Corporation	GoB

Mohd. Solaiman Haider	Director, Planning	Department of Environment	GoB
Farid Uddin Ahmed	Executive Director	Arannyak Foundation	NGO
Dr. Mohd. Abdul Quddus	Senior Program Officer	Arannyak Foundation	NGO
Md. Zashimuddin		Arannyak Foundation/SHED	NGO
Md. Shahadat Hosen	Project Coordinator-Inani PFACM project	Arannyak Foundation/SHED	NGO
Kitchong Chakma	Headman, Chakma Para, Inani	Local community	Local community
M. Jahirul Islam	Principal Investigator	Conservation of Sea Turtle in Bangladesh, Marinelife Aliance	NGO
Dr. Mahmood Hossain	Professor, Forestry & Wood Technology	Khulna University	Academic
Ishtiaq Uddin Ahmed	Country Representative	IUCN Bangladesh	NGO
Dipankar Aich	NBSAP	IUCN Bangladesh	NGO
Enam ul Haque	Founder	Bangladesh Bird Club	NGO
Dr. Mohammed Mostafa Feeroz	Professor	Jahangirnagar University, Dept. of Zoology, Wildlife Branch	Academic
Dr. Md. Mofizul Kabir	Professor	Jahangirnagar University, Dept. of Zoology, Wildlife Branch	Academic
Dr. Sajeda Begum	Professor	Jahangirnagar University, Dept. of Zoology, Wildlife Branch	Academic
Sharmin Akhtar	PhD Fellow and Senior Research Associate	Jahangirnagar University, Dept. of Zoology, Wildlife Branch	Academic
Ashis Kumar Datta	M.Sc. student	Jahangirnagar University, Dept. of Zoology, Wildlife Branch	Academic
Sk. Mustafizur Rahman	Principle Scientific Officer	Department of Fisheries	GoB
Aminul Islam	Deputy Director	Department of Fisheries	GoB
Dr. S.M. Nazrul Islam	Curator	Dhaka Zoo	GoB
Dr. Md. Hasan Imam	Deputy Curator	Dhaka Zoo	GoB

Zahir Uddin	Deputy Curator	Dhaka Zoo	GoB
Md. Sayedur Rahman	Director	National Botanical Garden	GoB
Md Khurshid Alam	Asst. Country Director	UNDP	donor
Md. Shaheduzzaman		FAO/BFD	
Arif Mohammad Faisal	Environment Specialist	Asian Development Bank	donor
Shakil Ahmed Ferdausi	Senior Environment Specialist	World Bank	donor
Ranjan Samantaray	Senior Agriculture Specialist	World Bank	donor
Dora Cudjoe	Senior Environment Specialist	World Bank	donor
Ottilie Mooshofer	Principal Advisor	GIZ	donor
Manfred Fernholz		EU	donor
Maurits Bosman	International Development Consultant	Bangladesh Delta Plan 2100 Project (Netherlands)	donor/project
Giasuddin Choudhury	Deputy Team Leader	Bangladesh Delta Plan 2100 Project (Netherlands)	donor/project
Dr. Md. Rafiqul Islam	Institutional/Governance Expert	Bangladesh Delta Plan 2100 Project (Netherlands)	donor/project

Field itinerary and activities

Date	Visited sites	Important observation / Remarks
01 April	Tilaghar Eco Park, Sylhet	Existing habitats of remaining forest patch. Visitor facilities developed from different projects. Threats to the biodiversity of the Eco Park.
02 April	Ratargul Swamp Forest Sylhet	Wildlife habitats in swamp forest. Visitor facilities. Threats to the swamp forest.
	Baikka Beel	Migratory bird habitat.

	Sreemangal	Facilities developed by USAID funded projects. Local livelihood. Threats to the biodiversity in this area.
03 April	Lawachara NP Sreemangal	Wildlife and their habitat condition in this NP. Threats to the biodiversity. Visitor facilities and co-management activities. Threats to the biodiversity.
	Mini Zoo Sreemangal	Types and condition of animals kept in zoo.
	Tribal village (Khasia Punji) near Lawachara NP	Livelihood of tribal people (Khasia). Activities (gardening and betel leaf cultivation) of this community. Potential threats to the biodiversity of Lawachara NP.
04 April	Satchari NP	Condition of habitat and wildlife Facilities developed from different donor projects Tourist activities in natural forest parts. Co-management activities.
06 April	Medakaccapia NP	Remaining patch of the mature Dipterocarp forest. Potentiality of forest regeneration.
	Safari Park, Dulahazara	Facilities for animals and visitors. Condition of captive / semi-captive animals. Captive breeding facilities and success.
07 April	Inani RF and Arannayk Activities at Shafir beel and Chakma Para	Forest patch of Inani reserve forest. Activities of local community supported by Arannayk Foundation. Meeting with the community to know their facilities, limitations and achievements.
	Marine life alliance turtle hatchary	Marine turtle hatchery. Facilities and limitations of the hatchery. Condition of marine turtle breeding ground.

	Teknaf Wildlife Sanctuary	Wildlife habitats including remaining mature forest patch and degraded hills. Threats to the Teknaf WS Plantation types Facilities developed by USAID supports and their maintenance.
	Fish landing zone and meeting with Bangladesh Fisheries Development Corporation	Condition of the fish landing zone. Talked to the fishermen. Met the manager of Fisheries Development Corporation to get ideas on marine fisheries and threats to marine biodiversity.
08 April	Chunati WS Visiting Arannayk activities	Visited forest condition and facilities developed. Threats to the biodiversity of Chunati WS. Visited local community to see their livelihood.
	Meeting with Bangladesh Fisheries Research Institute, Cox's Bazar	Met with the officials to know their activities in fisheries sector. Their perception on the threats to biodiversity.
	Meeting with DoF, Cox's Bazar	To know their activities related to marine fisheries.

ANNEX E. LIST OF PROTECTED AREAS IN BANGLADESH

1. List of National parks in Bangladesh

Sl.No	National Parks	Area (ha.)	Location	Year est.	Vegetation Type/ Critical plants	Critical animals
1	Bhawal NP	5022	Gazipur	1982	Deciduous forest: Sal (*Shorea robusta*)	Indian Pitta, Spangled Drongo, Rhesus macaque, small cats
2	Modhupur NP	8436	Tangail/ Mymensingh	1982	Deciduous forest: Sal, Azuli, Chapma	Red-breasted Parakeet, Indian Pitta, Shama, Rhesus macaque, Capped langur
3	Ramsagar NP	28	Dinajpur	2001	Secondary plantation	Migratory ducks visit in the big lake
4	Himchari NP	1729	Cox's Bazar	1980	Degraded hill forest; now only covered with bushes	Asian Elephant, Rhesus macaque
5	Lawachara NP	1250	Moulavibazar	1996	Mixed evergreen: Chapalish, Jam, Garjan, Kadam, Udal, *Ficus* spp.	Six species of primates including Hoolock Gibbon and Slow Loris, four species of squirrels, Barking deer, small cats, many amphibians and reptiles
6	Kaptai NP	5464	Chittagong Hill Tracts	1999	Mixed evergreen: Garjan, Teak, Boilam, Civit, Chapalish	Seven species of primates including Hoolock Gibbon, Assamese Macaque and Slow Loris, Clouded Leopard, Leopard, Black Bear, Asian Elephant
7	Nijhum Dweep	16352	Noakhali	2001	Coastal Mangrove:	Spotted Deer, Rhesus macaque, Smooth-coated

8	Medha Kachhapia NP	396	Cox's Bazar	2008	Mixed evergreen: *Dipterocarpus* spp.	Asian Elephant, Rhesus macaque
9	Satchari NP	243	Habigonj	2005	Mixed evergreen: Chapalish, Teak, Jam, Udal	Six species of primates including Hoolock Gibbon, Barking deer, many species of reptiles.
10	Khadim Nagar NP	679	Sylhet	2006	Bamboo thickets with some small patches of evergreen forest	Rhesus macaque, Capped langur, small cats and civets
11	Baraiyadhala NP	2934	Chittagong	2010	Mixed evergreen: Chapalish, Jam, Garjan	Assamese macaque, Barking deer, Dhole, small cats and civets
12	Kuakata NP	1613	Patuakhali	2010	Coastal mangrove: Keora, Goran, Hargaza	Migratory shore birds, Smooth-coated otter
13	Nababgonj NP	518	Dinajpur	2010	Deciduous forest: Sal	Spangled Drongo, small cats and civets
14	Shingra NP	306	Dinajpur	2010	Deciduous forest: Sal	Spangled Drongo, small cats and civets
15	Kadigarh NP	344	Mymensingh	2010	Deciduous forest: Sal	Small cats and civets
16	Alta Dighi NP	264	Naogaon	2012	Deciduous forest: Sal	Introduced python, rhesus macaques
17	Birgonj NP	169	Dinajpur	2012	Deciduous forest: Sal	Small cats and civets, Golden jackal, Bengal Fox

2. List of Wildlife Sanctuaries in Bangladesh

Sl. No	Wildlife Sanctuaries	Area (ha.)	Location	Year est.	Vegetation type/ habitat type	Critical animals
1	Rema-Kalenga WS	1796	Hobigonj	1996	Mixed evergreen: Chapalish, Jam, Garjan, Teak, Kadam, Udal, *Ficus* spp.	Hoolock Gibbon, Capped Langur, Pharye's Langur, Barking deer, Malayan Giant Squirrel, Asiatic Black Bear
2	Char Kukri-Mukri WS	40	Bhola	1981	Newly accreted char lands and coastal mangrove	Migratory bird habitat, Spotted deer, Smooth-coated otter, rhesus macaque, Golden Jackal
3	Sundarban (East) WS	31227	Bagerhat	1996	Mangrove: Sundari, Keora, Gewa, Choila, Goran, Golpata, Baen	Bengal Tiger, Spotted deer, Salt water crocodile, Rhesus macaque, King cobra, Water monitor
4	Sundarban (West) WS	71503	Satkhira	1996	Mangrove: Sundari, Keora, Gewa, Choila, Goran, Golpata, Baen	Bengal Tiger, Spotted deer, Salt water crocodile, Rhesus macaque, King cobra, Water monitor
5	Sundarban (South) WS	36971	Khulna	1996	Mangrove: Sundari, Keora, Gewa, Choila, Goran, Golpata, Baen	Bengal Tiger, Spotted deer, Salt water crocodile, Rhesus macaque, King cobra, Water monitor
6	Pablakhali WS	42087	Chittagong Hill Tracts	1983	Mixed evergreen: Garjan, Teak, Boilam, Civit, Chapalish	Asian Elephant, Hoolock Gibbon, Clouded Leopard, Leopard, Black Bear
7	Chunati WS	7764	Chittagong	1986	Mixed evergreen: Garjan,	Asian elephant, Rhesus macaque, Pig-tailed macaque, Barking deer, Water monitor
8	Fashiakhali WS	1302	Cox's Bazar	2007	Mixed evergreen: *Dipterocarpus* spp., Jam	Asian Elephant, Rhesus macaque, Capped langur, Porcupine, Wild Boar
9	Dudh Pukuria-Dhopachari	4717	Chittagong	2010	Mixed evergreen: Chapalish, Gorjan, Teak,	Hoolock Gibbon, Barking deer, Asian elephant,

	WS				Jam, Udal	Binturong, Sambar deer
10	Hazarikhil WS	1178	Chittagong	2010	Mixed evergreen: Chapalish, Jam, Garjan	Rhesus macaque, Capped langur, Barking deer, small cats and civets
11	Sangu WS	2332	Bandarban	2010	Mixed evergreen: Chapalish, Jam, Garjan, Civit, Boilam	Gaur, Sambar deer, Barking deer, Dhole, Asiatic Black Bear, Malayan Sun Bear, Bengal Tiger, Leopard
12	Teknaf WS	11615	Cox's Bazar	2010	Degraded hills with very small Dipterocarp patch	Asian elephant, Rhesus macaque, small cats, civets, porcupine
13	Tengragiri WS	4049	Barguna	2010	Coastal mangrove and newly accreted char land	Migratory bird habitat
14	Sonar Char WS	2026	Bhola	2011	Newly accreted land, coastal mangrove	Critical habitat for migratory shore birds
15	Dhangmari WS	340	Sundarban	2012	River estuary	Irrawaddy dolphin
16	Chandpai WS	560	Sundarban	2012	River estuary	Irrawaddy dolphin
17	Dudmukhi WS	170	Sundarban	2012	River estuary	Irrawaddy dolphin
18	Sonarchar WS	2026.48	Patuakhali	2011	Coastal mangrove	Critical habitat for migratory shore birds
19	Nazirganj WS (Dolphin)	146	Pabna	2013	River	Gangetic River Dolphin
20	Shilanda-Nagdemra WS (Dolphin)	24.17	Pabna	2013	River	Gangetic River Dolphin

3. List of Ecologically Critical Areas in Bangladesh

Sl.No	ECAs	Area (ha.)	Location	Year est.	Habitat type	Critical animals/ Ecological significance
1	Sea shore of Cox's Bazar and Teknaf	10465	Cox's Bazar	1999	Sandy beach Mangrove patch on the bank of the River Naaf	Nesting ground of four species of marine turtles; Olive Ridley, Green Turtle, Logger Head and Leather Back turtle. Last habitat for the remaining three individuals of Long-tailed macaque on the Naaf River bank.
2	St. Martin's Island	590	Cox's Bazar	1999	Coral Island, sandy beach	Nesting ground of marine turtles. It is the only coral island in the country
3	Sonadia Island	4916	Cox's Bazar	1999	Sandy beach, mud flats and mangrove	Critical habitat for shore birds especially for Spoon-billed sand piper. Nesting ground for marine turtles. Breeding colonies of herons, cormorants and other waders in the mangrove.
4	Hakaluki Haor	18383	Maulavi Bazar	1999	Large wetlands which becomes inundated seasonally	Habitats for migratory birds and many native fish species.
5	Tanguar Haor	9727	Sunamganj	1999	Large water bodies with swamps	Habitats for migratory birds and brooding sites for indigenous fishes
6	Marjat Baor	200	Jhenaidaha	1999	Large water bodies	Migratory bird site. Habitats for turtles and many native fishes
7	Gulshan-Banani-Baridhara Lake	20	Dhaka city	2001	Large lake	Water reservoir in Dhaka city
8	Strip of 10 km. outside the Sundarbans	76203	Bagerhat, Khulna, Satkhira	1999	Rivers, canals, estuaries	Significant for marine turtles, migratory birds and dolphins

	Reserved Forest					
9	Rivers around Dhaka city(Buriganga, Turag, Balu)		Dhaka	2009	Freshwater river	Water drainage from Dhaka city. Gangetic river Dolphin and native fishes

4. List of Other Protected Areas in Bangladesh

	Botanical Gardens/ Eco-parks/ Safari Parks	**Area (ha.)**	**Location**	**Year est.**	**Vegetation type/ Plants**	**Critical animals**
1	National Botanical Garden	84	Dhaka	1961	Conservatory or gene bank of many critical plant species	As green areas in Dhaka city many species of birds and mammals inhabit here.
2	Baldha Garden	1	Dhaka	1909	Conservatory of some critical plants	Refuge for birds in the core areas of Dhaka city.
3	Madhabkunda Eco-Park	266	Moulavibazar	2001	Natural water fall, mixed evergreen forest in surrounding areas	Rhesus macaque, squirrels, many species of frogs, bats and butterflies.
4	Sitakunda Botanical Garden and Eco-park	808	Chittagong	1998	Large areas with denuded hills with some small patches of remaining mixed-evergreen plants.	Rhesus macaque, Assamese macaque, Jungle fowl, Kalij pheasant, Laughing thrush and many other birds.
5	Dulahazara Safari Parks	600	Cox's Bazar	1999	Large area with Dipterocarp forest patch.	Successfully breeding some critical animals like Hog deer, Salt water crocodile, Samber deer, Spotted deer, Asiatic Black Bear and also some exotic animals like Ziraf, Wild beast
6	Banshkhali Eco-	1200	Chittagong	2003	Mixed-evergreen forest	Asian Elephant, Many species of birds, reptiles and

	park				patch with a large water body	amphibians.
7	Madhutila EP	100	Sherpur	1999	Deciduous Sal forest patch	Rhesus macaque, many species of birds.
8	Kuakata EP	5661	Patuakhali	2006	Coastal mangrove	Shore birds, waders, herons and cormorants.
9	Borshizora Eco-park	325	Moulovibazar	2006	Small patch of mixed-evergreen forest	Rhesus macaque, Irrawady squirrel, Jougle fowl, Kalij Pheasant.
10	Bangabandhu Sheikh Mujib Safari Park	1493.93	Gazipur	2013	Large area of Deciduous Sal forest patch	Rhesus macaque, Irrawady squirrel, Initiated captive breeding of some species of mammals and turtles.
11	Rajeshpur Eco-park	185.09	Comilla	-	A patch of mixed plantation	Many species of birds
12	Tilagarh Eco-park	46	Sylhet	2006	A patch of mixed plantation	Rhesus macaque, Irrawady Squirrel, some critical frogs like Painted Ballon frog and species of reptiles like land tortoise are found here.

5. Coverage of bio-ecological zones by protected areas (ha, %), percentage of species covered of number of species per vertebrate class(amphibians, reptilians, birds, mammals)* and averaged percentage of threatened animals (VU, EN, CR) of all groups (adopted from GoB 2015b)

Bio-ecological zone	Total area (ha)	No. of PAs	Area protected (ha)	Proportion protected (%)	Amphibians	Reptiles	Birds	Mammals	Proportion threatened animals (%)
1. Himalayan Piedmont Plain	706,330	0	0	0.0%	29%	24%	26%	27%	13%
2. Barind Tract	761,422	4	1,116	0.1%	29%	21%	29%	19%	10%
3. Madhupur Sal Tract	406,989	3	14,358	3.5%	57%	22%	40%	41%	32%
4.a Teesta Floodplain	1,436,746	1	169	0.0%	43%	34%	29%	21%	23%
4.b Ganges Floodplain	2,351,099	1	200	0.0%	33%	28%	28%	30%	26%
4.c Brahmaputra-Jamuna Floodplain	1,418,161	0	0	0.0%	29%	26%	38%	38%	25%
4.d Surma-Kushiyara Floodplain	366,358	0	0	0.0%	24%	29%	42%	38%	25%
4.e Meghna Floodplain	729,132	0	0	0.0%	48%	24%	30%	29%	31%
5.a Haor Bassin	683,889	2	27,842	4.1%	43%	26%	48%	19%	25%
5.b Chalan Beel	272,051	0	0	0.0%	29%	21%	31%	14%	15%
5.c Kaptai Lake	82,944	0	0	0.0%	19%	4%	27%	29%	9%
6. Gopalgani-Khulna Peat Lands	249,400	0	0	0.0%	24%	18%	27%	27%	14%
7.a Sundarbans	507,555	6	140,769	27.7%	38%	37%	42%	28%	34%
7.b Chakaria Sundarban	16,146	1	4,924	30.5%	19%	12%	30%	29%	13%
8.a Coastal Plains	99,699	0	0	0.0%	24%	26%	53%	53%	39%
8.b Offshore Islands	418,297	4	22,467	5.4%	33%	29%	29%	28%	22%
8.c Narikel-Jinjira Coral Island	391	1	590	150.8%	19%	12%	23%	9%	5%
8.d Meghna Estuarine Floodplain	261,486	0	0	0.0%	29%	14%	33%	17%	17%
8.e Sandy Beach-Sandy Dunes	2,384	0	0	0.0%	19%	13%	21%	12%	5%

9.a Chittagong Hills and the CHTs	1,748,577	12	82,325	4.7%	71%	56%	68%	73%	67%
9.b Sylhet Hills	332,010	6	4,577	1.4%	81%	43%	66%	66%	55%
9.c Lalmai-Tipperah Hills	40,039	0	0	0.0%	19%	10%	26%	23%	10%
10. Saline Tidal Floodplain	468,651	3	176,613	37.7%	29%	27%	30%	12%	11%
11. Major Rivers	858,970	3	578	0.1%	24%	10%	28%	20%	15%
12. Coastal and Marine Waters	2,116,782	1	173,800	8.2%	0%	14%	26%	7%	3%

*Species lists used originate from Nishat et al. (2002), conservation status (vu, en, cr) based on IUCN Bangladesh Red Data List (2000), areas of bio-ecological zones were derived through GIS analysis from maps included in Nishat et al. (2002) as original data were not available (GoB 2015)