Government of Bangladesh

Ministry of Environment and Forests

Bangladesh Forest Department

Management Plan
For
Fasiakhali Wildlife Sanctuary

Bangladesh Forest Department
January 2015

Management plan
For
Fasiakhali Wildlife Sanctuary

Supported by

Climate-Resilient Ecosystems and Livelihoods (CREL) Project

This publication is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents of this document do not necessarily reflect the views of the USAID or the United States Government.

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Acknowledgement

The management was prepared with active participation and co-operation of Bangladesh Forest Department and other Stakeholders.

Key contributions came from: Md. Yunus Ali, Chief Conservator of Forest (CCF), for his overall guidance and cooperation in preparing this management plan: Mr. Ratan Kumar Majumder, Deputy Chief Conservator of Forest (DCCF) (focal point); Mr. Tariqul Islam, Assistant Chief Conservator of Forest (ACCF); Mr. Dewan Jafrul Hasan, Conservator of Forest (CF) Chittagong Circle; Shah-E-Alam, Divisional Forest Officer (DFO) Cox'sbazar North Forest Division; Abdur Rahman, Assistant Conservator of Forest (ACF), Wildlife management and Nature Conservation Division, Chittagong; and FD staff of Fasiakhali Wildlife Sanctuary, Abu Morshed Chowdhury, Moktar Ahmed Chowdhury, Chairperson of Fasiakhali CMC; all members of Fasiakhali CMC; participants in local planning sessions from the Village Conservation Forum (VCF) of Fasiakhali and other officials.

I would like to thank Paul Thomson, Senior co-management Advisor (CREL), for his effort in preparing and developing the management plan.
I would like to thanks to CREL officials specially Mr. A.K.M Shamsuddin, Ex-CCF and Co-management Coordinator (Forestry); Abu Mostafa Kamal Uddin, Senior NRM Specialist; Mr. Shams Uddin, Manager-Landscape Planning and Ruhul Mohaiman Chowdhury, M& E Specialist and his team including field staffs of CREL.

The compilation of the management plan was done by the CREL technical assistance team: A.Z.M. Shamsul Huda, Consultant, Forest Management Plan; Afan Uddin and Abdullah Al Mamun, Associate Consultant, Forest Management plan, CREL. The process involved: consultations with 8 numbers of FD officers and 5 numbers of civil society representatives and members of 25 village conservation forums and community patrol groups as individuals or small groups; review of existing documents and plans; drafting of an outline plan; and holding of consultation workshops on 20 December, 2014.

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List of Acronyms

ACF - Assistant Conservator of Forests
ADB - Asian Development Bank
AIG - Alternative Income Generation
ANR – Assisted Natural Regeneration
CBC – Community Based Conservation
CBD- Convention on Biological Diversity
CCF - Chief Conservator of Forest
CF - Conservator of Forest
CMC – Co-management Committee (the operational body of the Co-management Council which is referred to in full to avoid confusion, except that CMC may refer to the combination of both committee and council in some places)
CMO – Co-management Organization
CPG – Community Patrol Group
DCCF- Deputy Chief Conservator of Forest
DCF- Deputy Conservator of Forest
DFO - Divisional Forest Officer
EIA - Environmental Impact Assessment
FCC- Forest Conservation Club
FD - Forest Department
FG - Forest Guard
FRH- Forest Rest House
FWS- Fasiakhali Wildlife Sanctuary
FRMP - Forest Resource Management Project
FSP - Forestry Sector Project
FWS- Fasiakhali Wildlife Sanctuary
GEF – Global Environment Facility
GIS - Geographic Information System
GoB - Government of Bangladesh
GPS – Global Positioning System
IPAC – Integrated Protected Area Co-management
IUCN - International Union for Conservation of Nature
JFM – Joint Forest Management
LDF - Landscape Development Fund
MIS- Management Information System
NACOM - Nature Conservation Manage-ment
NGO - Non-Governmental Organisation
NIC - Nature Interpretation Centre
WS - Wildlife Sanctuary
NSP - Nishorgo Support Project
NTFPs - Non-Timber Forest Products
PA - Protected Area
PCVA – Participatory Community Vulnerability Assesment
PF- Protected Forest
PF- Peoples Forum
PBSA - Participatory Benefit Sharing Agreement
PP - Project Proforma
PRA - Participatory Rural Appraisal
RF - Reserved Forest
RIMS - Resource Information Management System
RO- Range Officer
RRA - Rapid Rural Appraisal
TA - Technical Assistance
TFF – Tree Farming Fund
UNDP - United Nations Development Program
UNO- Upzilla Nirbahi Officer
UP- Union Parishad
USAID - United States Agency for International Development
VCF- Village Conservation Forum
WC - Working Circle

Executive Summary

Fasiakhali Wildlife Sanctuary (FWS) is located by the side of Chittagong-Cox's Bazar highway near Chakaria Upazilla HQ under Fasiakhali Range of Cox's Bazar (North) Forest Division. This forest was once very rich in floral and faunal diversity. At present the forest is degraded due to over exploitation and habitat destruction.

This management plan has been developed to cover not only the protected area but also the surrounding buffer and impact area; together these are the focus of the Fasiakhali Co-Management Council and Committee (CMC). This plan was prepared in a consultative, participatory process and becomes the defining reference for activities of Forest Department (as well as the CMC) within Fasiakhali Wildlife Sanctuary and sets out guidelines and activities for the CMC in the impact area for 10 years period **(2015-2025).**

The long term vision is to restore biodiverse semi-evergreen forest throughout almost all of the Sanctuary and a large part of the buffer area that is enjoyed responsibly by visitors; and this is actively supported and protected by local communities and enterprises who benefit from tourism, non-timber forest products, and soil and water conservation, and who adopt sustainable land management adapted to future climate changes in the landscape. The aims of this plan are: 1) to protect 483 ha of existing denser forest inside the Sanctuary, 2) to rehabilitate the degraded forest in 692 ha inside the Sanctuary, and 1,366 ha in the bordering buffer reserved forest through enhanced natural regeneration; 3) to achieve sustainable natural resource use levels and limit biomass extraction in part of the buffer zone and in the impact zone; 4) to promote improved livelihoods for approximately 9,500 households living within the WS based on climate change resilient enterprises and services; and 5) to promote nature based tourism by providing suitable visitor facilities and thereby generating sustainable income flows for co-management and livelihoods.

The management plan takes into account recent developments towards co-management under the Wildlife (Preservation and Security) Act 2012 and international standards on biodiversity conservation of protected areas. The management prescriptions are given on the basis of zonation i.e. core zone, buffer zone and impact zone.

The management issues and threats identified are: land encroachment, illicit felling, forest resource use, habitat degradation and fragmentation, climate change, tourism, wildlife conservation and protection.

The original forests of Fasiakhali were moist deciduous with mixed tropical evergreen trees dominated by *Diptercarpus* spp. (Garjan); now most of the area is mixed scrub forests. Asian Elephant is the most notable mammal occurring in Fasiakhali Wildlife Sanctuary, which it uses during migration between other forests. There is a reasonable diversity of other faunal groups, mostly species with a wider distribution, but it is presumed that several sensitive species have been lost since the 1980s due to deforestation and biotic interferences. Now a day Samber, Goyal, Serao are not seen in the FWS which may come again if the Sanctuary is protected without disturbance.

Cox's Bazar region is highly vulnerable to climate hazards including cyclones, tidal surges, rain storms, landslides and flash floods. These have already caused losses to

people, livestock, crops and natural vegetation in the area in the past and may intensify over time.

The basic principle of this management plan is a people oriented approach where local stakeholders are organized and represented from their villages and interest groups, along with Forest Department and other government agencies in the Fasiakhali Co-management Council and its executive committee .The plan assesses the present situation of biodiversity, resource protection and management, human interferences, impact zone landscape positions, and based on this analysis sets out priority management actions for a ten year period.

Fasiakhali Wildlife Sanctuary covers 1,287 ha (core zone), adjoining the sanctuary are 1,366 ha of reserved forest forming a buffer zone area, the immediate impact or landscape area is 4,384 ha of largely private lands within which are 30 villages. The boundary of Fasiakhali Wildlife Sanctuary is not well demarcated. Although the Wildlife Sanctuary was notified in 2007, no efforts have so far been made to physically demarcate the boundary in the field. The situation is exacerbated by heavy human pressure on the forest and encroachment of forest lands. This has resulted in fragmentation of remaining forest, loss of forest habitat, and loss of wildlife.

Non-Timber Forest Products (NTFPs) play an important role in Fasiakhali WS and its buffer and impact zones, providing livelihoods and employment to the forest dependent communities. Unfortunately over-exploitation of NTFPs including illicit cutting of fuel wood, bamboo, etc. has resulted in the degradation of the forest and NTFP resources. Use rights in terms of sustainable harvests of both timber and NTFPs should be granted to the local communities who are involved in protection activities through Participatory Benefit Sharing Agreements (PBSAs) from reserved forests in the buffer zone.

Linkages with markets and service providers will be encouraged by the CMC and People's Forum (PF) so that poor people currently exploiting the WS forest can earn higher incomes while reducing natural resource extraction. This may be by intensifying enterprises on their current lands, or by developing new skills and employment such as in small scale industry, tourism, and cottage industries.

There are 30 villages represented within the CMC of FWS, inhabited by 9,500 families (50,000 people). A total of 22 stakeholder categories have been identified in Fasiakhali WS area, of which 11 are primary ones. The primary stakeholders are local elites, local FD personnel, forest villagers, forest settlers, fuel wood collectors, betel leaf cultivator, sun-grass collector, Rohinga settlers, fishers, bamboo collectors, charcoal producers, and hunters. Secondary stakeholders include farmers, dry leaf collectors, timber merchants, brick field owners, sand collectors, fodder collectors and livestock grazers.

Protection of habitat against illicit felling, encroachment, and grazing are the primary responsibility of FD working with the CMC. FWS needs an additional 10 well trained staff including an Assistant Conservator of Forests to be posted as the responsible officer for the Wildlife Sanctuary. Co management is based on a 65 member Co-management Council and 29 members Co-management Committee, representing all local stakeholders, and including representatives of a People's Forum which itself represents 30 villages. These bodies provide forums to discuss problems and take decisions, and ensure local participation in protecting remaining forest and its regeneration, and

promote development of alternative livelihoods to reduce pressure on regenerating forest.

This management plan specifies actions in three zones in accordance with the Wildlife Preservation and Security Act, 2012: core, buffer and landscape/impact zones. During 2015-2025 in the core zone no roads and other substantial infrastructure development will be permitted. Selected existing trails used by encroachers and resource extractors will be designated as visitor walking trails and limited facilities for ecotourism will be developed (such as information boards). Enrichment planting with indigenous forest tree species following the framework method will be taken up in 200 ha of degraded/barren lands where natural regeneration is not coming up due to lack mother trees. In the buffer zone only native tree species will be planted. In all zones where there is degraded/bare land soil conservation measures e.g. localized planting of native trees, bamboo and bushes will be taken up to reduce erosion of stream/chara banks. This will include promoting contour cultivation and restoring vegetation on slopes in encroached areas and in private lands in the influence/landscape zone.

Sapling regeneration and density will be monitored in sample representative areas jointly by the co-management stakeholders (CMC, FD and community patrol groups).

FD will provide/arrange (with outside assistance as needed) suitable training for its staff and co-management stakeholders in protected area management including management of wildlife and nature based tourism, forest restoration, climate change resilience. Links will be made with agencies that can provide training to local people to enhance enterprises without threatening natural resources.

The Sanctuary will be publicized in electronic and print media to promote nature based tourism, raise the profile of the WS, and increase its use as part of formal and informal education. One arboretum, one orchid house will be established to attract to tourist. Short, medium and long distance nature trail will be developed with minimum disturbance for nature based tourism.

Private-public partnership will be encouraged to increase resources available for nature conservation based on mutual transparency, and agreed respectful publicity for building up the image of the contributors, FWS, FD and co-managers.

Introduction

This management plan has been prepared primarily for use by FD and CMC of Fasiakhali Wildlife Sanctuary.

Co-management enables active participation of local communities in forest management and offers direct and indirect benefits of sustaining their livelihoods, apart from achieving conservation goals. Since the 1990s in many countries, including Bangladesh, co-management has been adopted to address the limitations of previous top-down management. In Bangladesh the Forest Department has formally adopted co-management for protected areas and their landscapes, by actively involving forest dependent communities in decision making and protecting forests and their wildlife.

Fasiakhali Wildlife Sanctuary (FWS) is one of the important wildlife sanctuaries in Bangladesh due to the frequent movement of Asian Elephant through the sanctuary. Once this area was famous for lofty Garjan trees and an important habitat for wildlife. The type of forests is moist mixed semi-evergreen forest dominated by Dipterocarps. However, with the passage of time, the Garjan forest has become extremely degraded and forest habitat has been destroyed due to population pressure, encroachment, illicit felling of trees, dependency on forest products, locally the ecosystem has also been affected by river bank erosion and natural hazards. Therefore, to manage Fasiakhali Wildlife Sanctuary and its landscape sustainably and to conserve the biodiversity and restoration of natural forest this management plan has been prepared.
The Management Plan was developed following a landscape approach (core zone, buffer zone and impact/landscape zone). The plan focuses on the rehabilitation, protection and conservation of forests and constituent biodiversity, sustainable use of landscape areas to achieve conservation on a broader scale with the involvement of local people and other key stakeholders in co-management, resilience to climate change, sustainable ecotourism activities and livelihood diversification in the impact zone. The Management Plan is expected to guide in addition to FD and CMC, policy makers, decision makers, land owners, and funding agencies.

The main purpose of the management plan is long-term management to bring the maximum area of Fashiakhali WS under forest cover to restore forest and its constituent biodiversity in the best possible condition and thus resilient the climate change, to encourage eco- tourism, and to ensure sustainable livelihoods and natural resources for adjacent communities who actively support conservation.

The plan provides a 10 year framework for management, within which the scope, timing and relative emphasis on specific activities can be modified by field managers on the basis of experience, success and program achieved as the plan is implemented. In order to ensure success in implementation, resources need to be mobilized as required for the key activities set out. Sufficient flexibility has been kept to make necessary modifications and adjustments to management activities, which are based on:

(1) Protecting and restoring physical, biological and aesthetic features of Fashiakhali WS as part of the larger Cox's Bazar region forest ecosystem.

(2) Improving food security and resilience of local people to natural hazards including climate change and human-wildlife conflicts

(3) Increasing the revenue generation potential of the Sanctuary for promoting conservation and local development

(4) Realizing the WS's potential as a venue for tourism based on wildlife, recreational, educational, cultural and aesthetic appeal

(5) Integrating Fasiakhali Wildlife Sanctuary into local and regional development processes, especially for surrounding local communities to ensure wider acceptance of the value of the WS

(6) Improving the FD's staff welfare, motivation and capabilities.

PART 1: Current Status of Protected Area

1 Descriptions

1.1 Basic facts of the Fasiakhali Wildlife Sanctuary

1.1.1 Location

Fasiakhali Wildlife Sanctuary (FWS) is located by the side of Chittagong-Cox's Bazar highway near Chakaria Upazilla HQ under Fasiakhali Range of Cox's Bazar (North) Forest Division. The sanctuary lies between 21^0 45' to 21^0 40' N and 92^0 4' to 92^0 8' E. The Sanctuary is adjacent to the Bangabandhu Safari Park and Bandarban district boundary. It is about 48 km north of the tourist center of Cox's Bazar city (Figure 1).

1.1.2 Area

The area of FWS is 1,302 ha which was notified in 2007. Fasiakhali Wildlife Sanctuary was designated to comprise of three forest blocks: Dulahazara (287.50 ha), Fasiakhali (402.02 ha), and Ringbhong (613 ha). These three blocks at present fall under two forest beats namely Dulahazara and Fasiakhali beats. The total landscape area of the PA is about 7093 ha comprising of: 1302 ha core zone (Table 1) 1,366 ha buffer zone (Table 2) and 4,384 ha impact zone. However, GIS based land use mapping indicates the area within the PA boundary is 1,342 hectares (see table 5) of which 40 ha has been shown as private land and 1,302 ha core zone.

Table 1: Total areas of Core Zone/Protected Area (PA) in the FWS (Gazette notification of FWS, 2007)

Range	Beat	Block	Area (Ha)
Fasiakhali	Dulahazara	Dulahazara	287.50
	Fasiakhali	Fasiakhali	402.02
		Ringbhong	613.00
Total			1302.52

Table 2: Total Buffer Area in the FWS (CREL, 2014)

Range	Beat	Block	Area (Ha)
Fasiakhali	Dulahazara	Dulahazara	302
	Fasiakhali	Fasiakhali	3
		Ringbhong	601
	Dulahazara	Hargaza	459
Total			1,366

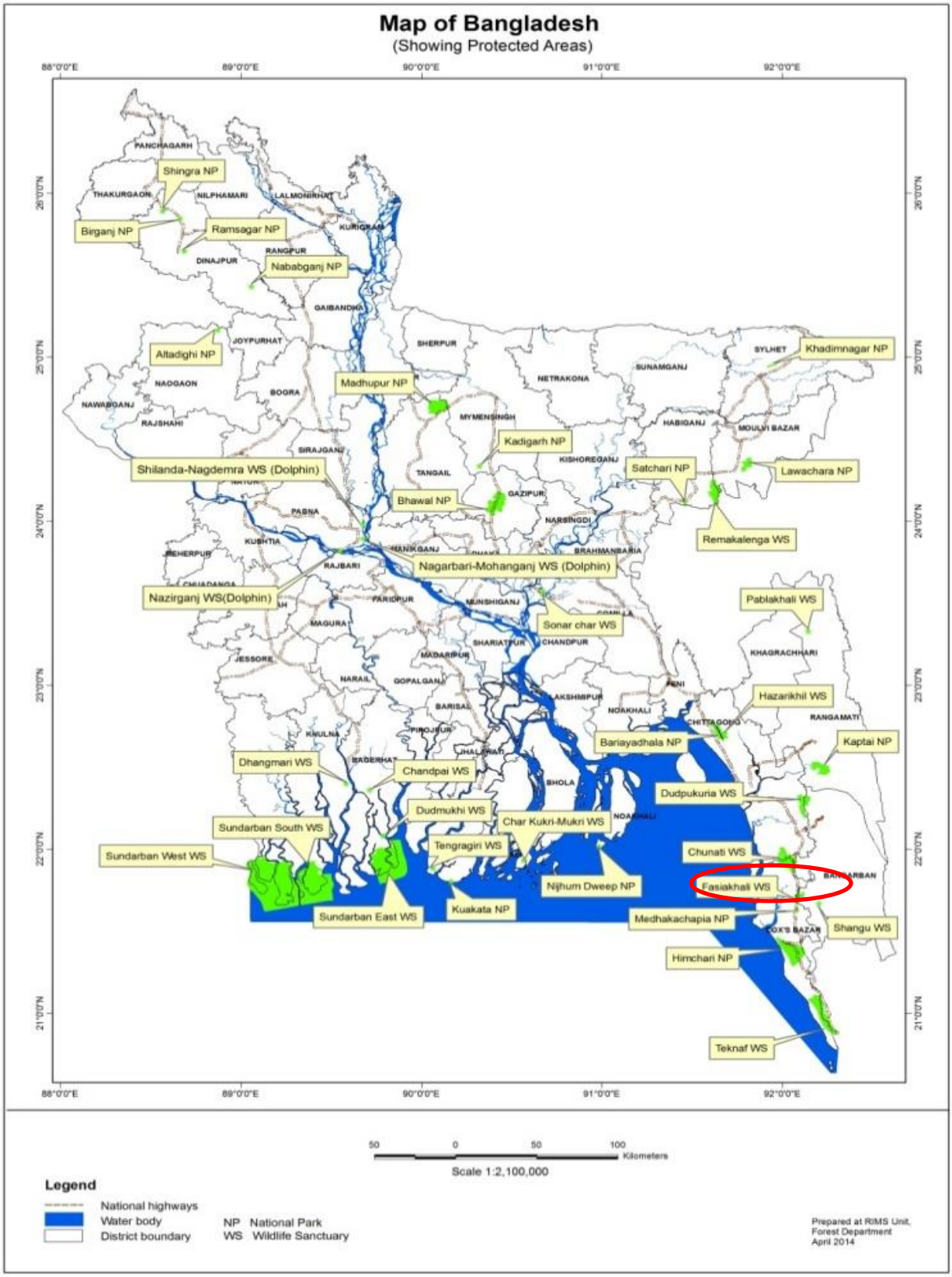

Figure 1: PAs of Bangladesh showing FWS

1.1.3 Boundary

A well-defined boundary is necessary for the proper management of any PA, but there is no well-defined boundary to FWS. This Sanctuary is bounded in practice by the following:
North: Haser Dighi – Lama Alikadam road
South: Dulahazara Chara and Bangabondhu Safari Park
East: Bandarban district boundary
West: Chittagong – Cox's Bazar highway.

1.1.4 Legal status and special regulatory provision

Fasiakhali Wildlife Sanctuary was declared under section 23(II) of Bangladesh Wildlife Preservation Act 1974, on 2 June 2007 through gazette notification number MoEF/G/5/6785.

1.1.5 Historical description of the site

Fasiakhali Wildlife Sanctuary is under the jurisdiction of Cox's Bazar (North) Forest division which was formed in 2001. The forest area was declared as reserve forest in the early 19th century under section 20 of Forest Act 1927. Once the area was evergreen and semi-evergreen tropical forest dominated by Garjan (*Dipterocarpus* spp.) and Dhakijam (*Syzygium* spp.) along with Chapalish, Telsur, Chandul, Pitraj, Uri aam, Bandorhola, Toon, canes, bamboos, shrubs and climbers. Epiphytes with aroids, mosses and orchids were abundant there. With the passage of time the natural forest has degraded. Some were felled and replaced by plantations of native and other long rotation tree (Garjan, teak, jam and others). Presently the remaining trees in the wildlife sanctuary are mostly Garjan and Jam along with some Teak and Agar plantations and short rotation participatory plantations of exotic Acacia spp. and Eucalyptus. Gradually the multi-storied and diverse forest structure has been converted into plantations of lower biodiversity value. Pressure from the surrounding human population by illicit felling, fuel wood cutting, and encroachment has increasingly intensified the problems. Now the WS has lost habitat challenging its importance for majestic Asian Elephants, one of the flagship species of this sanctuary.

1.2 Physical features

1.2.1 Geology and Soil

Fasiakhali Wildlife Sanctuary is composed of alluviums, terraces, and old terraced fans made up of unconsolidated sediments including sand, sandy loam, loamy clay, fine to coarse sandstone and lateritic layers. These sediments are strongly erodible. Soils in the hills is loamy to clayey. Top soils are rich in humus and often impregnated with iron resulting in a red or yellowish tinge. The loamy soil permits deeper penetration of tree roots unless obstructed by presence laterritic and placic horizons at shallow depths. Apparently the soil does not show any mineral deficiency or toxicity that may limit tree growth. Soils in the hills are well drained. The soils in the valleys are imperfectly drained alluvial soils and some vallys are used for dryland agriculture and rainfed transplanted Aman during the kharif season

1.2.2 Topography and Land form

The Sanctuary area is largely made up of flat land and undulating low rolling hills with gentle slopes. In some places there are steep valleys containing charas (streams). Matamuhuri River flows by the northern side of the sanctuary.

1.2.3 Water areas

FWS has high rainfall, runoff from the hills flows into gravel and sandy bedded charas (streams) which drain including two major charas (Kumari chara and Dulahazara chara) and from these into rivers, mainly the Matamuhuri River. . Small streams and shallow depressions provide small wetlands used by a few waterbirds, and by fish which are a source of local livelihood, as well as sometimes for drinking water.

1.2.4 Physical processes (Erosion & Accretion)

Soil erosion in the sanctuary area is noticeable, and results from high rainfall and floods combined with deforestation. Sediment flows into the adjacent low lying agricultural lands. Localized erosion and accretion are common phenomena along the charas.

1.3 Climatic characteristics

1.3.1 Rainfall, Temperature, relative Humidity

Generally, the areas in which the Sanctuary is located are characterized by a humid, tropical climate, little temperature variability, and rainfall concentrated between the months of June and October, with some differences**.** The area lies under the tropical climate zone having monsoon rainfall and climate. Normal rainfall occurs during the month of May to September for five months. Maximum rainfall in the month of July/August and the average rainfall is 3634 mm. There is an increasing trend in rainfall of Cox's Bazar region and the rate is +2.886 mm/yr (Figure 2). If the trend continues the average annual rainfall will be 3836.115 mm by the year 2050 (Table 3) which may have severe climatic effect.

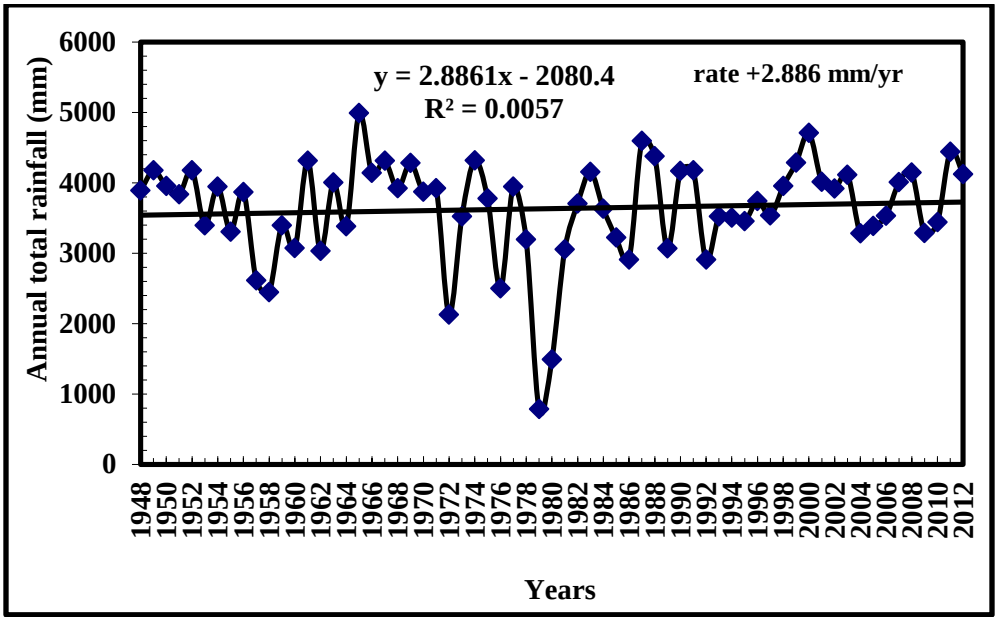

Figure 2: Trend of rainfall in Cox's Bazar region (Source: BMD 2012)

Table 3: Projection of annual rainfall in Cox's Bazar region by 2050 (Source: BMD 2012)

Year	1961-2012	2030	2050
Avg. rainfall (mm)	3634	3778.38	3836.11

The temperature in the area varies between 14.3 ^{0}C and 31.85 ^{0}C. Maximum high temperature is during the month of May. There is an increasing pattern (Table 4) in average temperature of Cox's Bazar region that may change the climatic pattern of the region. Relative humidity varies from 40% to 87%. During the winter the weather is cool. The humidity is high in the sanctuary area throughout the year.

Table 4: Projection of temperature in Cox's Bazar region by 2050 (Source: BMD 2012)

Year	1961-1990	2010	2030	2050
Temperature (^{0}C)	25.52	25.98	26.55	26.88

1.3.2 Climatic hazards (Cyclone, Flood and Landslide)

Cox's Bazar region is highly vulnerable to climate change. Extreme climatic events such as very high rainfall followed by flash flood and landslide are common phenomena in Cox's Bazar district. The district also experiencing frequent cyclonic events took place in 1960, 1961, 1963, 1965, 1970, 1985, 1991, 1994, 1995, 1997, 2007 and 2009. Extensive damage of forest took place in the cyclone of 1991. Every time there is colossal damage to the people, livestock, crops and vegetation due to these climatic hazards. Most of the occasions many people moved from the coastal areas to the hills of Fashiakhali forest areas and settled.

1.4 Ecosystem, Flora and Land uses of PA and Landscape

The sanctuary and landscape harbor terrestrial, forest and aquatic ecosystems. Rich diversity of flora, fauna, microorganism, edaphic and microclimatic factors including rainfall, humidity, sunshine, aspect and soil govern the ecological process and function of the sanctuary ecosystem.

1.4.1 Flora

The Fasiakhali Wildlife Sanctuary is consisting of Fasiakhali Beat and Dulahazara Beat. A number of different ecosystems harboring rich biodiversity can be found in the protected area including tropical evergreen and semi-evergreen mixed forests; grasslands, bamboo and cane; short and long-rotation plantations; small streams; homesteads and settlements; water bodies; and cultivated lands. The small streams enabling the drainage of water that collects in the depressions and valleys in the hilly landscape serve as important habitats for flora and fauna, as well as provide drinking water for both human and animal populations.

According to NSP, 2011 there are about 101species of plant in the sanctuary of which 63 tree, 12 shrub, 9 climber and 27 herb species (Annex 4).

FWS supports hundreds of floral species some parts of the forests still support natural vegetation, with the dominant tree species including *Dipterocarpus turbinatus*, *Hopea odorata*, *Artocarpus chaplasha* and *Syzygium cuminii.* Plantations of some species such as *Tectona grandis* and *Acacia auriculiformis were raised.* Besides these species Agar, Bamboo, Bet, Chickrassi, Arjun, Bohera etc. are also planted in this protected area. A total of 150 ha area has been covered by plantation programme (Annex 3). A list of NTFP has been given in annex 13.

1.4.2 Landscape land uses and tenure

The landscape area of the FWS is about 7,093 ha (Table 5) of which 1302 ha is in core zone, 1,366 ha is in buffer zone and 4,383 ha is in landscape zone /impact zone. Within the core zone, area 35 ha is private land. A diversified land cover is found in the FWS area. These land use include forests including plantations, herb-shrub-bush, fallow or agricultural land, water bodies including river, wetland, aquaculture and settlement. Degraded lands cover the highest proportion of land body though around 235 ha of plantation raised by FD (Annex 3). Over the past few decades, land cover has changed significantly due to anthropogenic pressures, such as migration, illegal felling and harvesting, conversion of land to agricultural uses, and encroachment. Land use of landscape areas under each category are presented in Table 5 and land use map of FWS is shown in (Figure 3).Table 5 is showing the land use area within the PA boundary, of which 40 hectare private land.

Table 5 Land cover Statistics inside Landscape area of Fasiakhali (Source: CREL, 2014)

Landcover	Core	Buffer	Impact	Landscape
Degraded Forest	692	372	421	1485
Forest	485	227	304	1016
Irrigated Agriculture	126	360	2034	2520
Saltpan		95	339	434
Settlement	25	260	1113	1398
Wetland	14	52	173	239
Total	1342	1366	4384	7093

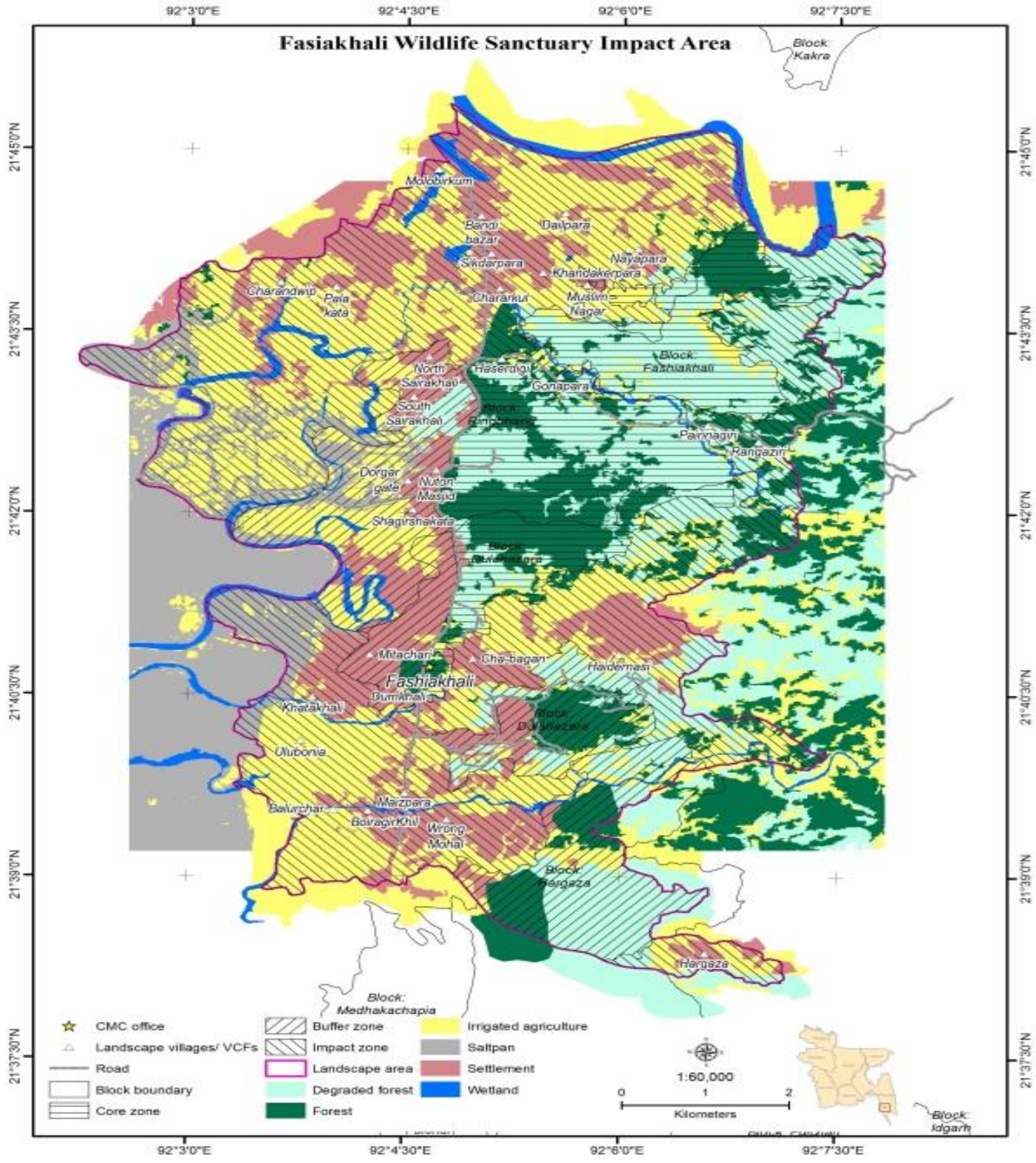

Figure 3: Landuse Map of Fashiakhali Wildlife Sanctuary

1.5 Fauna

Fasiakhali Wildlife Sanctuary was rich in faunal diversity. At present wildlife of the sanctuary is threatened due to deforestation, habitat fragmentation and human disturbance. Asian Elephant is the main charismatic species and probably was a keystone species. Other wildlife include: Rhesus Macaque, Slow Loris, Jungle Cat, Fishing Cat, White-crested Laughing thrush, and Red Jungle fowl is common. Within FWS 162 bird species have been recorded during surveys since 2005, in neighboring forests of Dulahazari and Malumghat mostly in the 1970s to 1990s 129 bird species were recorded, giving a combined total of 200 species recorded or likely to have occurred in the past in FWS (Annex 5). In addition 25 mammal species, 15 species of amphibians, and 35 reptile species are reported (Annex 5).

1.6 Socio economic profile

1.6.1 Population and settlement

At present, there are 30 villages/ paras, 3 unions and one Pourashabha under Fasiakhali Range/ CMC. A total of 9,500 families live in these villages with a total population of 50,000 (approx.) where 52% are male and 48% are female. Among them 87% are Muslims and the rest are Hindu and Buddhist. The tribal group Marma and chakma are present in the landscape.

The main occupation of the local people is agriculture as 60% of the populations are engaged in agriculture, 15% are engaged in fishing, 20% are day labors and the rest are engaged in other occupation.

1.6.2 Infrastructure and services

Communication access is good in the landscape area. There are 34 educational institutions including schools, college and Madrasa, 9 Cyclone shelter centers for the affected people during several natural hazards, 11 market places, Upazila hospital and different Government and non-government organizations in the landscape area. Dulahazara Christian Memorial Hospital lies adjacent to the FWS. This provides health services to the neighboring villagers including CHTs.

1.6.3 Livelihood activities and resource uses

People of the region more or less are dependent on forest or forest resources. NTFP's such as bamboo, cane, grass etc. also play an important role for their income generation and consumption. Most of the people in the Fasiakhali area use fuel-wood for cooking and it is a cause of major degradation of FWS forest and habitat. Types of resource uses with their dependency on forests are shown in table 6.

Table 6: Resource uses of FWS Areas

Name of resources	Reasons for resource exploita-tion	Users	Dependency
Fuel wood	HHs consumption and for commercial purpose	Local people, tea stall, hotel owners	High
Timber	Commercial and HH	Local people, furniture	Low

	building material	mart	
Sungrass	Commercial and HH thatching material	Local people, Local Market	High
Other NTFPs*	Commercial and HHs Consumption	Local People	High
Wildlife	Commercial and HHs Consumption	Local People	Low
Betel leaf vine cultivation	Commercial use	Local market	Low

* Includes bamboo, cane, medicinal plants, fruits, vegetables, dry leaf and grass etc.

1.7 Past management system and plans

Scientific forest management in this sub-continent was started during British rule in 1865. In those days, forests were managed primarily for revenue collection. Only valuable trees were extracted from the forest to get more revenue. Then a forest management plan or work plan prepared for each forest division. This management plan guides forest manager to manage forest or to perform day-to-day work in the forest. This plan spells out where to cut trees, how much to cut and what to plant to cover up the cleared forest etc. on annual basis. In 1930's the management system was modified to clear felling with artificial regeneration or plantation.

Lastly, Mr. MahbubUddin chowdhury DCF, prepared the working plan for the period 1969-'70 to 1988-'89 for Cox's Bazar. In 1990, according to the Government's decision, the logging from the forests stopped. Since then, there is no more working plan is in place. Lastly, in 2007, Fasiakhali Wildlife Sanctuary was declared as Protected Area but no management plan was prepared.

2 Emerging issues

2.1 Administration of Forest PA and associated facilities

Fasiakhali Wildlife Sanctuary is under administrative jurisdiction of Fasiakhali Forest range of Cox's Bazar (North) Forest Division. There is no separate administrative setup for the management of the PA. The Fasiakhali Wildlife Sanctuary consists of two beats under Fasiakhali Forest Range. There is no individual ACF and Forest Ranger for FWS. Sometimes foresters of each beat are in additional charge of other beats that hinder the effective management of FWS. At present FWS has only 13 personnel including foresters and forest guards which is not sufficient to manage the PA effectively.

2.2 Co-management institutions and associated facilities

Traditional management strategies of PA have botched to conserve the forest sustainably, so a new management approach has undertaken in 2006, named co-management strategy.

For Fasiakhali Wildlife Sanctuary, related co-management actors are the FD as legal custodian of PAs, and key stakeholders that play important role in the conservation management. In the structure of co-management there are Co Management Council, Co-Management Committee (CMC), Peoples Forum (PF), Village Conservation Forum (VCF) and Community Patrol Group (CPG).

Co Management Council in the FWS was formed on 23rd December, 2012 with 65 councilors. The UNO acts as Chairperson and either the ACF or the RO acts Member Secretary of the council.

The Co Management Committee (CMC) is responsible for overall management in the PA. It consists of 29 members, elected by the conservation council by following a structured guideline that will contain the number of people to be elected from each representative category, their election procedures and the tasks to be performed by the committee. 30 VCF was formed in the CMC.

There is one People's Forum which has two bodies, one is General body with members of 60 and another is Executive body with member of 11, Two CPGs have been formed with 42 members to protect forest resources of PA. Each CPG consists of 21 members (Table 7).

Table 7: Co-management structure of Fasiakhali Wildlife Sanctuary

SL No	Name of Activity/ Organization	No organization	Member
1	Council	1	65
2	Co management Committee (CMC)	1	29
3	Peoples Forum (General Body)	1	60
4	Peoples Forum (Executive Body)	1	11
5	Community Patrolling Group (CPG)	2	42
6	Village Conservation Forum (VCF)	30	1800

2.3 PA and landscape boundary delineation

Fasiakhali Reserve forest was proclaimed as Wildlife sanctuary in 2007. The boundary of the sanctuary is defined by Haserdighi – Lama Alikadam road in the North, Dulahazara Chara and Bangabondhu Safari Park in the South, Bandarban district in the East and Chittagong – Cox's Bazar highway on the west. The boundary of forest was not delineated in the field and the entire forest block is not covered under the PA. Some area has been left out as buffer zone. Moreover, some forest areas encroached and brought under cultivation and settlements. No efforts have been made to physically demarcate the boundaries in the field and the situation got exacerbated with heavy human pressure on forest land. This has adversely affected the ecological boundaries of FWS with limited elephant movement. It is necessary to survey, recognize and demarcate all the marginal boundaries of the FWS through the existing survey technique.

2.4 Forest and habitat management interventions

The Fasiakhali forest was very rich in biodiversity both flora and fauna but due population pressure and other interference the forest and the habitat is almost destroyed. Encroachment and illegal extraction of forest resources was common feature of FWS in traditional forest management system .To arrest such situation co-management system was introduced in forest management. The co-management involves local people's participation for the protection and conservation of natural forests. There is a co-management organization (CMO) in the FWS for the management and conservation of bio diversity and habitat preservation. Under the CMO structure co-management council and co-management committee are also involved. Institutional arrangement for community participation in forest management has been developed but specific capacity building will be required for them to cope up with the upcoming challenges like biodiversity conservation climate resilience ecosystem and livelihood development and forest protection.

For sustainable habitat management specific intervention is required in core zone, buffer zone and landscape zone considering wildlife, key stone species, climate change and local people's dependency on Fasiakhali Wildlife Sanctuary.

2.5 Encroachment, illegal extraction and forest destruction (with causes)

Forest land encroachment for agriculture, brickfields and settlements is common inside the WS. From focus group discussion it has been found that regularly 282 people entered through 18 access point (Annex 11) Forest land is encroached permanently but also for a temporary period mainly for grazing, fishing and agricultural purposes. The village elites are directly or indirectly associated with forest land grabbing for establishing homesteads and cultivation. Institutional encroachment is common for setting up school, madarasa, graveyard, mosque etc. This phenomenon of forest land encroachment is still continuing and needs to be stopped immediately.

Illegal extraction of forest resources is a common scenario in FWS. A trend of forest loss from 2001 to 2012 is given in annex 8 based on vegetation cover analysis by GIS. It includes illicit felling, illegal hunting of birds and animals etc. This happened mainly for the high demand of fuel wood, unemployment, lack of knowledge and consciousness towards forests and forest resources.

Forest destruction is taking place as the forest lands are being used illegally for human settlement, agricultural purposes etc. Encroachment is the biggest problem of FWS. There is a village inside the FWS which is expanding day by day, encroaching forest land. Presence of Dulahazra Christian Memorial Hospital caused several encroachments for market and habitation inside the PA.

2.6 Existing dependence on and use of forests and other common natural resources

Most of the villagers within the landscape areas are poor and they are more or less dependent on forest resources. These large numbers of people depend on forest land and forest resources for the reasons of fuel-wood collection, livestock grazing, fodder collection, bamboo and cane extraction, green and dry leaf collection, fruits and vegetables collection, sun-grass collection, medicinal plant collection.
Fuel wood collection is the main factor of forest deterioration due to cutting of seedlings, saplings and bamboos which hinder the ecosystem to rejuvenate again. Moreover, a large area of forest land is encroached by settlers. The encroached land is used for the cultivation of paddy, betel leaf, maize, cucumber, brinjal, potato, water melon, green chilli etc.

2.7 Gender, youth and ethnic communities

There are 30 villages/ paras, 3 unions and one Pourashabha under Fasiakhali Range/ CMC. A total of 9,500 families live in these villages with a total population of 50,000 (approx.) where 52% are male and 48% are female. Among them 87% are Muslims and the rest are Hindu and Buddhist. Men are dominant in decision making in the family matter. In most cases, women are overlooked. Gender equality is very important for the conservation of the FWS.
There are 2 ethnic groups named Marma and Chakma are present in the landscape area of Fasiakhali Wildlife Sanctuary (FWS). These ethnic groups have their own culture and tradition. Their dependency on FWS is high.

2.8 Ecotourism and education/information (existing visitor levels, facilities)

Fasiakhali Wildlife Sanctuary has good potential for ecotourism as it borders the main road used by most tourists visiting Cox's Bazar, is adjacent to the Dualahazara safari park, and also is next to but outside the Chittagong Hill Tracts which can all make it attractive and easily accessed by tourists. By developing ecotourism facilities, specially marking and maintaining foot trails, and building shelters, picnic spot, sitting benches, drinking water supply,, toilets and information displays, and permitting a tourist tourism can be promoted. Students and researchers can also be attracted as a convenient forest for studies.

2.9 Existing carbon stocks and scope to enhance

Carbon stock is an indicator to understand forest situation. It is increasingly important as solutions are sought to address climate change. A carbon inventory was conducted in FWS to assess the forest condition and the forest carbon situation as an input to this management plan. It shows that 300.75 CO_2 Mg ha^{-1} are stored on average in FWS indicating good forest cover condition (Table 8).

Table 8 Stock of CO2 Mg ha^{-1} at different land cover classes in FWS (Source: IPAC, 2011)

Land cover type	Area (ha)	Nos. Seedlings ha^{-1}	Nos. Saplings ha^{-1}	Nos. Live trees ha^{-1}	CO_2 Mg ha^{-1}
Degraded forest	692	891	1878	50	145.4
Forest	483	1,971	3969	313	581.6
Settlement	18	371	1662	101	136.1
Plantation		1309	2971	334	339.80
Average					300.75

2.10 Management constraints

Like other PAs in the country, FWS also have several kinds of management challenges to achieve forest management objectives. These are given in following (Table 9).

Table 9: Management objectives and constrain in Fasiakhali Wildlife Sanctuary

Management objectives	Management Challenges
To ensure Landscape approach in conservation of FWS where Asian Elephant is flagship species.	There is no boundary demarcation (Core zone, buffer zone and impact zone). Agricultural activities, settlements, green fuel wood, bamboo and wild fruits collections within the PA. Lack of transport and modern equipment to protect forest.
To restore Elephant habitats as ecosystems resilient to climate changes impact.	Restore vegetation favored by elephant such as bamboo, wild fruits within the PA. Protect corridors for elephant movement from CHTs to Chunati via Fasiakhai. Lack of trained professionals, staffing and infrastructure. Lack of transport and modern equipment facilities for the fortification of forest.
To strengthen co-management for sustainable conservation of biodiversity in FWS.	Gaps in knowledge, understanding and trust for effective collaboration among the CMC stakeholders including FD. Lack of expert inputs to inform CMC-FD interactions and decisions Inadequate financial support for the community patrol groups (CPG).
To strengthen eco-tourism and nature education facilities in suitable areas within FWS,	Lack of funds. Lack of awareness among visitors to Cox's Bazar about FWS, local people unaware of livelihood opportunities from eco-tourism.

To reinforce and diversify sustainable livelihoods activities; in order to build up resilience to climate change inthe FWS dependent communities.	Lack training about alternative income sources such as nursery, cottage industries. Villagers have no knowledge about the climate resilient high value agricultural crops.

2.11 Conflicts and their resolution

In Fasiakhali more than 20 stakeholders are identified**. Institutional stakeholders** are Forest Department, NGOs, Union parishad, Army, and Police. **Primary stakeholders** are forest land encroacher, fuel-wood collector, illicit logger, forest produce collector, hunter, farmer, tourists etc. being directly associated with forest resource extraction activities. **Secondary stakeholders** are Timber merchant, brickfield owner, hotel owners, and furniture businessman, saw mill owner linked indirectly with forest-based activities.

Coordination among these stakeholders is very weak. Primary stakeholders are generally the poor villager and users as driving force of forest destruction and maximum gainers are the elites or secondary stakeholders. Institutional stakeholders always try to use their power and authority over other stakeholders. To mitigate such conflicts possible resolutions are identified in Table 10.

Table 10: Sources of conflict with their resolution in FWS

Sources of conflict	Resolution
Land disputes	By arranging local salish through local UP member and chairman and/or other local elites, meeting with land administrative authorities.
Encroaching forest land	FD and local influential people make negotiation
Tree felling	Forest cases Motivation.
Human- wildlife conflict	Due to destruction of wildlife habitat, elephants often attack settlements and agricultural fields in search of food. Habitat restoration and stopping further encroachment in forest areas; fencing the agricultural lands and settlements; growing crops such as chillies or enterprises such as bee keeping that elephants avoid Conserving elephant movement corridors Development and implementation of compensation scheme Awareness building among local settlers about how to stray elephants back to the forests.
Inter-departmental conflict	Allocation of forest land for settlement recorded as khas land. Co-ordination with the land administration should be improved to stop the settlement of forest land

Asian Elephant is the most important wildlife species of this area. Asian Elephant are forest dwelling animals they have been describing as Keystone or Flagship Species. They are often called the 'engineers' of the forest as they play a significant role in maintaining the ecosystems they inhabit. Fragmentation of elephant habitat, scarcity of fodder species and increased human activities within the sanctuary pose serious challenges for elephant habitat conservation and human elephant conflict management in FWS. Due to destruction of wildlife habitat, elephants often attack settlements and agricultural fields in search of food and movement.

2.12 Climate change and likely impacts on vegetation, fauna, ecosystem services

Climate change has become a burning issue in the recent years. The main cause of climate change is Temperature rise which depends on energy balance from recent participatory community vulnerable assessment report; some climatic disasters have been identified in the Fasiakhali Wildlife Sanctuary. These are cyclone and storms, excessive rainfall, landslide, flash flood, water logging and downward movement of water table.

The climatic phenomenon has an impact on vegetation, fauna and ecosystem services of FWS. Change in vegetation pattern consequently alters the other ecosystem services. Frequent cyclone with heavy rainfall causes severe damage to vegetation particularly trees. During heavy rainfall vegetation cover retains water and serves the water to the stream all year round. In the absence of forest, heavy rainfall causes landslide and surface run-off and dry season observe shortage of water in all streams..

Saline water intrusion and high tide in the coastal areas caused migration of people from the coastal areas into the Fasiakhali Forest areas by illegal settlements. The trend will increase with the sea level rise. From the recorded data it was observed that the climatic hazards are more iratic than 10-20 years ago and it may be increased in future.

3 Institutions

3.1 Forest Department

FD is mainly responsible for the protection, conservation and development of the FWS as the main custodian. For the proper management of the PA Forest Department is suffering from lack of manpower and equipment. For effective management of the Wildlife Sanctuary a separate administrative body is necessary (Annex 9). Modern equipment and adequate manpower is necessary for effective protection, conservation and management of the wildlife sanctuary (Table 11).

Table 11: proposed equipment for Fasiakhali Wildlife Sanctuary

Name	No. unit
Digital Camera	2
Binocular	4
GPS	2
Torches	10
Desktop computer	1
Laptop computer	1
Rifle	12
Double cab Pick up	1
Motor bike 100 cc	3
Grand total	36

For effective management, protection and conservation of FWS other allied institutions are involved. The structural pattern, roles-responsibilities and functional activities of the linked institution are mentioned.

3.1.1 Management pattern

FWS is managed by FD under Fasiakhali Range of Cox's Bazar North Division. There are two beats within the PA. Each Beat is managed by a forester/Deputy Ranger who is responsible for the protection and implementation of all development activities.

3.1.2 Roles and responsibilities

The Divisional Forest Officer (DFO) is overall responsible for the management of the PA including administration, protection and improvement of the resources and conservation of biodiversity, environmental management, preparation of budget, and control over all activities within his jurisdiction. An ACF is also assigned with this FWS.
The Range Officer (RO) is the key person who is responsible for overall activities of the PA. He will maintain liaison with other related government departments and local NGOs and other organizations for smooth implementation of co-management activities. The Forester in Charge of a beat is responsible for protection and other field activities within his beat.

3.2 Co-Management Structures

Co-management organization (CMO) consists of the following types of bodies:

- Co Management Committee (CMC)
- Co-management council
- Peoples forum (PF)
- Village conservation forum (VCF)

3.2.1 Structure and roles & responsibilities of Co Management Committee (CMC)

- Divisional Forest Officer (DFO) and Upazila Nirbahi Officer (UNO) are the advisor of the committee and the respective Range Officer (RO) will serve as the Member- Secretary of the CMC;
- The members of the respective categories/groups will elect members for the CMC according to the quota mentioned in government order;
- All members will be elected for 2-year tenure except the nominated (ex-officio) members and no person can be a member for more than 2 consecutive terms;
- The members of the CMC will elect one chairperson, one vice-chairperson one treasurer among themselves;
- The maximum number of members of the committee will be 29.
- To scrutinize the activities of VCF, PF and CPG;
- To ease voluntary work in forest conservation and management;
- To facilitate effective management of natural resources;
- To ensure effective participation of all the stakeholders in forest management;
- To ensure security of natural recourses;
- To help in the implementation of adopted development activities;
- To ensure effect distribution among the stakeholders acquired from PA
- Social forestry activities
- Alternative livelihood development
- Conflict mitigation
- Rapid response team formation
- management of wildlife corridor
- Eco-tourism management
- Land conflict resolution
- Maintaining communication with other government department.

3.2.2 Structure and roles & responsibilities of Co-management Council

For the fulfillment of the objectives, co-management council will be formed for management of PA with the full support and active participation of the key & stakeholders of the protected Areas and the landscape. Different categories of stakeholders will select/ elect their own representatives for the Co-management Council. The categories are Civil Society (Maximum 5 persons), Local Administration (Maximum 3 persons), Forest Department (Maximum 8 persons), Local Government (Maximum 5 persons), Local Community (Maximum 39 persons), and Representatives from other Government (Maximum 5 persons). Local Parliament Member, Upazila Parisdad Chairman and

Divisional Forest Officer are the Advisor of the council. Upazila Nirbahi Officer (UNO) and the respective Range Officer will serve as the Chairman and Member secretary of the Co-management council. The Co-management Council will have maximum 65 members. Out of these, minimum number of women members will be 15.

3.2.3 Structure and roles & responsibilities of Peoples Forum (PF)

The peoples Forum will be formed by election from the representative of villages and local communities within the landscape area. The nos of members of peoples forum will be 22, representing all the key stakeholders and should have representative from women, the youth, lower income households, and important resource users groups. Thirty-three percent of the members of the people's forum will be women. They will be involved in the following activities.

- Represents local users of natural resources and ensure that local livelihood issues are taken into account in the preparation and implementation of Protected Area co-Management plans;
- Recommend and support initiatives for protecting the natural's resources of the protected Area and conserving biodiversity and assist the Forest Department and Co-management organization in implementing tree plantation, reforestation, habitat restoration, nature tourism activities and other management activities of the protected area;
- Assist to prepare Protected Area Co-management plans and Annul work plans for landscape area conservation and development in and around the Protected Area;
- Provide any other required assistance to the Co- Management Committee on Protected Area.

3.2.4 Structure and roles & responsibilities of Village Conservation Forum (VCF)

Village conservation forum is an inclusive platform of the Co-Management process where the poor villagers or resources except specific categories like local government member, civil society member and owner of the resources user institutions that ensures direct participatory democracy. It offers equal opportunities to majority village's residence including women and indigenous community to discuss criticize and propose relevant activities for Co-Management Organizations. The following steps to be taken to form VCF:

- Organize village meeting to describe the objective of the census;
- Household census to be conducted for identifying the position and condition of the village people;
- At the time of census, clearly describe the power and responsibilities of the VCF, PF, and CMC; 50% of the committee members will be women. Peoples Forum will be formed from the VCF.
- VCF can monitor and discuss the implementation of the development projects and suggest PF and CMC to improve the quality of work;
- To select labor for cleaning or any sorts of activities inside the forest. VCF will assist PF, CMC and FD;

- VCF may during the meeting take decision to form its own committee to look into the issues and make suggestions; To control the anti-conservation activities;
- VCF is responsible to inform the CMC if any such type of activities happened in their village; - VCF can ask CMC to provide the project proposal and financial document of CMC to go through for inspection if they have any question or confusion; VCF are responsible to give comments and recommendations of CMC activities through PF, if they are not satisfied by the answer of the CMC they can raise the question in front of Divisional Forest Officer (DFO);
- VCF is mandated to meet at least four times in a year may meet more according to the necessity of community.

3.3 Training and capacity building

The local inhabitants are not aware about the livelihood improvement program. Poverty and lack of awareness hinder their capacity of development. Several government and non-government organizations active in the area and they have a great influence over the Fasiakhali Wildlife Sanctuary and its landscape. Some of these institutions work on social welfare, economic activities, climate change and livelihood programs etc. NGOs are now the leading training and capacity building institutions that give a number of training to the local people to augment their capacity. From recent participatory community vulnerable assessment (PCVA) report the list of the institutes with their training and capacity building programs of Fasiakhali Wildlife Sanctuary is shown in table 12.

Table 12: List of institutes with their training and capacity building programs

Name of NGO/CBOs	Area	Capacity building program
CODEC	Fasiakhaliwildlife Sanctuary	Plantation and Education programs.
GRAMEEN BANK	Fasiakhali wildlife Sanctuary	Micro credit, improved cooking stoves (ICS), solar panel
BRAC	Fasiakhali wildlife Sanctuary	Education, Micro credit, Nursery, sanitation.
ASA	Fasiakhali wildlife Sanctuary	Micro credit, Group formation
SHED	Fasiakhali wildlife Sanctuary	Livelihood Programs
CARE	Fasiakhali wildlife Sanctuary	Water and Sanitation, improved cooking stoves (ICS)
PROSHIKA	Fasiakhali wildlife Sanctuary	Micro credit
IDFO	Fasiakhali wildlife Sanctuary	Solar panel
UDDIPON	Fasiakhali wildlife Sanctuary	Micro credit

Local level BFD staffs, CMO members, resource users groups as well as other local stakeholders are needed to facilitate with trainings on various subjects and skills such as; organization building, leadership and management for newly formed co management institutions, AIGA, sustainability and resilience covering all activities under sustainability and resilience programmed, nature-based tourism management and implementation, human-wildlife conflict mitigation for the conservation natural resource and biodiversity of FWS.

Capacity building of CMO:

CMOs are the main vehicle to support Government for improved management of the Faisakhali Wildlife Sanctuary. CMO's functional and financial capacity needs to build for their active role in management and conservation. Functional and financial capacity refers to legitimacy of the organization, functional capacity for improved management, organization has good governance and capacity for inclusiveness, has the capacity to prepare participatory and adaptive management plan and resource mobilization capacity for sustainable funding to implement the plan.

Ultimately, it has to continue to deliver valued services or benefits through protecting and sustaining biologically significant eco-systems and improving the lives of people dependent on the area. In this connection system need to introduce for enhancing CMO capacity on regular basis so that they will able to contribute in the PA management. CMO leaders need to know the modern management system that are implemented in other countries through study tour and cross visit, attending and participating in workshops and symposium, need to build leadership capacity, able to enhance knowledge on NRM and climate change through training.

4 Values of Protected Area

4.1 Ecosystem

Ecosystem is defined as 'a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit', and ecosystem services as "the benefits people obtain from ecosystems". Ecosystem services have been categorized into provisioning, regulatory, supporting and cultural services. Based on this classification, the ecosystem services provided by FWS are summarized in Table 13. The challenge is to limit unsustainable direct extraction from the WS which undermines the other services.

Table 13: Ecosystem services from Fasiakhali WS and its landscape

Service Type	Services
Provisioning Services	Timber Fuel wood Thatching materials Food (crops, livestock, wild plants)
Regulatory Services	Climate regulation Water regulation Water purification
Supporting Services	Soil formation Nutrient cycling Primary production
Cultural Services	Spiritual and religious Tourism, aesthetic Educational

The biodiversity value of Fasiakhali Wildlife Sanctuary although presently reduced from its former level is still considerable and has the potential to be restored. Of particular note it is used regularly by Asian Elephants, a globally endangered species, otherwise the flora and fauna is typical of Bangladesh's eastern forests, with for example 200 bird species recorded from the general area (162 species from the WS itself).

4.2 Socio-economic

About 9,500 households depend to a greater or lesser extent on forest resources especially fuelwood for cooking but also NTFPs such as bamboo, cane, grass, and on the lands outside the WS and its buffer zone which receive ecosystem services.

5 Threats

5.1 Resource extraction

Collection of fuel wood and house building materials is widespread within the PA and remain a major threat to the biodiversity of FWS. Local people collect dry leaves and sungrass, vegetables and fruits. The collection of these forest resources removes indigenous trees, saplings and shrubs, resulting in forest degeneration and poor recruitment of trees, and invasion of undesirable species. Illegal removal of trees has reduced canopy cover in FWS (Annex 8).

5.2 Livestock

Grazing within WS is prohibited according to the Wildlife Act (2012), but livestock grazing is common and destructive particularly by interfering with forest regeneration in the sanctuary. Livestock, mainly cattle and buffalos, roam freely and grazing is widespread within the PA, particularly during rainy and autumn season when seedlings and undergrowth are grazed. From focus group discussion it has been found that 527cattle, 30 buffalo and 190 goats regularly enter FWS (Annex 12).

5.3 Encroachment

The boundaries of FWS are not maintained and encroachment for cultivation and settlements has taken place. No efforts have been made to physically demarcate the boundaries in the field and encroachment is still increasing. In 2014 a majority of the land within the WS was encroached: degraded land (692 ha), settlements (18 ha) and agriculture (126 ha). Often village elites are directly or indirectly associated with forest land grabbing to establish homesteads and cultivation. Institutional infringement in forest land is common in the buffer zone, for example to establish school, madrassa, graveyard and mosques. In some cases, the encroachment has been regularized in the buffer area by issuing land ownership documents as khas land.

5.4 Human- wildlife conflict

Asian Elephants are the keystone species in the area as their influence on the habitat determines habitat quality for other species, due the impact of elephant browsing as well as their role with regard to seed dispersion. Fragmentation of elephant habitat, food scarcity and increased human activities within the sanctuary pose serious challenges for elephant habitat conservation and human elephant conflict management in FWS. Due to destruction of their habitat, elephants increasingly attack settlements and agricultural fields in search of food. The primary reason for human-elephant conflict is cultivation and human settlement on elephant corridors. People also experience crop damage due to wild boar, monkeys and birds. Lastly the main highway to Cox's Bazar borders the WS posing the threat of road kill for wildlife particularly slower moving herpetofauna at night.

5.5 Poaching

Although not widespread, some local people hunt/trap some wildlife, mainly Gui shap, Red Jungle fowl, and sometimes Barking Deer. It is reported that sometimes people from distant places come to the forest for bird hunting. Any hunting poses a threat to the wildlife of the sanctuary as their populations are now highly reduced.

5.6 Conflict between conservation and development

For ecotourism development and sustainable and effective management of FWS some infrastructure development work is needed. . Improper development work may cause disturbance to wildlife and damage habitat. All the development work should be done near the road side or boundary of the PA to reduce disturbance impact on the forest.

PART 2: Analyses of Current Management Practices and Future Program

6 Objectives of PA management

6.1 General policy framework

As a signatory party of the CBD Bangladesh has developed a National Biodiversity Strategy and Action Plan (NBSAP).
According to the guideline of NBSAP (GoB 2004) and National Forest Policy (1994) regarding CBD the primary objective of the Bangladesh biodiversity conservation policy is "to establish conditions to conserve, and wherever necessary, to restore the biodiversity of Bangladesh as an essential component to ensure the wellbeing of the present and future generations, and equitable sharing of benefits". This involves maintenance and improvement of environmental stability for proper functioning of ecological systems, and ensuring the preservation of the unique biological heritage of the nation as an asset for the benefit of the current and future generations. Co-management is one of the widely accepted approaches for protected areas management.

6.2 Objectives

The long term vision of the FWS management plan is to maintain and restore the PA as part of the forest landscape of Cox's Bazar region and support biodiversity in such a way that key species of the area are preserved, while conserving the ecosystem services for the benefit of local populations and future generations to ensure sustainable livelihoods and resilience to environmental hazards, including climate change. Additional to that, the sanctuary should be a show case of a well conserved ecosystem as a resource for nature based tourism, education and science. Within this perspective, the following management objectives are proposed for Fasiakhali Wildlife Sanctuary:

(1) Protect and maintain physical, biological and aesthetic features of FWS as a part Cox's Bazar forest ecosystem

- Regulate land use through zoning and zone demarcation of the area, taking into account land value and function as well as crucial and vulnerable habitats of wild species;
- Protect crucial habitats particularly mature fruiting trees such as figs
- Research, surveys and monitoring of biodiversity resources to understand ecological values, processes and threats;
- Reduce human-elephant conflict by adopting voluntary landuse controls and zones, backed up by effective compensation measures.
- Control invasive species, including livestock and other domestic animals in vulnerable habitats;
- Develop and implement effective surveillance and law enforcement.

- Reduce dependenc on the PA by improving livelihoods of people through non-forest based enterprises

(2) Improve food security and resilience of populations to natural hazard including climate change and human-wildlife conflicts

- Resilience to climate change through adaptation (plantation, agriculture);
- Restore forest and improve soil conservation to improve watershed management in the PA, buffer and impact zones

(3) Increase the benefits from the sanctuary reaching local communities

- Introduce entry fee collection system for visitors to the sanctuary;
- Establish revenue sharing with CMC
- Establish benefit sharing in buffer area forests with local stakeholders;
- Promote (re)investment in tourism development.

(4) Realizing and utilizing the PA's potential as venue for tourism based on wildlife, recreational, educational, cultural and aesthetic appeal

- Develop tourism infrastructure (information facilities, observation shelters, nature trails, picnic sites, etc.);
- Promote Fasiakhali in urban and tourist centers of Bangladesh, especially Chittagong and Cox's Bazar;
- Support responsible local and private initiatives in the field of tourism development;
- Control negative impacts of tourism (pollution, animal disturbance, noise disturbance).

(5) Integrating Fasiakhali Wildlfe Sanctuary into local and regional development process, especially surrounding local communities to ensure wider acceptance of the PA's values

- Create awareness among stakeholders including local resource users as well as key actors determining land and resource use, involving also local educational institutes;
- Consolidate and enhance co-management.
- Strengthen incentives for community involvement in protecting and restoring forest and wildlife.
- Training for local stakeholders in co-management and ecotourism.

(6) Improving the FD's staff welfare, motivation and capabilities

- Enhancing office and accommodation facilities for FD staff;
- Improving logistics and mobility;
- Improving field equipment (uniforms, arms, GPS);
- Training (law enforcement, co-management, and ecotourism.

7 PA and landscape zonation

7.1 Zoning of landscape area

For the better management FWS and its landscape are divided into three zones i.e. Core zone, Buffer zone and Landscape zone / Impact zone (Figure 4).

7.1.1 Core zone

The entire forest area that was declared as Fasiakhali Wildlife Sanctuary in the official gazette is designated as core zone (1302 ha). The main aim of management of core zone is long-term protection of remaining forests, and rehabilitation of degraded forests and mixed plantations towards natural forest habitat for biodiversity conservation. Forest management in this zone will focus on conserving remaining natural forests and bringing back natural vegetation (composition and structure), wherever possible. This will be achieved through effective protection against all forms of human interference and maintaining natural course of ecological succession. This will be achieved by protecting against illicit removal of trees and vegetation, encroachment, grazing and fire, and by encouraging natural regeneration. Where required, enrichment planting of indigenous species will supplement natural regeneration, particularly in those areas, where regenerative rootstock is depleted. In some places nature trail and foot path will be constructed for eco-tourism purposes.

7.1.2 Buffer zone

FD lands outside the protected areas and within the landscape boundary are considered as buffer zone, this covers 1,366 ha (Dulahazara block 302 ha, Fasiakhali 3 ha, Ringbhong 602 ha and Hargaza 459 ha). The forests in this zone will be put under sustainable use to reduce human pressure on Fasiakhali Wildlife Sanctuary. Subsistence consumption needs of local people for fuel wood, NTFPs and timber will be met through co-management practices. Management of this area will focus on intensive production of replacement resources, particularly fuel wood, poles and timber, and NTFPs, and also on maintaining biodiversity and sustainable elephant habitat in selected areas. Existing short and long rotation plantations will be converted to forest of indigenous species under a participatory approach. However, the participants will, in addition to protecting plantations, be responsible for providing biodiversity protection in FWS. These plantations will not be clear felled but instead be managed under selective felling (mainly to remove exotic species) so that the area can regenerate to complement the core zone by providing a larger area of mixed native forest, with the buffer subject to prescribed uses by partner communities. Vacant forest lands without adequate rootstock will be taken up for buffer plantations and managed by following the relevant FSP guidelines as decided by FD. The management of FD lands in this sub-zone will focus on sustainable use of the remaining natural patches, bringing existing plantations under co-management practices, raising participatory plantations of indigenous species in vacant areas, checking conversion of forest land into agriculture, maintaining biodiversity conservation values, and creating buffer areas for Asian

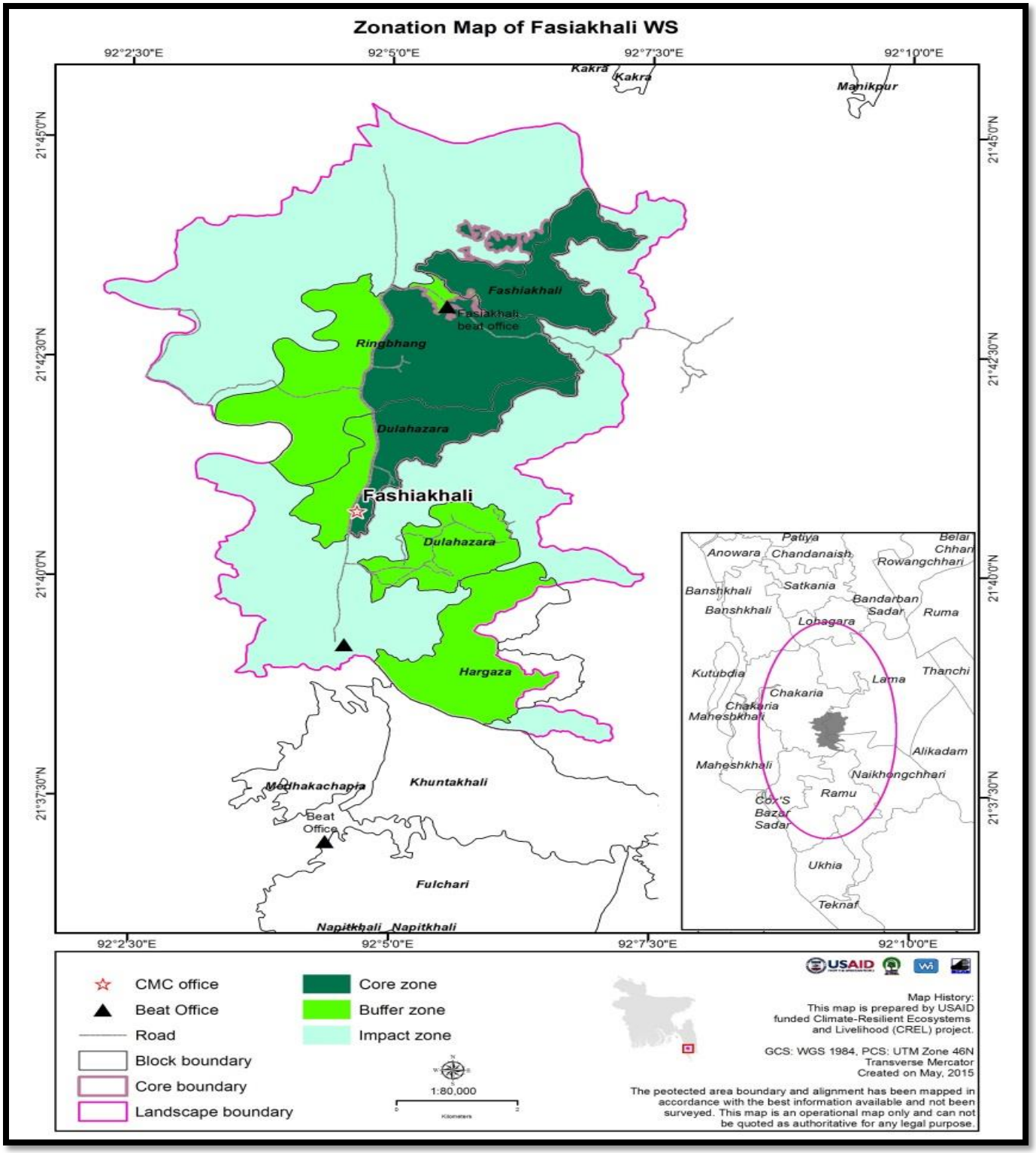

Figure 4: Landscape Map of Fasiakhali Wildlife Sanctuary

Elephants and other wildlife. Local stakeholders will be identified and co-management agreements signed for providing livelihood opportunities and protecting habitat. To encourage eco-tourism observation shelters and toilet facilities will be provided. On the northern side of Lama Alikadam road a foot trail will be developed along with a picnic area under CMC management.

7.1.3 Impact zone/ landscape zone

This is the remaining area within the combined landscape boundary and comprises non-forest lands. The focus here is on ensuring sustainable natural resource use that is resilient to climate hazards and stresses, and achieving support from communities for conservation based on diversified livelihoods that make use of fuel, timber and other products from sustainable sources in the village areas and in the buffer zone. In addition the CMC, FD and local government will work together to establish elephant friendly corridors at Ringbong, Haserdighi, Fasiakhali, Manikpur connecting with Harbang and Chunati. Landowners will be encouraged to adopt sustainable climate resilient practices, and to adopt higher value crops and other trades, so long as these do not attract conflict with elephants. Use of solar energy and bio gas will be encouraged in the landscape villages to reduce pressure on forest.

7.2 Boundary delineation

All the marginal boundaries of the WS will be surveyed with GPS on the ground and marked on maps (digital and hard copy) and on the ground. The borders of different management zones will be defined, mapped and also recognized on the ground. Natural features like rivers, streams/*charas*, ridges, roads, etc. may be used during demarcation. Concrete pillars or other markers (e.g. iron pillars, trenches, mounds) will be fitted in place at all important and turning points and will be labeled. Boundary markers are vulnerable to human-interference or natural calamities, therefore a regular annual maintenance program will be necessary for boundaries and pillars

7.3 Actions to address encroachment and tenure issues

A database will be generated of settlement and number of settlers in the core and buffer zones. Annual update of the database will be carried out with help of CPGs. Satellite imagery and other sources will be used to monitor and update maps every two years showing areas of encroachment for crops or other purposes. FD, CMC and DoE will take up a coordinated program, as DoE is engaged in combating hill cutting. Scattered encroachers spreading over the PA core area can be rehabilitated in the buffer zone. Existing laws and provisions will be strictly enforced in the face of any large scale new encroachments.

8 Management actions

8.1 Management of PA (conservation priority area)

8.1.1 Rules and norms

The main objective is to protect, rehabilitate/restore and maintain the tropical forest by encouraging natural regeneration.
In the core zone all forms of human interference (felling, agriculture, killing or capturing wildlife, fires and cattle grazing) are illegal. Forest management in this zone will focus on conserving remaining natural forests and bringing back natural vegetation (composition and structure) and restoring habitat for wildlife, particularly but not limited to elephant. This will be achieved by patrolling against illicit removal of forest produce, poaching, encroachment, grazing and fire, and encouraging natural regeneration.

8.1.2 Restoring habitat and ecosystems

Fasiakhali Wildlife Sanctuary is in vulnerable condition due to heavy human pressure. In 483 ha there is forest with a good canopy cover; here the main action will be patrols and protection. Around 692 ha of the core zone is forest in degraded condition. To reverse this habitat will be restored through Assisted Natural Regeneration (ANR) and enrichment planting of key forest trees. In addition small works to conserve soil and water such as check dams on streams or slope stabilization may be undertaken. Trees species indigenous to FWS in the past will be planted to cover 700 ha area in core zone including 692 ha degraded forest during the 10 years period of the management plan in the following way-

- ANR is recommended in the areas where there is natural rootstock or natural regeneration of tree seedings - 200 ha area of core zone will be identified and taken for ANR in this period Uchterbil area has a great potentiality of natural regeneration of Garjan trees so it will be a focus for ANR and CMC/community assistance in seed planting.
- In a further 100 ha where there are few mother tree in FWS, plantation with indigenous wide crown tree species will be carried out using Thali model (Figure 5 A) and fence plantation (Figure 5 B) for the restoration of the area. Fence plantation will be raised in patches of one ha each. Thali plantation may also be protected through fencing in several patches.. In Thali plantation recommended spacing is (5m*5m) and in case of fence plantation spacing will be (3m*3m). Given protection against illicit felling and burning, plant succession will progress over a period towards semi-evergreen forests. The suggested species for enrichment planting are Garjan, Chapalish, Boilam, Dhakijam, Jarul, Telsur, Gamar, Shimul, Civit, and Ficus.

A total 200 ha area will be brought under habitat improvement work in the following way-

- To stabilize chara banks from erosion native trees, bushes and bamboo will be planted. For slope protection or where landslide occurs frequently, gully plugging is recommended

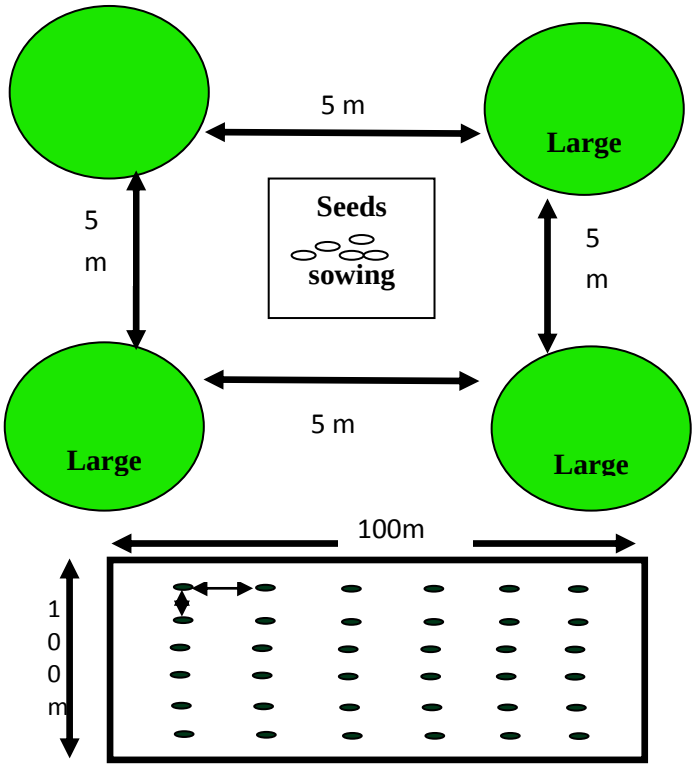

Figure 5: Thali plantation B. Fence plantation

8.1.3 Wildlife Conservation and Recovery

The measures in section 8.1.2 are described to restore habitat for forest dependent wildlife. As Asian Elephant is one of the flagship species for FWS, areas in between sites already used by elephants will be restored as a priority by planting elephant-preferred vegetation: bamboo, wild banana, bhuikumra, chalta, kanthal, dumu and other spp. (*Ficus* sp.), chapalish, gilla lata. Water sources used by elephants will be protected from human use.

IUCN has taken a project to identify the **elephant corridors** of Bangladesh. Most of the corridors are in Cox'sbazar, Chittagong and Chittagong Hill Tracts. They have identified 12 numbers of corridors which start from Cox'sbazar south to Kaptai via Cox'sbazar north and Chittagong Forest Division. These corridors connect most of the Wildlife Sancturies and National Parks within the areas. The list of the corridors has been shown in annex 14.

There is scope to restore populations of forest dependent birds through ANR and enrichment planting. Enrichment will focus on fig trees (genus Ficus - dumur, bot, etc.) and other native forest trees, including understory trees, with small fruits. Old trees including those that are dead or dying have twisted boles, furrowed bark or natural cavities are an important part of forest ecosystems supporting many invertebrates and hole nesting birds, and will be preserved. The CMC will raise awareness that hunting is illegal.

8.1.4 Action to improve climate change resilience

The actions noted above will help to link together forest patches and also stabilize small watersheds, both strengthening the resilience of the ecosystem to climate shocks and changes.

8.1.5 Smart Patrolling (CPGs, FD)

Illegal removal of forest products within the wildlife sanctuary may be checked through widespread joint (FD staff, CPG member and stakeholders) patrolling by applying SMART (Special Monitoring and Reporting Tool) method inside the forests, particularly the core areas. With the technical support from CEGIS, FD has developed in the Sundarban Reserved Forest a GIS/ GPS based system for the systematic collection of patrolling data (Anon, 2003). The following process may be applied in smart patrolling for effective protection of the PA.

Community participation in patrols is essential to gain local support for protection and improve vigilance and intelligence sharing on locations of entry and extraction. To improve communication walkie talkies and mobile telephones will be provided/ subsidized. At least one four wheel jeep along with at least one motorcycle per beat will be provided for FD field staff. Upgraded fire protection and weeding equipment will be maintained in each beat office.

Incentives and equipment are needed. Efficient patrolling will be ensured through provision of clothes, shoes, torch and umbrella to the CPG members. CPG members will be preferred in allocation of lands under social forestry in the buffer zone (see later) and in livelihood development activities, and allowances for CPG members will be developed from resources mobilized by both CMC (e.g. entry fees) and FD (e.g. revenue). Rewards or prizes will be given to CPGs for good performance and persons whose information leads to the control of forest offences.

8.2 Management of PA (non-conservation priority areas)

8.2.1 Rules and norms

The management of areas within Fasiakhali Wildlife Sanctuary where there is large scale encroachment and/or areas under litigation will be addressed separately as non-conservation priority areas. This totals 144 ha which will be marked and delineated separately and intensive awareness program will be taken. Homestead tree planting will be encouraged, but an effort will be made to help re-settle these people from the core zone into a degraded area of the buffer zone (or through vocational training to encourage their voluntary relocation away from the area).
Forest management in this zone (non-conservation priority areas) will focus on limiting further encroachment, minimizing human-elephant conflict by changing cultivation systems, and where people agree to resettle, restoring forest in vacated lands

8.2.2 Limits on encroachment, settlement and land uses

Out of 1302 ha of FWS, the non-conservation priority area in this core zone is about 144 ha (mostly encroached by homesteads and agriculture and/or with litigation. Provision of funds for the rehabilitation of settlers has been kept in the budget (Annex 10). It is essential to have political commitment and administrative support from the law enforcing agencies to tackle the situation. Co-operation of all agencies with FD through the CMC and co-management council is essential.

8.2.3 Restoration activities

Watersheds will be identified for carrying out habitat management practices within the natural boundaries of a drainage area. An identified watershed will provide a context for a meaningful participation of local people. Appropriate land management practices in such watersheds will focus on in-situ moisture conservation, based on the percolation of water under-ground. This will enable the natural regeneration of indigenous vegetation, soil conservation and enhancement of moisture regime. Low land husbandry technologies (e.g. half-moon trenches, contour furrows, staggered trenches, mulching, hedge rows, small check dams, impounding pits, small tanks, soil barriers and traps, diversion ditches, etc.), which can be implemented by local stakeholders by contributing their voluntary labor, will be implemented in the identified watersheds. Streamside will be planted with favorable tree species (see also section 8.1.2) for control of landslide and erosion and for perennial water-flow.

8.2.4 Participatory biomass production

One objectives of managing this zone is to reduce pressures on the conservation priority areas of FWS, encroachers will be encouraged to plant suitable fast growing indigenous tree species. However, detailed consultations will be held between CMC and FD before finalizing any land-based management intervention, for which technical support may be provided by local FD staff.

8.2.5 Action to improve climate change resilience

Hill cutting here causes land slide and erosion during heavy rainfall. To reverse this deep-rooted trees and grasses will be planted in the bare hills.Agro-forestry will also be promoted where encroachers cannot be resettled.

8.3 Management of buffer zone

8.3.1 Rules and norms

Management of this 1,366 ha area will focus on 1) maintaining biodiversity and restoring habitats suitable for elephants to complement the core zone and links with buffer areas outside of the FWS and its landscape, and 2) intensive participatory production of replacement resources, particularly fuel wood, poles and timber, and NTFP to reduce pressure on FWS and biodiversity priority areas of the buffer zone. Existing short and long rotation plantations will be managed and converted to indigenous trees under a participatory approach. However, the participants will, in addition to the protection of and benefiting from plantations, be responsible for providing biodiversity protection in the FWS areas. These plantations will not be clear felled but instead will be managed under selection felling (mainly of exotic species) so that the area can be naturally and deliberately regenerated to complement the core zone as a mixed forest (with some important parts ultimately to be incorporated in FWS. The overall aim of this zone is to facilitate protection of the core zone - FWS. Main management prescription of this zone will be:

- Social forestry practice involving co-management stakeholders. Species that are economically valuable and fast growing will be used in case of social forestry.
- Fuel wood plantation with fast growing species like *Acacia auriculiformis*, Ipil ipil etc. may be planted with short rotation associated with indigenous species. Indigenous species will be retained harvesting the short rotation.
- NTFPs plantation is recommended and will be collected on sustainable way to serve the livelihood of the local people.
- Biodiversity focused management. A total of 200 ha located in buffer zone currently comprising of degraded habitats will be targeted to restore biodiverse mixed forest for wildlife including Asian Elephants. Here indigenous tree species particularly those bearing fruits, species preferred by elephants and bamboo will be reintroduced through enrichment planting. This area will supplement the core zone, and will be protected from human interference such as grazing, fuel wood collection, fire etc. by involving local community through community patrolling.

8.3.2 Social forestry

Social Forestry programs will be encouraged with a view to meet the forest product requirements of local population and to reduce dependency on forest, to reduce the process of ecological and climatic degradation through proper soil and water conservation and to improve the socio economic condition of the people. Local people (encroachers and communities in the landscape zone will be involved in social forestry program The plantations established under social forestry program will be harvested at the end of

rotation (10 years) and the sale proceeds are distributed according to clause-20 of Social Forestry Rules-2004.

8.4.2 Action to improve climate change resilience

To improve climate change resilience two measures will be taken. One is to use renewable energy by reducing the use of fossil fuel and the other to increase the forest cover by increasing plantation activities and protecting the tree resources thereby increase resistance and resilience, assist ecosystem shift or evolution towards a new desired state that meets altered conditions. Buffering measures will focus on preventing disturbances, such as invasive species (e.g. by preventing their spread or removing them), managing the forest actively after a disturbance (e.g. by assisting the establishment of adapted and acceptable species). Measures that facilitate ecosystem shift or evolution aims to ease and manage natural adaptation processes. Such measures will include the reduction of fragmented landscapes, conserving genetic diversity and a large spectrum of forest types for their value and higher resilience, adopting species and genotypes that are adapted to future climates in forest plantations, planting mixed species in an uneven age structure.

It has been found that in this zone hill cutting is common which causes land slide and erosion due to heavy rainfall. To improve resilience measures will be taken up to stop the hill cutting. Plantation of deep-rooted trees and grasses in the bare hills may also be options to reverse such condition. Uneven aged and mixed plantation program will be adopted to create multistoried forest to mitigate climatic vulnerability of the PA and enlarge the area of forest of biodiversity value.

8.4 Management of impact zone/ Landscape zone

8.4.1 Rules and norms

This 4,384 ha landscape zone has been identified around FWS as inhabited by communities directly impacting on the biodiversity of the protected area, the aim here is to reduce the dependency of inhabitants on forest resources and to create corridors for the movement of wildlife especially Asian Elephants. Landscape zones will focus on the surrounding land and people that is helpful in protecting and conserving the core zone, and creating congenial habitat for wildlife. As opportunities for receiving tangible benefits from the conservation-oriented management of core zone are limited, adequate provisions will be made for enhancing off-forest livelihood opportunities of the local stakeholders in the interface landscape. Subsistence consumption needs of local people for fuel wood, NTFPs and timber will be met through co-management practices in the buffer zone and in public lands in the landscape zone.

8.4.2 Social forestry

Social Forestry programs will be encouraged with a view to meet the forest product requirements of local population and to reduce dependency on forest, to reduce the process of ecological and climatic degradation through proper soil and water conservation and to improve the socio economic condition of the people. Due to scarcity of land, marginal and fallow land (slopes of roads, rails and embankments) will be brought under social forestry. Local people will be involved in social forestry program. The plantation established under social forestry program will be harvested at the end of rotation (10

years) and the sale proceeds are distributed according to clause-20 of Social Forestry Rules-2004. Strip plantation is recommended on both sides of the village roads involving local community. Awareness and training program will be conducted to make the people capable of homestead plantation.

8.4.3 Livelihood diversification and enhancement

As commercial harvesting is not allowed inside the PA and so no benefits flow to local people formally from the core areas as per the Wildlife (Preservation) (Amendment) Act, 1974. Other benefits for local communities needs to be explored through alternative income generation activities. Main objective of livelihood programs for landscape development is to develop appropriate linkages with livelihood programs and other projects/initiatives that will reduce biotic pressure on forests by providing alternative livelihood opportunities to poor stakeholders living in and around the PA.

The CMC will operate and raise funds for a Landscape Development Fund (LDF) which it will use to support community level investments designed to improve resilience (such as micro-watershed protection, water management, and other public services. It will also encourage links between the poor in the area (whether part of VCFs or not) and service providers for training and micro-credit to support micro-enterprises that generate value additions locally. The benefits from eco-tourism may also be ploughed back for the development of local communities and PA. The program will be focused mainly in the identified interface landscape zone but also in the core and buffer zone where local communities are living. The following appropriate production technologies, which may be implemented as a part of off-PA development interventions, were identified based on field investigations done by the partner NGO (NACOM).

8.4.3.1 Integrated homestead farming

Homestead farming provides livelihood security of people and enhances their income by creating livelihood assets and self-employment opportunities. This activity will include component like growing vegetables (on open fields and other unutilized places around houses), cash crops (Betel leaf, Betel nut), horticultural and tree nursery, mushroom culture and apiculture (domesticated wild bees).

8.4.3.2 Cultivation of high value crops

High value crops that are more nutritive, high price and more demand will be introduced. However, this production technology is suitable to those farmers, who have cultivable land and can make a minimum investment. Suitable high value crops for the surrounding landscape include tomato, potato, papaya, ginger, turmeric, yard long bean, leafy vegetables, mushroom, chilly, guava, banana, jackfruit, pineapple etc.

8.4.3.3 Village tree nursery

Many private nurseries have grown up in the landscape of wildlife sanctuary for meeting the demand for quality seedlings and seeds of horticultural, vegetables and tree species. Village nurseries to be developed by local people having some land will be encouraged to meet the local demand for quality seedlings and seeds. Technical and logistic support will be arranged to prospective farmers. Necessary will be given by FD.

8.4.3.4 Food storage and processing

Simple food storage, processing and preservation techniques will be explained to local people for creating value addition locally and providing self-employment opportunities. For example, pickles of mango, lemon and jackfruit can be made locally for households nutrition and cash sale.

8.4.3. 5 Livestock rearing

Poultry and dairy farming may be suitable livelihood for poor people residing within and outside the PA. The following livestock rearing technologies are found suitable for their implementation in and around the PA:

- Dairy farm
- Broiler/Layer rearing

8.4.3.6 Fisheries

Fish culture (in micro-ponds), Duck-cum-fish culture (in family ponds), Cooperative fish farming in common ponds.

8.4.3.7 Ecotourism

Local people may be trained as eco-guide and they can be economically benefitted from eco guide fees.

8.4.3.8 Cottage industries

Based on bamboo, murta and cane products or handicrafts may be prepared and trainings are recommended.

8.4.3.9 Sewing activities

Different types of sewing products can be prepared involving village women particularly Tupi (Caps), Nakshi katha etc.

8.4.4 Actions to reduce fuel wood collection/use

Fuel wood collection is the major problem of FWS. Most of the people in and around the Cox's bazaar region are fully dependent on fuel wood for cooking. The poor landless female and young boys are engaged in collection of fuel wood from the FWS area. Even they cut seedlings and saplings and even bamboos for fuel wood. It is creating heavy pressure on the forest areas of FWS. Motivation works to be done for the professional fuel wood to divert them to alternate fuel business like brickets, bio gas. Besides, motivation will also be done among fuel wood user to encourage alternative fuel other than wood. To reduce the pressure on the forest the following measures may be taken.

- Introduction of improved cooking stoves (ICS)
- Facilitate training program about the benefits of ICS
- Providing kerosene stoves to the inhabitants
- Biogas may be considered as another good substitute for fuel wood.
- Compressed rice husk (brickets) may be supplied
- Fuel wood plantation may be raised in the social forestry programs

8.4.5 Measures to improve community level resilience to hazards and climate change

FWS is vulnerable to a number for climatic effect like rainfall, drought, cyclone and storms, flood, landslide. Village wise climatic threats toFWS CMC are shown in (annex 6-7). To determine the climate change impact on forest and livelihood PCVA system is followed under CREL project in FWS.
Adaptation measures to mitigate these climatic hazard with the upcoming situation has also identified in PCVA system. Village wise climatic threats and their management interventions of FWS CMC are shown in (annex 6 and 7).

8.5 Management Information System of PA

Management Information System (MIS) of Protected Area is envisaged as an integrated system which will be used to support the planning, implementation and monitoring of multi-objective forest management activities. The MIS can be used for strategic, tactical and operational planning and implementation, and operational control in and across administrative units and levels of the organizational hierarchy. Besides the databases and models required to support decision-making in the many programs of the Department, the MIS also has the ability to maintain current forest inventories, generate maps of spatially-oriented data, land cover types, plantations of various years, location of landscape villages etc. The MIS will facilitate archiving,

- Information on PA land cover classes, years of plantation and distribution, landscape area zonation, co-management organizations and members, landscape villages with population statistics;
- Forest inventory data and analyzed results;
- Plantation and harvest records including, nursery information (species wise stock details by beat and range), plantation journals and felling records.
- Human resources records from FD personnel including list of concerned officers and staffs with duration of each posting.
- project based intervention records, including list of projects with relevant project documents, lists of beneficiaries, members of various components of co-management organizations e.g. community patrol groups, eco-tour guides, local service providers etc.
- Socio-economic studies including CMO scorecard assessments, project beneficiaries, sample beneficiary surveys, gender scorecard analysis, value chain assessments etc.
- Forest offence records including encroachments, illicit harvests/removal of resources, poaching, human-wildlife conflicts etc.
- Technical studies conducted from projects, academic institutions and others.

8.5.1 Develop Management Information System (MIS)

Protected area MIS could have following modules, in a web-based IT environment:

- Plantation Monitoring Information System (PMIS) – plantation and felling records including journals;
- Forest Cover Change Monitoring Information System (FCCMIS) – GIS based landscape maps;
- Climate Change Monitoring Information System (CCMIS) PCVA and village based Climate Change Adaptation and Mitigation Plans;

- Co-management institutions Monitoring Information System (CMCMIS) – Co-management organizations and memberships;
- Forest Protection Management Information System (FPMIS) – Joint Patrolling of Community Patrol Groups and/or Smart patrolling;
- Forest Inventory Management Information System (FINMIS) – inventory data and results
- Nursery Management Information System (NMIS) – species wise stocks

8.5.2 Archiving PA information

- Protected Area Management Plan with associated data
- Maps of PA landscapes with land cover, plantations, zonation, forest administrative units, distribution of VCFs, and other line and point features;
- Spatial data of the protected areas including GIS, GPS, remote sensing and Google Earth information
- Plantation and nursery records; Forest Offence Records.
- CMC related information; profile, list of members in Council and Committees, list of VCFs, VCF member information, CPG information,
- CMC's project implementation information,
- List of projects and relevant information including project activities;
- List of beneficiaries;
- Survey data and results including forest inventory, resident forest bird surveys, household surveys, etc.

9 Ecotourism

9.1 Ecotourism

An environmentally sound eco-tourism system in the form of nature conservation, education and interpretation and to generate alternate income of the local community through the co management organization will be established.

9.2 Appropriate visitors level and locations/zones

FWS is full of scenic beauty that may give the opportunity to the visitors to enjoy the nature. However, some areas are identified that may be used as ecotourism site. These are BoroBagan, PainnaJhiri, Bhanga Building, Dorgar Gate, Kumarichara and Dulahazarachara. Nature camps (of 1-2 days duration) may be organized at (BoroBagan, & Dorgah Gate) places of interest within the WS for students and youths for learning by experience and discussions on biodiversity conservation issues. Camp accommodation will be provided in temporary tents to be established near sites of interest.

9.3 Entry fees

A certain amount of entry fee can be fixed in the ecotourism area which can be fixed by FD. The collected revenue can be used for the conservation of biodiversity, protection and development of local people.

9.4 Facilities and infrastructure development

Tourism facilities that are sustainable, durable, environment friendly, moderately priced, clean and self-sufficient need to be promoted in and around the WS as well as infrastructure within the WS should also be developed. Some of the feasible tourism facilities of FWS are as follows:

- Basic picnic facilities such as sheltered and outdoor tables, simple toilets and litter disposal buckets/boxes will be provided in the identified picnic spots of FWS.
- Two Nature trails can be developed in FWS where A long trail **(**Bhanga Building –BoroBagan - Steel Breeze) can be developed and a medium trail can be at Dorgar Gatepoint (Dorgar Gate – 1.5 Km inside the forest) for visitors' movement on foot, traversing key natural and cultural features of interest (e.g. patches of dense forests, cliffs, cultural remnants, natural streams/ charas, tribal areas etc.).While both the trails will help visitors to enjoy the beauty of hill tracks and nature trails. Trails will be Sign-posts with adequate information which will be provided at main foot trail heads. A list of do's and don'ts for visitors will also be prepared and made available at important visit places. Golghar, simple toilets and litter disposal buckets/boxes will be provided along the foot trails.
- One watch tower at Ringbhong block can be built to get an overview of the area at a glance.

- A Nature Interpretation Centre (beside Fasiakhali Beat Office) can be established where landscape features of the WS may be depicted in pictorial forms including topographical and biodiversity patterns. Local exhibits, murals, dioramas, specimen of plants and wildlife, trophies and photographs may be added with proper leveling and description.

9.5 Promoting visits

The publicity of the FWS will be improved for propagating the scenic beauty of the FWS, including green hills and biodiversity. Adequate coverage in the electronic and print media (TV, Radio, Videos, newspaper, magazines, brochures, etc.) will be ensured for this purpose. Publicity and information materials having basic information about the WS will be provided to visitors by means of fixed signs, brochures, leaflets, printed guides, seminar, drama etc. at key road access points. Mass Communication Officer of FD will have to play strong role in this program.

9.6 Ecotourism services (guides, training)

Tourist guide will be developed by involving unemployed youth members/naturalists of co-management councils/committees and user groups as eco-guides. They will be trained as eco-guides by organizing a series of training workshops on communication and interpretation skills (including on what to speak, how to speak, presentation skills, body language assessment, team building exercises, etc.). They will also be trained on animal signals and calls, bird identification, biotic influences, local culture, etc. and how to move, walk and enjoy scenery without disturbing the nature.

9.7 Education and interpretation

Schools and colleges will be targeted for conservation education and increase awareness about ecotourism. Conducting talks, essays writing and competition will be included in neighboring schools as a part of awareness development. Sabuj Vahinis (Green Brigades) will be formed and trained in nearby schools and madarsas. Nature interpretation as an educational activity will focus on revealing meaning and relationships of complex ecosystems, landscapes and seascapes. A Nature Interpretation Centre, as a part of environment education will be established at FWS. It will consist of walkthrough displays, audio-visuals, explanatory printed materials, items of historical and conservation significance, computer interactive media, etc. A video film on wildlife and its habitat and local cultural aspects may be developed for showing to visitors at NIC.

A NTFP based museum may be established to introduce local livelihood and culture of the FWS area.

10 Funding and resource mobilization

10.1 Budget requirements/ costs

Funding and resource mobilization is very important for implementing the management plan. A summary of main prescription has been prepared (Table 16). To implement the management plan several activities were identified which needs a total budget of **Tk. 694.995 million (Annex 10)** for ten years period. These budget requirements cannot be fulfilled by the FD. The revenue budget of GoB mainly confined for meeting the salary of FD staffs. Separate budget is needed to allocate to FD in ADP for implementing the plan. So development scheme is needed to implement the plan.

10.2 Resource mobilization

Internal financing within the PA, landscape, entry fees, GoB revenue allocations and fund from local communities may be extracted for the sustainable management of FWS. At present no such fund are being mobilized for the management and improvement of PA. FD allocation towards the management of FWS is very negligible from which nothing can be managed or developed. Generally the development budget is an important source of funding for implementing the projects. There is no separate or specific allocation for the PA for the management of the protected areas. Separate project can be taken for the management of PA. Part retention of locally generated revenue from the visitors to PAs can be achieved (on the pattern of social forestry plantations- an account, opened on the pattern of TFF, can be managed by FD) for funding PA management activities. Possible sources of revenue generation from entrance and special use may include- PA's entry fee, rest house fee, donation etc.

10.3 External fund raising strategy

External fund is required to implement the management prescription of the plan. If needed donor funding projects can be taken by FD for the management of PA. At present several funds can be searched from GEF, Carbon funds, World Bank, Asian Development Bank, European Commission, and Japan International Co-operation Agency can extend to support these projects. Small projects with trust fund or foundations can also be taken. There might be charitable donations, private sector linkages to enhance the fund and for conservation of species special fund may be available from the conservation agencies or NGOs.

10.4 Potential for ecosystem services payment (carbon payments)

FWS has limited opportunity to accumulate its required funding through its ecosystem services especially through carbon trade. It has contributed to reduce 300.75 **CO_2 Mg ha^{-1}** emission. Through the effective implementation of this management plan scope of carbon trading may be enhanced. It is expected that forest cover will be augmented during the implementation period of this management plan.

11 Monitoring, adjustment of plans and research

11.1 Monitoring, adjustment of plans and research

Monitoring and research is a tool for better understanding of the functions of FWS in order to sustainably manage constituent forests and biodiversity. An appropriate conservation monitoring and research program will be developed with the following main objectives:

- To understand the trend of change upgrading or degradation of FWS ecosystem;
- To understand the biodiversity resources, ecosystem and landscape environment of FWS;
- To establish a baseline listing of all flora and fauna species for assessing their current abundance, distribution, and functional relationship among biotic communities;
- To develop quantitative population estimates for selected key species, and develop detailed information on their current distribution and habitat use;
- To identify priority research and monitoring topics to help in the management program.

11.1.1 Monitoring forest management effectiveness

One of the main parameters of monitoring forest management effectiveness may be "Declining incidence of illegal cutting" and reducing poaching (Table 14). All the activities and information regarding this parameter will be properly monitored time to time and documented. For effective monitoring assessment parameters along with core indicators is given in table 14.

Table 14: Indication of forest monitoring with assessment parameters

Core indicators	Assessment parameters
Declining incidence of illegal cutting	Increased number of trees
	Increased canopy cover
	Increased natural regeneration
Frequent sighting of wild animals and birds	Sighting of wild elephants
	Phagents and horn bill sighting
Carbon stock assessment	Increased Basal area and density

11.2 Monitoring changes in habitat/biodiversity/indicator species

A well-developed technique of monitoring in multi-species management scenario is to select one or more key species, and to ensure that habitat suitability for this species or a

group of species is retained. Main species considered for purposes of macro-level habitat management while implementing this Management Plan is the elephant, requiring regenerating forest areas with grasses and bamboo for food and shelter, and water bodies for drinking and bathing. The long-term aim will be to maximize gains in quantity and quality of habitat, and quality of associated species. The following parameters may be used to monitor changes in habitat and biodiversity.

- Increased production of natural resources in targeted areas of FWS.
- Increased biodiversity in targeted areas of FWS.

A survey of natural regeneration (density of seedlings and saplings per ha) in the forests may be taken with respect to the first indicator. This will be complemented by photo monitoring technique, focusing on changes in plant height as visual evidence. Forest dwelling bird species may be used for assessing biodiversity status with respect to the second indicator. A simple procedure of sighting and counting (either population or nests) the indicator species including elephant using the forests as their habitat will be employed by associating local stakeholders in identified transect walks. To understand habitat improvement core indicator is given in table 15.

Table 15: Indicators of habitat improvement

Core indicators	Assessment parameters
Improved elephant habitat	Elephant movement will be ensured through the existing corridors
	Increased the number of elephant
	Increased the number of habitat of wildlife
	Damage to local inhabitants will be reduced.
Increased production of natural resources in targeted areas (Increase in natural and assisted regeneration of tree species)	Changes in plant coverage in a photo
	% area coverage
Increased biodiversity (Increased density of indicator bird Species)	Density (number/sq.km) of indicator bird species through sighting an counting

11.3 Research

11.3.1 Socio-economic research

Socio-economic research is an integral part of proper management of resources and may be taken up on priority basis based on management objectives. Possible topics of investigation may include

- The institutional development and economic sustainability of co management council/ committee and user groups formed at different levels,
- Impacts and dependence of local people on the FWS,
- Ethnic knowledge about local biodiversity,
- Impacts of human activities on natural habitats and NTFPs on local economy etc,
- Forward and backward linkages of nature tourism,
- Sustainable collection, harvesting, storage and processing and marketing of NTFPs

Many of these studies will be carried out through action research and by associating local stakeholders. Prioritization of research topics will be decided in a Workshop in which key persons from FD and other relevant stakeholders will participate. A computerized data base and retrieval system will be established.

11.3.2 Ecological and biological research

Main topics of ecological research may include identification of fragile habitats and ecosystems, environmental impact studies, water body studies, evaluation of the contribution of the FWS in water yield and conservation, impacts of forest grazing and forest fires on natural regeneration and wildlife, and impacts of habitat changes and ecotourism on wildlife etc.

Some relevant topics of biological research may include wildlife-population viability analyses, population dynamics and feeding behavior, wildlife niche use behavior, wildlife distribution patterns, wildlife seasonal variability and movements, and wildlife health and diseases. The needs of species that are dependent on specific habitats (e.g. streamside areas) or specific components (e.g. standing and fallen dead trees) will also be studied for site-specific habitat management.

12 Gender, youth and ethnic community

12.1 Gender, Youth and Ethnic Community

Capacity building program may be taken to reduce gender inequality and ethnic community to reduce their dependency on forest. Youth empowerment program may be taken through club or co-operatives formation and training.
Education program may be taken for women empowerment and social enhancement.

For the youth women and ethnic community of FWS area the following step may be taken;

- Formal and informal education for youth, men, women and ethnic community
- Technical training for livelihood improvement
- Special donation
- Awareness building for biodiversity conservation.
- Training to Youth Tourism
- Handicrafts
- Tailoring
- Improved vegetable Cultivation
- Improved Cooking Stroves
- Technical Training
- Economic supports
- Job placement
- Fuel Wood plantation in Homesteads
- Substitutte of pole in betel leaf cultivation
- Nursery
- Mushroom
- Compost Manure

13 Model structure for annual plans

Table 16 Model structure of annual plans

Program	Activities	Timing	Main output	Responsibilities
Coordination	Meeting	Monthly	Resolution forest land tenure problem Increased administrative support	DFO and Deputy commissioner, Cox's Bazar
	Meeting with law enforcing Agency	Quarterly	Reduced forest offence and crime Increased security support Increased forest protection support	Police, Army (Fasiakhali camp) with FD
	Co-management committee meeting (CMC)	Monthly	preparation of monthly plan • Improvement of forest protection	CMO and FD
	Co-management committee meeting (CMC)	Quarterly	Quarterly progress assessment	CMO and FD
	council meeting (CMC)	Half-yearly	Decision making and planning Strengthening CMO	CMO and FD
Habitat protection program	Mapping	First year, second year and third year	Zoning map Boundary map	FD and CMO
	Boundary demarcation	First year, second year and third year	Delineating boundaries	FD and CMO
	Control of illicit felling through patrolling	Full planning period	Reduced biotic interference Increased vegetation cover Increased regeneration Increased biodiversity	FD/ Stakeholders/ CMC
	Control of	Full planning	Reduced biotic	FD /CPG

	forest grazing through patrolling	period	interference Increased vegetation cover Increased regeneration Increased biodiversity	
	Control of encroachment through patrolling and motivation, law enforment	Full planning period	Prevent encroachment Recovery of forest land	FD/ CMC
	Resolving forest conflicts	Full planning period	Increased forest protection	FD/ CMC
Core zone management (conservation priority area)	Enrichment plantation	Full planning period(yearly)	Increased vegetation cover Increased biodiversity	FD
	Assisted natural regeneration	Full planning period(yearly)	Increased Vegetation cover Increased natural regeneration Increased biodiversity	FD
	Biodiversity conservation through protection	Full planning period(yearly)	Increased biodiversity	FD
Core zone management (non-conservation priority area)	Homestead plantation	Full planning period(yearly)	Livelihood / habitat improvement	FD/CMC
	Agroforestry	Full planning period(yearly)	Livelihood / habitat improvement	FD/ CMC
Buffer zone management	Enrichment plantation	Full planning period(yearly)	Increased vegetation cover	FD/ CMC
	Participatory afforestation	Full planning period(yearly)	Increased vegetation cover along with mitigation of demand	FD/ CMC
	Elephant corridor management	Full planning period(yearly)	Food and shelter movement ensured	FD/CMC
	NTFP regeneration	Full planning period(yearly)	Supplement the demand of local people	FD/CMC
	Involving stakeholder in forest protection	Full planning period(yearly)	Biodiversity conservation and resolved habitat	FD/CMC

Landscape zone/impact zone	Climate resilient activity described in annex 7	Full planning period	Adaption to climate change impact	CREL with close coordination of FD
	Homestead plantation	Full planning period(yearly)	Livelihood improvement	CREL/FD/stakeholder
	Climate resilient cultivation	Full planning period(yearly)	Increased food security	Stakeholder/ CREL
	Community based cylone shelter building	Second year	Increased safety of life Increased social development	CREL with close coordination of FD
	Elephant corridor involving stakeholders in forest protection	Full planning period(yearly)	Providing food and shelter (improved habitat)	/ FD/CMC/ NGO
	Alternative Income Generating Activities (AIGA)	Full planning period(yearly)	Improved livelihood Reduced dependency on forest resources	/ CMC/FD/ NGOs
Infrastructure including visitor facilities	Renovation and maintenance of Forest rest house	Full plan period (yearly)	Improved visitor facilities	FD/ CMC
	Renovation and maintenance of staff quarter	Full plan period (yearly)	Improved staff facilities	FD/CMC
	Nature trail development (As specified in section 9.4)	First Year and second year	Improved ecotourism	FD/CMC
	Nature interpretation center and MUseum	second year, third year and fourth year	maximum enjoy minimum impact on the PA	FD/CMC
	Observation tower	second year and third year	Improved tourism facilities	FD/CMC/ NGO
	GolGhar (resting facilities)	Second year and third year	Improved tourism facilities	FD/CMC
	Construction and mainte-nance picnic site	second year and third year	Improved tourism facilities	FD/CMC
	Sign board	second year	Improved ecotourism	FD/CMC

	Tube well	Full planning period	Improved quality of ecotourism	FD/CMC
	Toilet	First year and second year	Improved ecotourism	FD/CMC
	PA gate	First year and second year	Improved management	FD/CMC
	Ticket counter	First year	Improved tourism management	FD/CMC
	Waste bin	First year and fourth year	Improve waste management Less pollution	FD/CMC
	Student dormitory	second year, third year and fourth year	Increase learning	FD/CMC
Visitor management	Parking place	First year and second year	Sustainable traffic management	CMC/FD
	Tourist shop and cafeteria	First year, second year and third year	Increase tourism facilities Local Livlihood	CMC/FD
	Development code of conduct	First year and second year	Increased ecotourism management	FD/CMC
	Monitoring and recoding visitors entry	Full planning period	enhanced ecotourism management	FD/CMC
	Training eco-guides	Full planning period(yearly)	Trained eco-guide for nature conservation	FD/CMC
	Publicity materials	Full planning period(yearly)	Awareness about nature based tourism	FD/stakeholder
	Entry fee collection	Full planning period	revenue earning	
Capacity building and research	PA archive development	Full Planning period	Knowledge management help effective decision making	FD
	Training assessment for participatory PA management	Full Planning period	Training identified	FD/stakeholder
	Training of staffs and stakeholders on conservation	Full planning period	Trained personnel	FD/stakeholder
	Meeting and workshop	Full planning period	Capacity building	FD/stakeholder

	Conservation research studies	Full planning period	Develop Guidelines for conservation	FD/stakeholder
	Biological research	Full planning period	Develop Guidelines	FD/stakeholder
	Research on utilization	Full planning period	Develop Guidelines	FD/stakeholder
	Ecological research	Full planning period	Develop Guidelines	FD/stakeholder
	Silvicultural research	Full planning period	Develop Guidelines	FD/stakeholder
	Human-elephant conflict management	Full Planning period	Biodiversity conservation Reduce property damage	FD
Capacity building for Livelihood program	Selecting priority production technologies (reconnaissance surveys)	First year and second year	Assessed Demand – supply	FD/stakeholder
	Identifying a list of feasible production Technologies	First year and second year	Feasible production technologies identified	FD/stakeholder
	Stakeholders' Consultations on the proposed production technologies	First year and second year	Locally accepted Effective approach identified	FD/stakeholder
	Developing skills and loan for alternative income generation (poultry, fisheries, nursery, sewing etc.)	First year and second year	Livelihood development	FD/stakeholder
Staffing and resource need	Staff recruitment and equipment as described in section Annex 9	First year and second year	effective management	FD
Fund raising Plan	Potential financial sources and As described in section 10;	Full planning period	Financial efficiency	FD, CMO

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Annex

Annex 1: Gazette notification of Fasiakhali Wildlife Sanctuary

Bangladesh Gazette, April 19, 2007

Ministry of Environment and Forest
Forest Section- 2
Gazette
Date, 11 April, 2007

No MoEF/sha-5/Wildlife-2/06/48- According the gazette notification no. 6785 FOR, date 29 July, 1907 710 acres of dulahajra block, 1514 acres of Ringbong block, 993 acres of Fasiakhali block under chakaria upzilla of Cox'sbazar district has been declared as protected area. In exercise of the power conferred by section 23 (1) of Bangladesh Wildlife (Preservation) Act, 1974, the Government of the People's Republic of Bangladesh, is pleased to declare that, for the development and conservation of tree resources and wildlife, aforesaid forest area (which has been described in the schedule below) to be described as Fasiakhali Wildlife Sanctuary with effect from the date of publication of this notification in the gazette of the Government of the People's Republic of Bangladesh.

Schedule

Schedule District	Upzilla	Mouza/Block	Forest Land (Acre)	Forest Category	Remarks
Cox'sbazar	**Chakaria**	**Fasiakhali**	**993**	**Protected Forest**	Gazette notification no. 6785 FOR, date 29 July, 1907
Cox'sbazar	**Chakaria**	**Ringbong**	**1514**	**Protected Forest**	Gazette notification no. 6785 FOR, date 29 July, 1907
Cox'sbazar	**Chakaria**	**Dhulahajra**	**710**	**Protected Forest**	Gazette notification no. 6785 FOR, date 29 July, 1907
Grant total		**3217**		**The forest land lies between 21^0 40´ to 21^0 40´ north latitude and 92^0 04´ to 92^0 08´ East longitude**	

Description of the Boundary

North: Matamuhuri river and private land, District – Cox'sbazar, Thana – Chakaria, Mouza – Fasiakhali, sheet no. 1, J.L no. 34, R.S. dag no. 858, 859, 1241, 1201, 1208, 1209, 838, 25, 821, 846, 1165, 1175, 1174, 1226 and 1269.

South: Private land, District – Cox'sbazar, Thana – Chakaria, Mouza – Baga Chattar, sheet no. 3, R.S. dag no. 378, 375, 380, 381 and 382. Reserved forest Dulahajra and Safari Park (Boundary of Dulahajra Safari Park).

East: Unclass state forest of hill tracts of bandorban district, Refugee camp of Boga Chattar and FuterJhiri.

West: Arakan road.

Annex 2: Useful glossary

Biodiversity	The variety of life and its processes including complexity of species, communities, gene pools and ecological functions.
Buffer zone	It is an area peripheral to a Wildlife Sanctuary or equivalent reserve, where restrictions are placed upon resource use or special development measures are undertaken to enhance the conservation values of the area**.** This peripheral areacan provide the local inhabitants with the privilege of regular consumption of forest products.
Core zone	These areas are securely protected sites for conserving biological diversity. The entire forest area that was declared as Wildlife Sanctuary in the official gazette is designated as core zone.
Framework tree species	The framework species method involves planting mixtures of 20-30 indigenous forest tree species, which are typical of the target forest ecosystem. these speciesi) are fast-growing with dense spreading crowns that rapidly shade out competing weeds and ii) are attractive to seed-dispersing wildlife, especially birds and bats. In addition, framework species must be easy to propagate in nurseries. High quality seedlings of 20-30 framework tree species, 5-60 cm tall (30 cm for the fastest growing species) are planted 1.6 – 1.8 m apart at the beginning of the rainy season. Weeds are vigorously controlled and fertilizer is sometimes added, but after 2-3 rainy seasons the canopy closes, the forest becomes self-sustaining and no further maintenance is required. Once the "framework" of a forest has been re-established, the other components of the ecosystem can return naturally.
Influence zone	The extent of area outside the legal boundaries over which local villagers have a traditional PA based forests based dependency and/or over which significant wildlife damage occurs.
Landscape	Landscape comprises the visible features of an area of land, including the physical elements of landforms such as mountains, hills, water bodies such as rivers, lakes, ponds and the sea, living elements of land cover including indigenous vegetation, human elements including different forms of land use, buildings and structures, and transitory elements such as lighting and weather conditions. Ecologically landscape consists of mosaic of natural communities – associations of plants and animals and their related processes and interactions.
Keystone species	Animals or plants which by virtue of their presence or absence alter the structure of a community.
Succession stage:	A stage or recognizable condition of a plant community which occurs during its development from bare ground to climax.

Annex 3: Plantation data of recent years within PA area

Name of beat	Year of plantation	Plantation type	Plantation area
Fasiakhali Beat	2010-2011	Short Rotation	10 ha
		Long Rotation	10 ha
		Agor	30 ha
		Bamboo	10 ha
		Bet	10 ha
	2011-2012	Bet	10 ha
	2012-2013	Short Rotation	10 ha
	2013-2014	Short Rotation	25 ha
Dulahazara Beat	2010-2011	Bet	10 ha
	2011-2012	Long Rotation	10 ha
		Bamboo	10 ha
	2012-2013	Long Rotation	5 ha
	2013-2014	Nil	

Annex 4: List of Flora in the Fasiakhali Wildlife Sanctuary

Category	**Common Name**	**Scientific Name**	**Family Name**
Tree	Akashmoni	*Acacia auriculiformis*	Leguminosae
	Mangium	*Acacia mangium,*	Leguminosae
	Bel	*Aegle marmelos*	Rutaceae
	koroi, Sil Koroi	*Albizia procera*	Fabaceae
	Ata	*Annona squamosal*	Annonaceae
	Kadam	*Anthocephalus chinensis*	Rubiaceae
	Pitraj	*Aphanamixis polystachya*	Meliaceae
	Chapalish	*Artocarpus chaplasha*	Moraceae
	Latkan	*Baccaurea ramiflora*	Euphorbiaceae
	Shimul	*Bombax ceiba*	Malvaceae
	Khoi, Serai	*Bridelia tomentosa*	Euphorbiaceae
	Harjora	*Buettneria pilosa*	Sterculiaceae
	Palaash	*Butea monosperma*	Fabaceae
	Bormala	*Callicarpa arborea*	Verbenaceae
	Sonalo	*Cassia fistula*	Leguminosae
	Bandarlatia	*Cassia nodosa*	Leguminosae
	Minjiri	*Cassia siamea Lamk*	Leguminosae
	Chickrassi	*Chiclrassia tebularis*	Meliaceae
	Bhat	*Clerodendrum viscosum*	Lamiaceae
	Sissoo	*Dalbergia sissoo*	Fabaceae
	Hargaza	*Dillenia pentagyna*	Dilleniaceae
	Chalta	*Dillenia indica*	Dilleniaceae
	Garjan	*Dipterocarpus spp.*	Dipterocarpaceae
	Jalpai	*Eaeocarpus robustus*	Elaeocarpaceae
	Gillalota	*Entada phaseoloides*	Leguminosae
	Mandar	*Erythrina ovalifolia*	Fabaceae
	Eucalyptus	*Eucalyptus camaldulensis*	Mytraceae
	Kakdumur	*Ficus hispida*	Moraceae
	Assawath	*Ficus religiosa*	Moraceae
	Jiribot	*Ficus spp*	Moraceae

Category	Common Name	Scientific Name	Family Name
Tree	Udal	*Firmiana colorata*	Sterculiaceae
	Agar	*Gracilaria graciis*	Gracilariaceae
	Kau	*Garcinia cowa*	Guttiferae
	Gamar/Gamari	*Gmelina arborea*	Verbenaceae
	Rubber	*Hevea brasiliansis*	Euphorbiaceae
	Telsur	*Hopea odorata*	Dipterocarpaceae
	Jarul	*Lagerstromia speciosa,*	Lythraceae
	Bhadi	*Lannea coromandelia*	Anacardiaceae
	Menda	*Litsea sebifera*	Lauraceae
	Am	*Magnifera indica*	Anacardiaceae
	Champa	*Michelia champaca*	Magnoliaceae
	Bon-tejpata	*Melastoma malabathricum*	Melastomataceae
	Mulibans	*Melocanna baccifera*	Poaceae
	Daloo Bans/Dalu	*Neohoueaua dulloa*	Poaceae
	Kali Bans	*Oxytenanthera*	Poaceae
	Aamloki	*Phyllanthus emblica*	Phyllanthaceae
	Indian Beech	*Pongamia pinnata*	Fabaceae
	Batna, Raibatna	*Quercus spicata*	Fagaceae
	Sal	*Shorea robusta,*	Dipterocarpaceae
	Dharmara	*Stereospermum*	Bignoniaceae
	Civit/ Chandul	*Swintonia floribunda*	Anacardiaceae
	Mahagony	*Swietenia macrophylla*	Meliaceae
	Jam, Kalojam	*Syzygium cumini*	Myrtaceae
	Dhakijam	*Syzygium grande*	Myrtaceae
	Tagarphul	*Tabernaemontana*	Apocynaceae
	Shegun/Teak	*Tectona grandis*	Verbenaceae
	Arjun	*Terminalia arjuna*	Combretaceae
	Bohera	*Terminalia belerica*	Combretaceae
Tree	Toon	*Toona ciliata*	Meliaceae
	Pitali	*Trewia polycarpa*	Euphorbiaceae
	Mankanta	*Xeromphis spinosa*	Rubiaceae
	Boroi	*Zizipus mauritiana*	Rhamnaceae
	Banboroi	*Zizyphus oenoplia*	Rhamnaceae
Shrub	Nuniagach	*Aegialitis rotundifolia*	Plumbaginaceae
	Danura	*Aphania danura*	Sapindaceae
	Kaligoda	*Bambusa tulda*	Poaceae
	Bamunhati	*Clerodendrum indicum*	Verbenaceae
	Ghetphul	*Clerodendrum viscosum*	Verbenaceae
	Assamlata	*Eupatorium odoratum*	Compositae
	Silchauri	*Mussaendra roxburghii*	Rubiaceae
	Panseuli	*Phyllanthus reticulates*	Euphorbiaceae
	Swarpagandha	*Rauvolfia serpentine*	Apocynaceae
	Titbegun	*Solanum torvum*	Solanaceae
	Bogamedula	*Tephrosia candida*	Leguminosae
	Banokra	*Triumfetta rhomboidea*	Tiliaceae
	Cane	*Calamus spp.*	Palmae
	Banalu	*Dioscorea bulbifera*	Dioscoreaceae
	Susni alu	*Dioscorea esculenta*	Dioscoreaceae
	Shora alu	*Dioscorea glabra*	Dioscoreaceae

Category	Common Name	Scientific Name	Family Name
Climber	Dudkalmi	*Ipomea alba*	Convolvulaceae
	Mistialu	*Ipomoea batatus*	Convolvulaceae
	Dhol-kolmi	*Ipomoea fistulosa*	Convolulacea
	Kumarilata	*Smilax macrophylla*	Liliaceae
	Nillata	*Thunbergia grandiflora*	Acanthaceae
Herb	Upatlangra	*Achyranthes aspera*	Amaranthaceae
	Orchid	*Aerides odorata*	Orchidaceae
	Habinishak	*Aglaonema hookerianum*	Araceae
	Sugandhbach	*Alpinia galangal*	Zingiberaceae
	Porgacha	*Bulbophyllum lilacinum*	Orchidaceae
	Moss	*Brownlowia elata*	Tiliaceae
	Akanda	*Calotropis procera*	Apocynacee
	Chakunda	*Cassia tora*	Leguminosae
	Kachu	*Colocasia esculenta*	Araceae
	Jangli Kachu,	*Colocasia nymphaefolia*	Araceae
	Behua	*Cyperus difformis*	Cyperaceae
	Orchid	*Gymbidium aloifolium*	Orchidaceae
	Blue waterleaf	*Hydrolea zeylanica*	Hydrophyllaceae
	Tokma	*Hyptis suaveolens*	Labiatae
	Ulukhagra	*Imperata cylindrical*	Poaceae
	Lantana	*Lantana camara*	Verbenaceae
	Lajjaboti	*Mimosa pudica*	Leguminosae
	Sarkachu	*Monochoria vaginalis*	Pontederiaceae
	Alkushi	*Mucuna pruriens*	Leguminosae
	Ramkola	*Musa ornate*	Musaceae
	Kachakola	*Musa paradisiac*	Musaceae
	Phuika, Tepari	*Physalis minima*	Solanaceae
Herb	Kash	*Saccharum spontaneum*	Poaceae
	Karabi	*Sarchochlamys*	Urticaceae
	Urusia	*Sida acuta*	Malvaceae
	Phuljharu, Jharu	*Thysanolaena maxima*	Poaceae
	Panlata	*Uraria hamosa*	Leguminosae

Annex 5: Lists of Fauna in the Fasiakhali Wildlife Sanctuary (Birds)

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
1	Rain Quail	*Coturnix*	*coromandelica*	G		2
2	Red Junglefowl	*Gallus*	*gallus*	F	uc	c
3	Lesser Whistling Duck	*Dendrocygna*	*javanica*	W	r	
4	Rock (Feral) Pigeon	*Columba*	*livia*	V	c	
5	Oriental Turtle-Dove	*Streptopelia*	*orientalis*	Fe		uc
6	Eurasian Collared Dove	*Streptopelia*	*decaocto*	V	uc	
7	Red Turtle-Dove	*Streptopelia*	*tranquebarica*	V	uc	
8	Western Spotted Dove	*Spilopelia*	*suratensis*	V	c	c
9	Grey-capped Emerald Dove	*Chalcophaps*	*indica*	F	c	r
10	Orange-breasted Green Pigeon	*Treron*	*bicinctus*	Fe		uc
11	Grey-fronted Green Pigeon	*Treron*	*affinis*	Fe	c	
12	Thick-billed Green Pigeon	*Treron*	*curvirostra*	Fe	r	
13	Yellow-footed Green Pigeon	*Treron*	*phoenicopterus*	F	c	uc
14	Large-tailed Nightjar	*Caprimulgus*	*macrurus*	F	c	uc
15	Silver-backed Needletail	*Hirundaps*	*cochinchinensis*	Fe		1
16	Asian Palm-Swift	*Cypsiurus*	*balasiensis*	V	c	
17	Pacific Swift	*Apus*	*pacificus*	Fe		1
18	Greater Coucal	*Centropus*	*sinensis*	V	uc	uc
19	Lesser Coucal	*Centropus*	*bengalensis*	B	uc	
20	Green-billed Malkoha	*Phaenicophaeus*	*tristis*	F	c	uc
21	Jacobin (Pied) Cuckoo	*Clamator*	*jacobinus*	V	r	
22	Western Koel	*Eudynamys*	*scolopacea*	V	c	c
23	Plaintive Cuckoo	*Cacomantis*	*merulinus*	V	r	uc
24	Common Hawk Cuckoo	*Hierococcyx*	*varius*	V	c	
25	Indian Cuckoo	*Cuculus*	*micropterus*	V	r	c
26	White-breasted Waterhen	*Amaurornis*	*phoenicurus*	W	uc	uc
27	Asian Openbill	*Anastomus*	*oscitans*	W		1
28	Black-crowned Night Heron	*Nycticorax*	*nycticorax*	Wp	r	
29	Indian Pond Heron	*Ardeola*	*grayii*	W	c	

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
30	Cattle Egret	*Bubulcus*	*ibis*	W	uc	1
31	Little Egret	*Egretta*	*garzetta*	W	uc	
32	Little Cormorant	*Microcarbo*	*niger*	W		uc
33	Greater Sandplover	*Charadrius*	*leschenaultii*	C		1
34	Red-wattled Lapwing	*Vanellus*	*indicus*	W	uc	
35	Greater Painted-snipe	*Rostratula*	*benghalensis*	W	uc	
36	Pintail Snipe	*Gallinago*	*stenura*	W	r	
37	Common Snipe	*Gallinago*	*gallinago*	W	r	
38	Common Sandpiper	*Actitis*	*hypoleucos*	Wr	r	
39	Green Sandpiper	*Tringa*	*ochropus*	Wr	r	uc
40	Wood Sandpiper	*Tringa*	*glareola*	W	r	uc
41	Barred Buttonquail	*Turnix*	*suscitator*	Fe	1	
42	Whiskered Tern	*Chlidonias*	*hybridus*	W		c
43	White-winged Tern	*Chlidonias*	*leucopterus*	W		uc
44	Brown Boobook (Hawk Owl)	*Ninox*	*scutulata*	V	c	uc
45	Asian Barred Owlet	*Glaucidium*	*cuculoides*	Fe	c	uc
46	Spotted Owlet	*Athene*	*brama*	V	c	uc
47	Collared Scops Owl	*Otus*	*lettia*	VF	r	
48	Oriental Scops Owl	*Otus*	*sunia*	F	r	
49	Brown Fish Owl	*Ketupa*	*zeylonensis*	VF	r	
50	Osprey	*Pandion*	*haliaetus*	W		r
51	Black-shouldered Kite	*Elanus*	*axillaris*	V	uc	
52	Oriental Honey-buzzard	*Pernis*	*ptilorhynchus*	F	r	
53	Crested Serpent Eagle	*Spilornis*	*cheela*	FV	uc	uc
54	Changeable Hawk Eagle	*Nisaetus*	*cirrhatus*	F	r	uc
55	Western Marsh Harrier	*Circus*	*aeruginosus*	W		1
56	Shikra	*Accipiter*	*badius*	V	r	
57	Besra	*Accipiter*	*virgatus*	Fe	uc	1
58	Brahminy Kite	*Haliastur*	*indus*	V	c	
59	Black Kite	*Milvus*	*migrans*	V	uc	
60	Common Hoopoe	*Upupa*	*epops*	V	c	
61	Asian Green Bee-eater	*Merops*	*orientalis*	V	c	uc

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
62	Chestnut-headed Bee-eater	*Merops*	*leschenaulti*	Fe	uc	uc
63	Blue-tailed Bee-eater	*Merops*	*philippinus*	V	uc	uc
64	Indian Roller	*Coracias*	*benghalensis*	V	c	uc
65	Common Kingfisher	*Alcedo*	*atthis*	W	c	
66	Pied Kingfisher	*Ceryle*	*rudis*	Wr		r
67	Stork-billed Kingfisher	*Pelargopsis*	*capensis*	W	r	
68	White-breasted Kingfisher	*Halcyon*	*smyrnensis*	V	uc	c
69	Black-capped Kingfisher	*Halcyon*	*pileata*	C		uc
70	Collared Kingfisher	*Todiramphus*	*chloris*	C		uc
71	Coppersmith Barbet	*Psilopogon*	*haemacephalus*	VFd	r	
72	Lineated Barbet	*Psilopogon*	*lineatus*	F	c	c
73	Blue-throated Barbet	*Psilopogon*	*asiaticus*	Fe	c	
74	Eurasian Wryneck	*Jynx*	*torquilla*	V	r	
75	Greater Flameback (Goldenback)	*Chrysocolaptes*	*guttacristatus*	F	c	uc
76	Black-rumped (Lesser) Flameback (Goldenback)	*Dinopium*	*benghalense*	V	r	uc
77	Rufous Woodpecker	*Microptemus*	*brachyurus*	Fe		c
78	Greater Yellownape	*Chrysophlegma*	*flavinucha*	Fe	r	
79	Bllack-naped (Grey-headed) Woodpecker	*Picus*	*guerini*	Fe	r	uc
80	Great Slaty Woodpecker	*Mulleripicus*	*pulverulentus*	Fe		r
81	Grey-capped Pygmy Woodpecker	*Picoides*	*canicapillus*	Fd	uc	
82	Fulvous-breasted Woodpecker	*Dendrocopos*	*macei*	V	c	
83	Common Kestrel	*Falco*	*tinnunculus*	V	uc	
84	Vernal Hanging Parrot	*Loriculus*	*vernalis*	FeB	uc	uc
85	Red-breasted Parakeet	*Psittacula*	*alexandri*	FeB	uc	c

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
86	Rose-ringed Parakeet	*Psittacula*	*krameri*	V	c	uc
87	Hooded Pitta	*Pitta*	*sordida*	Fe		c
88	Ashy Woodswal-low	*Artamus*	*fuscus*	V	uc	uc
89	Common Iora	*Aegithina*	*tiphia*	FV	c	c
90	Large Wood-shrike	*Tephrodornis*	*gularis*	Fe		uc
91	Common Woodshrike	*Tephrodornis*	*pondicerianus*	Fd	c	uc
92	Large Cuck-ooshrike	*Coracina*	*macei*	F	r	c
93	Black-winged Cuckooshrike	*Coracina*	*melaschistos*	F	r	uc
94	Black-headed Cuckooshrike	*Coracina*	*melanoptera*	Fd	r	
95	Rosy Minivet	*Pericrocotus*	*roseus*	Fe	r	c
96	Ashy Minivet	*Pericrocotus*	*divaricatus*	F		1
97	Small Minivet	*Pericrocotus*	*cinnamomeus*	Fd	uc	c
98	Scarlet Minivet	*Pericrocotus*	*flammeus*	Fe	c	c
99	Bar-winged Flycatcher-shrike	*Hemipus*	*picatus*	Fe		uc
100	Brown Shrike	*Lanius*	*cristatus*	V	c	c
101	Long-tailed Shrike	*Lanius*	*schach*	V	c	c
102	Grey-backed Shrike	*Lanius*	*tephronotus*	B	uc	1
103	Black-naped Oriole	*Oriolus*	*chinensis*	F	r	
104	Black-hooded Oriole	*Oriolus*	*xanthornus*	V	uc	c
105	Black Drongo	*Dicrurus*	*macrocercus*	V	c	c
106	Ashy Drongo	*Dicrurus*	*leucophaeus*	F	r	uc
107	Crow-billed Drongo	*Dicrurus*	*annectans*	Fe		1
108	Bronzed Drongo	*Dicrurus*	*aeneus*	F	uc	c
109	Hair-crested Drongo	*Dicrurus*	*hottentotus*	F	c	uc
110	Greater Racket-tailed Drongo	*Dicrurus*	*paradiseus*	Fe	r	c
111	White-throated Fantail	*Rhipidura*	*albicollis*	V	c	
112	Black-naped Monarch	*Hypothymis*	*azurea*	F	c	c
113	(Common) Green Magpie	*Cissa*	*chinensis*	Fe		c
114	Rufous Treepie	*Dendrocitta*	*vagabunda*	VFd	uc	c
115	Grey Treepie	*Dendrocitta*	*formosae*	Fe		c

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
116	House Crow	*Corvus*	*splendens*	V	c	c
117	Jungle (Large-billed) Crow	*Corvus*	*macrorhynchos*	V	c	c
118	Great Tit	*Parus*	*major*	Fd	c	uc
119	Barn Swallow	*Hirundo*	*rustica*	V	c	c
120	Bengal (Rufous-winged) (Bush) Lark	*Mirafra*	*assamica*	B	c	
121	Zitting Cisticola	*Cisticola*	*juncidis*	V		c
122	Grey-breasted Prinia	*Prinia*	*hodgsonii*	B	c	
123	Plain Prinia	*Prinia*	*inornata*	B	uc	
124	Black-headed Bulbul	*Pycnonotus*	*atriceps*	Fe	r	uc
125	Black-crested Bulbul	*Pycnonotus*	*melanicterus*	F	r	uc
126	Red-whiskered Bulbul	*Pycnonotus*	*jocosus*	FB	c	c
127	Red-vented Bulbul	*Pycnonotus*	*cafer*	VB	c	c
128	White-throated Bulbul	*Alophoixus*	*flaveolus*	Fe	c	c
129	Common Tailorbird	*Orthotomus*	*sutorius*	VB	c	c
130	Dark-necked Tailorbird	*Orthotomus*	*atrogularis*	Fe	uc	c
131	Striated Grassbird	*Megalurus*	*palustris*	W	r	
132	Asian Fairy Bluebird	*Irena*	*puella*	Fe		uc
133	Blue-winged Leafbird	*Chloropsis*	*cochinchinensis*	Fe		r
134	Golden-fronted Leafbird	*Chloropsis*	*aurifrons*	F	c	c
135	Blue Rock Thrush	*Monticola*	*solitarius*	V	uc	1
136	Orange-headed Thrush	*Zoothera*	*citrina*	F	r	
137	Taiga (Red-throated) Flycatcher*	*Ficedula*	*albicilla*	FV	c	c
138	Verditer Flycatcher	*Eumyias*	*thalassina*	F	uc	
139	Pale-chinned (Brooks's) Blue Flycatcher	*Cyornis*	*poliogenys*	Fe	r	
140	Blue-throated Blue Flycatcher	*Cyornis*	*rubeculoides*	F		uc
141	Grey-headed	*Culicicapa*	*ceylonensis*	F	c	

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
	Canary-Flycatcher*					
142	Oriental Magpie-Robin*	*Copsychus*	*saularis*	V	c	c
143	White-rumped Shama	*Copsychus*	*malabaricus*	F	c	c
144	Black Redstart	*Phoenicurus*	*ochruros*	VB	r	
145	Common Stonechat	*Saxicola*	*torquata*	VB	c	
146	Asian Glossy Starling	*Aplonis*	*panayensis*	Fe		c
147	Chestnut-tailed Starling*	*Sturnus*	*malabaricus*	V	c	
148	Pied (Myna) Starling*	*Sturnus*	*contra*	V	c	
149	Common Myna*	*Acridotheres*	*tristis*	V	c	
150	Jungle Myna*	*Acridotheres*	*fuscus*	V	c	c
151	Common Hill Myna	*Gracula*	*religiosa*	Fe	c	uc
152	Velvet-fronted Nuthatch	*Sitta*	*frontalis*	F	uc	
153	Oriental White-eye	*Zosterops*	*palpebrosus*	F	r	c
154	Blyth's Reed Warbler*	*Acrocephalus*	*dumetorum*	VB	c	
155	Dusky Warbler*	*Phylloscopus*	*fuscatus*	BW	uc	uc
156	Tickell's Leaf Warbler	*Phylloscopus*	*affinis*	B	uc	
157	Yellow-browed Warbler*	*Phylloscopus*	*inornatus*	F	c	uc
158	Greenish Warbler*	*Phylloscopus*	*trochiloides*	F	uc	c
159	Western Crowned Warbler	*Phylloscopus*	*occipitalis*	F		1
160	Blyth's Leaf Warbler	*Phylloscopus*	*reguloides*	F	uc	uc
161	Yellow-vented Warbler	*Phylloscopus*	*cantator*	F		uc
162	Golden-spectacled Warbler sp	*Seicercus*	*sp*			uc
163	White-crested Laughingthrush	*Garrulax*	*leucolophus*	Fe		c
164	Lesser Necklaced Laughingthrush	*Garrulax*	*monileger*	Fe	r	uc
165	Greater Necklaced Laughingthrush	*Garrulax*	*pectoralis*	Fe	uc	c
166	Rufous-necked Laughingthrush	*Garrulax*	*ruficollis*	B	uc	

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
167	Abbott's Babbler	*Malacocincla*	*abbotti*	Fe	c	uc
168	Buff-breasted Babbler	*Pellorneum*	*tickelli*	Fe		r
169	Puff-throated (Spotted) Babbler	*Pellorneum*	*ruficeps*	F	c	c
170	White-browed Scimitar Babbler	*Pomatorhinus*	*schisticeps*	Fe		uc
171	Grey-throated Babbler	*Stachyris*	*nigriceps*	Fe	r	uc
172	Striped Tit Babbler	*Macronous*	*gularis*	Fe	uc	c
173	Chestnut-capped Babbler	*Timalia*	*pileata*	BG	r	
174	Striated Babbler*	*Turdoides*	*earlei*	B	c	
175	Thick-billed Flowerpecker	*Dicaeum*	*agile*	F	uc	r
176	Yellow-vented Flowerpecker	*Dicaeum*	*chrysorrheum*	Fe		r
177	Orange-bellied Flowerpecker	*Dicaeum*	*trigonostigma*	Fem		c
178	Pale-billed (Tickell's) Flowerpecker*	*Dicaeum*	*erythrorynchos*	VF	uc	uc
179	Plain Flowerpecker	*Dicaeum*	*concolor*	F	uc	
180	Scarlet-backed Flowerpecker	*Dicaeum*	*cruentatum*	Fe	uc	c
181	Ruby-cheeked Sunbird	*Anthreptes*	*singalensis*	F	uc	c
182	Purple-rumped Sunbird*	*Nectarinia*	*zeylonica*	V	uc	r
183	Purple-throated Sunbird	*Nectarinia*	*sperata*	Fe	c	c
184	Olive-backed Sunbird	*Nectarinia*	*jugularis*	Fe		1
185	Purple Sunbird*	*Nectarinia*	*asiatica*	VB	uc	r
186	Crimson Sunbird	*Aethopyga*	*siparaja*	F	c	c
187	Little Spi-derhunter	*Arachnothera*	*longirostra*	Fe	c	uc
188	House Sparrow*	*Passer*	*domesticus*	V	c	c
189	Forest Wagtail*	*Dendronanthus*	*indicus*	F	c	
190	White Wagtail*	*Motacilla*	*alba*	VW	c	
191	White-browed Wagtail*	*Motacilla*	*maderaspatensis*	W	c	
192	Citrine Wagtail	*Motacilla*	*citreola*	W	r	
193	Grey Wagtail*	*Motacilla*	*cinerea*	VW	uc	
194	Paddyfield Pipit*	*Anthus*	*rufulus*	VG	c	
195	Olive-backed	*Anthus*	*hodgsoni*	FB	c	

Sl	English Name	*Genus*	*Species*	Ha	Fashiakhali WS	Malum-ghat & Dulahazari
	Pipit*					
196	Baya Weaver*	*Ploceus*	*philippinus*	V	c	
197	Indian Silverbill*	*Lonchura*	*malabarica*	V	r	
198	White-rumped Munia	*Lonchura*	*striata*	Fe	uc	1
199	Scaly-breasted Munia*	*Lonchura*	*punctulata*	V	c	
200	Black-headed Munia	*Lonchura*	*malacca*	W	r	
	No of species recorded				**162**	**129**

Sources: Fashiakhali surveys for IPAC and CREL also critical review of Jahangirnagar University study. Dulahazari and Malumghat D. Johnson (pers.comm.)

Habitat:
Forest (all) -F
Evergreen forest - Fe
Mangrove - Fem
Wetland - W
Haors - Wh
Rivers - Wr
Villages - V
Bushes - B
Coast - C
Grassland - G

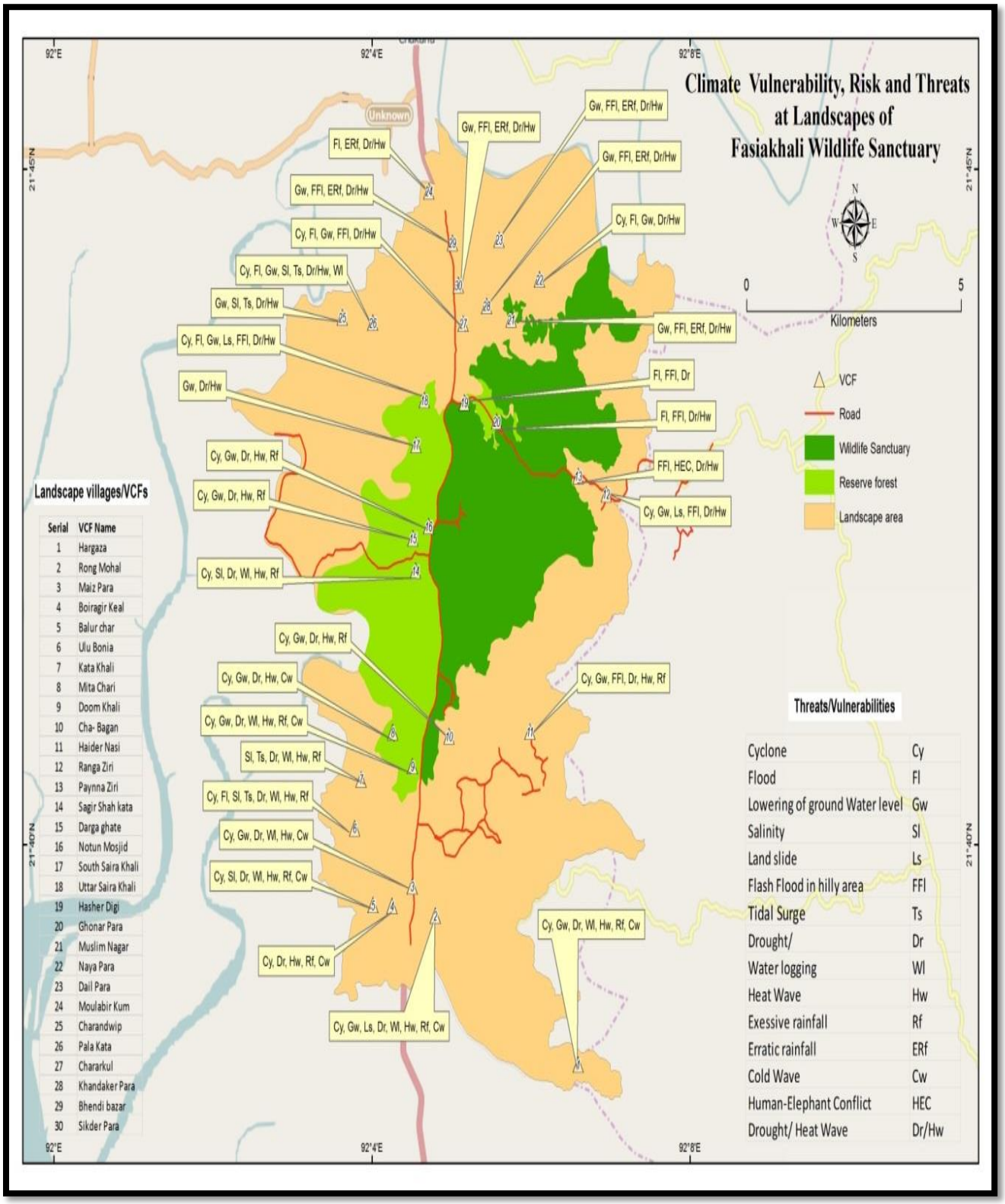
Status: common, c; uncommon, uc; rare, r; 1-5 records, number

Other fauna

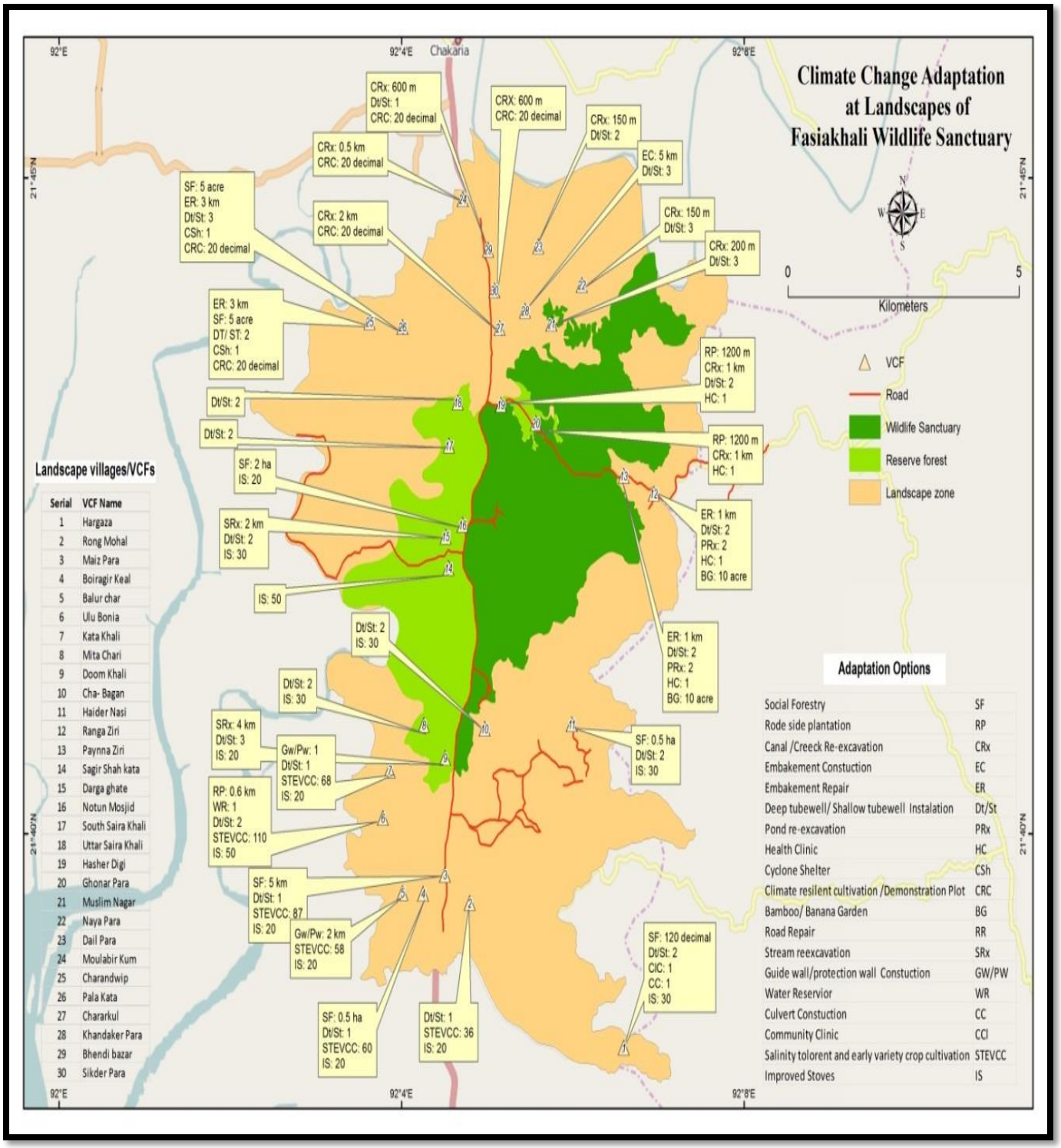
Class	English name	Local name	Scientific name	Family
Amphibians	Common Toad	Kuno Bang	*Bufo melanostictus*	Bufonidae
	Annandale's Pigmy Tree Frog		*Chiromantis simus*	Rhacophoridae
	Two-striped Pigmy Tree Frog		*Chiromantis vittatus*	Rhacophoridae
	Point-nosed Frog	Soru-matha Bang	*Clinotarsus alticola*	Ranidae
	Indian Skipper Frog	Kotkoti Bang	*Euphlyctis cyanophlyctis*	Dicroglossidae
	Indian Bull Frog	Sona / Kola Bang	*Hoplobatrachus tigerinus*	Dicroglossidae
	Bhamo Frog		*Humerana humeralis*	Ranidae
	Cope's Frog	Murgi Daka Bang	*Hylarana leptoglossa*	Ranidae
	Two-striped grass Frog	Pana Bang	*Hylarana taipehensis*	Ranidae
	Painted Bull Frog	Venpu Bang	*Kaloula pulchra*	Bufonidae
	Smith's Litter Frog	Holde chokha Bang	*Leptobrachium smithi*	Megophryidae
	Berdmore's Microhylid Frog	Boro Laubichi Bang	*Microhyla berdmorei*	Microhylidae
	Ornate Microhylid Frog	Cheena Bang	*Microhyla ornata*	Bufonidae
	Puddle Frog		*Occidozyga lima*	Dicroglossidae
	Six-lined Tree Frog	Dorakata Gecho Bang	*Polypedates leucomystax*	Rhacophoridae
	Tree Frog	Gecho Bang	*Polypedates macuiatus*	Rhacophoridae
	Htun Win's Tree Frog	Lal-pa Gecho Bang	*Rhacophorus bipunctata*	Rhacophoridae
Mammals	Asian small clawed otter		*Aonyx cinerea*	Mustelidae
	Asiatic Jackal		*Canis aureus*	Canidae
	Red Dog, Wild Dog		*Cuon alpinus*	Canidae
	Orange-bellied Himalayan Squirrel	Kamlapet Himalayee Katbirali	*Dremomys lokriah*	Sciuridae
	Asian Elephant	Hati	*Elephas maximus*	Elephantidae
	Pig-tailed Macaque	Ultoleji Banor/ Kulu Bandor	*Macaca leonine*	Cercopithecidae
	Rhesus Macaque	Banor	*Macaca mulatta*	Cercopithecidae
	Barking Deer		*Muntiacus muntjak*	Cervidae
	Slow Loris	Lojjawati Banor/Lajuk Banor	*Nycticebus bengalensis*	Lorisidae

	Fishing Cat		*Prionailurus viverrinus*	Felidae
	Flying Fox/ Indian Flying Fox	Badur	*Pteropus giganteus*	Pteropodida
	Indian Wild Pig		*Sus scrofa*	*Suidae*
	Capped Langur	Mukhpora Hanuman	*Trachypithecus pileatus*	Cercopithecidae
	Large Indian Civet	Bagdash	*Viverra zibetha*	*Viverridae*
Reptiles	Common Vine Snake	Laodoga Shap	*Ahaetulla nasuta*	Colubridae
	Emma Gray's Forest Lizard	Rokto-chusha	*Calotes emma*	Agamidae
	Common Garden Lizard	Rokto-chusha	*Calotes versicolor*	Agamidae
	Golden tree snake		*Chrysopelea ornata*	Colubridae
	Indian Rat Snake	Daraj	*Coluber mucosus*	Colubridae
	Khasi Hills Bent-Toed Gecko		*Cyrtodactylus ayeyarwadyensis*	Gekkonidae
	Keeled Grass Skink	Anjoni/Anjon	*Eutropis carinata*	Scincidae
	Bronze Grass Skink	Anjon	*Eutropis macularia*	Scincidae
	Tokay Gecko	Tokkhak/ Kokkey	*Gekko gecko*	Gekkonidae
	Bowring's House Gecko	Badame Tiktiki	*Hemidactylus bowringii*	Gekkonidae
	Brook's House Gecko	Tiktiki	*Hemidactylus brookii*	Gekkonidae
	Common House Gecko	Tiktiki	*Hemidactylus frenatus*	Gekkonidae
	Flat-tailed Gecko	Chapta-leji Tittiki	*Hemidactylus platyurus*	Gekkonidae
	Common garden Skink		*Mabuya carinata*	Sciuridae
	Many-lined Grass Skink	Anjon	*Mabuya multifasciata*	Scincidae
	Monocled Cobra	Gokhra Shap	*Naja kaouthia*	Elapidae
	Spectacled Cobra	Khoia Gokhra Shap	*Naja naja*	Elapidae
	King Cobra	Raj Gokhra	*Ophiophagus Hannah*	Elapidae
	Green Fan-throated Lizard	Nil-gola Girgiti	*Ptyctolaemus gularis*	Agamidae
	Spot-tailed Pit Viper	Viper Shap	*Trimeresurus erythrurus*	Viperidae
	Bengal Monitor	Gui Shap	*Varanus bengalensis*	Varanidae

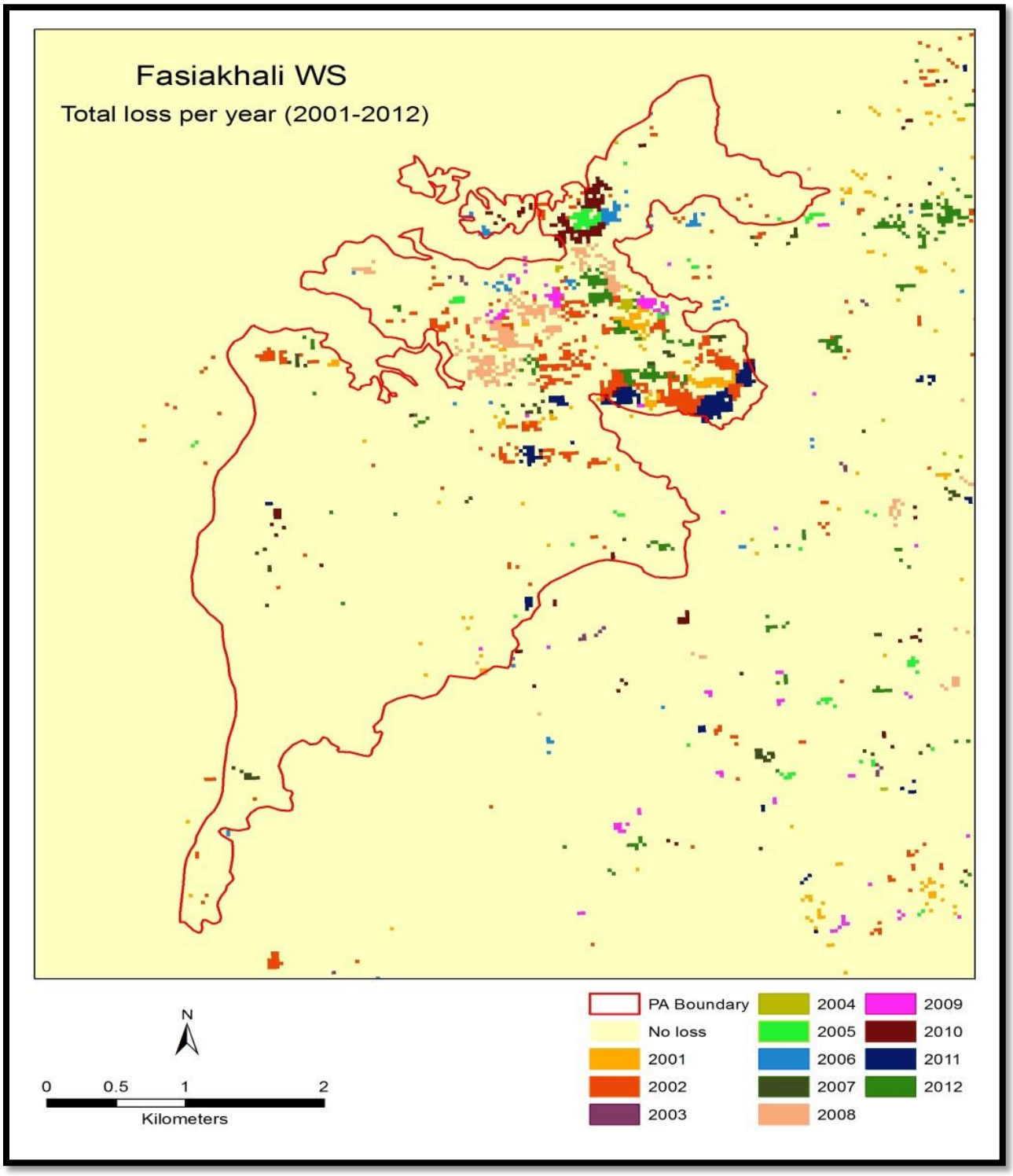
Annex 6: Climate Change Threat/challenges map at village landscape for FWS



Annex 7: Management intervention map to adapt to climate change planned by Fasiakhali CMC



Annex 8: Forest loss trend map in Fasiakhali Wildlife Sanctuary



Annex 9: Existing and Required manpower in the FWS

Range/ Beat	ACF		Office Assistant		RO/DRO		Foresters		Forest Guard		Forest Mali		Care taker		MLSS		Total	
	Exist	Additional proposed	Exist	Additional proposed	Exist	Additional proposed	Exist	Additional proposed	Exist	Additional proposed	Exist	Additional proposed	Exist	Additional proposed	Exist	Additional proposed	Exist	Additional proposed
Fasiakhali Range office	0	1	0	1	0	1	0		0	0	0	0	0	1	0	1	0	5
Fasiakhali (Beat Office)	**0**	**0**	**0**	**0**	**0**	**0**	**1**	0	**2**	2	**2**	1					**5**	3
Dulahazara (Beat Office)	**0**	**0**	**0**	**0**	**0**	**0**	**1**	0	**3**	1	**2**	1					**6**	2
Total	**0**	**1**	**0**	**1**	**0**	**1**	**2**	0	**5**	3	**4**	2	0	1	0	1	**11**	10

Annex 10: Input requirements and tentative ten year budget for Fasiakhali Wildlife Sanctuary management plan 2015-2025

Program	Activity	Unit	Quantity/year							Total Cost (000) Tk for 1st 5 Years	Y6-Y10		Cost (000) Tk for Y6-Y10	Grand Total	
			Y1	Y2	Y3	Y4	Y5	Qty Total	Unit Cost (000) Tk		Qty Total	Unit cost (000 Tk)		Qty Total	Cost (000) Tk
Habitat protection program	Updating maps	LS								500	LS		500	LS	1000
	Boundary demarcation (Pillars)	km	20	20				40		1600	40	LS	1000		2600
	Control of illicit felling , forest grazing, encroachment	LS								750		LS	1200	LS	1950
	CM council and CM committee meeting	LS								2550		LS	3200	LS	5750
	PF, VCF, CPG meetings	LS								2020		LS	2800	LS	4820
	Patrolling equipment (CPG) CPG member (42)	LS								525		LS	800	LS	1325
	Remuneration of CPG	LS								1032			2064	LS	3096
	Rewards for biodiversity protection efforts	LS								50			100	LS	150
	Resolving forest conflicts	LS								100		LS	150	LS	250
Core zone manage-ment	Enrichment planting	Ha	20	20	20	20	20	100	120	12000	100	180	18000	200	30000
	ANR	Ha	20	20	20	20	20	100	120	12000	100	180	18000	200	30000
	Habitat improvement Works	Ha	20	20	20	20	20	100	120	12000	100	180	18000	200	30000
	Habitat restoration works	Ha	10	10	10	10	10	50	120	6000	50	180	9000	100	9000
	Eviction of encroachers from CZ and Rehabilita-tion to other areas	LS								50000			50000		56000
Buffer zone	Enrichment plantation	Ha	20	20	20	20	20	100	120	12000	100	180	18000	200	68000

manage-ment	Participatory afforestation (seedlings)	No. (000)	5	5	5	5	5	25	0.08	2000	25	0.12	3000	50	15000
	Elephant corridor	LS								5000		LS	8000	LS	10000
	NTFP regeneration	Ha	10	10	10	10	10	50	120	6000	50	180	9000	100	14000
Landscape zone/ Community services and actions (considering PCVA)	Social forestry (seedlings)	No. (000)	10	10	10	10	10	50	.07	350	50	.09	450	100	6450
	Strip plantation	Km	4	4	4	4	4	20	0.05	1000	20	0.07	1400	40	1750
	Homestead plantation (seedling distribution)	No.						20	0.01	1000	20	0.02	2000	40	3000
	Climate resilient cultivation	LS						80	100	8000		LS	12000	LS	13000
	Elephant corridor involving stakeholders in forest protection	LS								2500		LS	3000		11000
	Installation of tube well	No.						25	30	750	20	45	900	45	3400
	Canal re-excavation	Km						2	500	1000	2	LS	800	2	1550
	Embankment construction	Km						5	2000	10000		LS	8000	5	9000
	Embankment repair	Km						9	100	900		LS	600	9	10600
	Pond Excavation							1	200	200		LS	200	1	1100
	Cyclone shelter	No.						2	30000	60000	M	LS	20000	2	20200
	Bamboo cultivation	ha						10	120	1200	20	180	3600	30	63600
Livelihood program	Selecting priority production technologies (reconnaissance surveys)	LS								70		LS	100		1300
	Identifying a list of feasible production Technologies	LS								30		LS	50		120
	Stakeholders' Consultations on the proposed production technologies	LS								25		LS	40		70

	Developing skills (and facilitating access to sources of credit) for alternative income generation (poultry, aquaculture, nursery, sewing)	LS								3000			4000		4025
Tourism and visitor manage-ment	Nature Interpretation Centre	No.						1	20000	20000	M	LS	5000	1	8000
	PA gate	No						1	10000	10000	M	LS	1000	1	21000
	Parking place develop-ment	LS						1	100	100	M	LS	100	1	10100
	Tourist market and cafeteria	No.						2	10000	20000	M	LS	10000	2	10100
	Watch Towers	No.						1	20000	20000	M	LS	5000	1	25000
	Student Hut / Dormitory	No.						1	10000	10000	M	LS	10000	1	30000
	Construction and maintenance of tourism spot	No.						10	300	3000		LS	1000	10	11000
	Nature trails construction and maintenance	LS						6	200	1200		LS	1000	6	4000
	1 lake development	LS						1	10000	10000	M	LS	5000	1	6200
	1 arboretum	ha	2	2	2	2	2	1	5000	5000	M	LS	5000	10	15000
	1 orchid	LS						1	5000	5000	M	LS	5000		10000
	Identifying suitable sites for Nature Camps	No.						2	5	10	2	8	16	4	5016
	Sign arrow/ boards	No.						20	30	600	M	LS	400	LS	410
	Toilets construction and maintenance	No.						4	200	800	M	LS	500	4	1100
	Resting Facility (gol garh)	No.						4	100	400	M	LS	300	1	1100
	Tube well for picnic spots and toilets	No.						4	200	800	4	250	1000	8	1400

	Trash cans	No.						10	1.5	15	10	2	20	20	820
	Identifying & training eco-guides	LS								500			800		815
	Preparing publicity Materials	LS								2000		LS	3000	LS	3500
	Film making (audiovisu-als) for NIC	No.							2000	2000			1000		3000
Training and research	Training assessment for participatory PA management	LS								500			600		2600
	Training of staffs and stakeholders on conservation	LS								10000			15000		15500
	Meeting and workshop	LS								500			800		10800
	Floral and faunal Inventories	No.	2	2	1			5	1000	5000			5000		5500
	Carbon inventory									2000			3000		8000
	Conservation research studies	LS								1000			1500		3500
	Ecological research	LS								1000			1500		2500
	Silvicultural research	LS								1000			1500		2500
Administra-tive staff	ACF (1)	m-m													As per na-tional pay scale
	RO (1)	m-m													
	Office assistant/ Computer operator (1)	m-m													
	Foresters (2)	m-m													
	FG (8)	m-m													
	Plantation Mali (6)	m-m													
	Care taker	m-m													
Facility Develop-	Renovation and Maintenance of Forest	No.						1		1000			1500		2500

ment Programs	rest house														
	Renovation and maintenance of Range officers' quarters	No.						1		1000			1500		2500
	Renovation and maintenance of Beat Officers' quarters	No.						2		1000			1500		2500
	Renovations and maintenance of FGs barrack	No.						2	1250	2500			3500		6000
	Construction and maintenance of ACF's Quarters	No.	1							10000	M	LS	2000		12000
	Double-cab pickups	No.	1					1	3000	3000	M	LS	1000		4000
	100 cc motorcycles	No.						2	150	300	M	LS	200	2	500
	Desktop Computer + laptop computer + Printer	No.	2+ 1+ 1					6	200	1200	6	300	1800	12	3000
	Field equipment (survey ins.+GPS +Binocular + Torches +fire protection)	LS								500			800		1300
	Digital camera	No.	2					2	500	1000	2		1500		2500
	Rifle	No	8					8	40	320			500		820
	CPG dress	No							5	500			800		1300
	CPG remuneration	LS								1008					1008
	PA Archive development	LS								1000			1500		2500
	Total									372905			322090		694995

Activities and Indicative Cost Estimate

The budget requirements for the implementation of the Management Plan for FWS are projected based on the information gathered from FD field offices and official documents.
This proposed schedule of activities and costs is based on the major input requirements identified in the Management Plan. It is intended as both a summary of the major inputs required during the five-year life of the Plan, and as a guide to further detailed costing by FD staff charged with its implementation. Costs shown are subject to revision during the Plan implementation period.

Annex 11: Number of access point in FWS

Issue	Ranking	Paths for entering forest	No. of people enter	From Where
Access to forests (People)				
	1	Kumari Ranga Jhuri	10	Rangajhuri
		2 No Balur Road	6	Kumarpara
		Ghonarpara road (Mosjhid road)	10	Ghonarpara
		School mat road	6	Hasherdighi
		Army Camp Road	20	Sariakhali camp
		Supply road	10	South Sariakhali
		Sirapahar	5	Sirapahar
		Notun Moshid Hargaja	10	Soirsha Kata
Sub Total		**8**	**77**	
Dulhazara Beat		Amtoli Road	30	Sogirshakata
		Oishodibagan road	15	Sogirshakata
		Akai road	20	Ring bong and Sogirshakata
		Bhuiyachara road	50	Dumkhali
		Konarrpara	25	Konapara
		Cha (Tea) Bagan Sathgarpara road	10	Sathgharpara
		Moulabikata road	35	Hardarnashi
		Solimmiyer Bagan road	15-20	Gulistanbazar, Hardarnashi Road
		Ideal School Road	5	Dumkhali
		Cantonment Road	15	Domkhali
	Sub total	10	205	
	Grand total	18	282	

Annex 12: Livestock grazing in FWS

Village	Cow	Buffalo	Goat
Gumunia	50	0	20
Bazar Beal	80	0	40
Uchitar Beal	60	0	30
Kulalpara	20	0	10
Ghonarpara	30	0	15
Sairakhali	10	0	5
Moggamarpara	7	0	5
Nonun Mosjhid path	20	0	5
Ring Bong	100	30	0
Domkhali	50	0	10
Cha Bagan	100	0	50
Total	527	30	190

Annex 13: Major NTFP species in FWS

Sl No	Name	Scientific Name	Use
01	Borta	*Artocarpus lecucha*	Fruit
02	Shimul tula	*Bombax ceiba*	Cotton
03	Mitinga	*Bambusa tulda*	Bamboo
04	Baria	*Bambusa vulgaris*	Bamboo
05	Muli	*Melocana Beccifera*	Bamboo
06	Jali bet	*Calamus guruba*	Bet
07	Korak bet	*Calamus latifolius*	Bet
08	Murta	*Schumannianthus dichotomus*	Pati pata
09	Bohera	*Terminelia bellirica*	Medicine
10	Haritaki	*Terminelia cebula*	Medicine
11	Dumur	*Ficus hispida*	Food ,Medicine
12	Amloki	*Phyllanthus emlica*	Medicine
13	Agar	*Aquilaria agallocha*	Perfume,Medicine
14	Sungrass	*Saccharum spontanium*	Thatch material
15	Kalichari Bash	*Gigantachia andamanica*	Fencing bamboo
16	Dhekia	*Diplazium polypodioides*	Vegitable
17	Alulata	*Dioscirea pentaphylla*	Food,Medicine
18	Gilalata	*Entada rhedii*	Medicine
19	Kalilata	*Derris trifoliata*	Food,Rope
20	Bees	*Apis dorsata*	Honey,Wax
21	Ful jharu	*Thysanolaena maxima*	Broom

Annex 14: List elephant corridors of Bangladesh identified by IUCN

Sl. No.	Name of Corridors	Connectivity	Corridor Location	
			Forest Division/Range/ Beat	District/ Upzila/Union
1	Ukhia- Sowankhali	Nikhongchari-Kutupalong- Gundum-Tumru- Azuhaya to Madhuchara- Bot toligona- Balukhali-Palongkhali- Sowankhali	Cox'sbazar South FD/Ukhia Range/ Ukhia Beat Survey	Cox'sbazar/ Ukhia/ Rajapalong
2	Tulabagan-Panerchara	Razarkul- Tulabagan to Panerchara to Himchari	Cox'sbazar South FD/ Panerchara Range/ Panerchara Beat	Cox'sbazar/ Ramu/ Dokkhin Mithachari
3	Nikhongchari-Tulabagan	Nikhongchari-Sonaichari- Razarkul to Tulabagan- Panerchara-Himchari	Cox'sbazar South FD/ Razarkul Range/ Razarkul Beat	Cox'sbazar/ Ramu/ Razarkul
4	Vomoriagona-Rajghat	Tulatoli- Panerchara-Vomoriagona to Rajghat- Khuntakhali	Cox'sbazar North FD/ Idgaon Range/ Vomoriagona Beat	Cox'sbazar/ Ramu/ Razarkul
5	Tulatoli- Idgar	Idgar- Lama to Tolatoli-Machuakhali- Kalirchara	Cox'sbazar North FD/ Idgaon Range/ Tulatoli Beat	Cox'sbazar/ Ramu/ Idgar
6	Khuntakhali-Medhakacchapia	Lama- Dulahazara-Bogachari- Khuntakhali-Medhakacchapia to Bahaltoli	Cox'sbazar North FD/ Fulchari Range/ Medhakacchapia Beat	Cox'sbazar/ Chakaria/ Khuntakhali
7	Fasiakhali-Chairakhali	Fasiakhali and Dulahazara to Chairakhali, Ringvong, Sagirsaha Kata	Cox'sbazar North FD/ Fasiakhali Range/ Fasiakhali Beat	Cox'sbazar/ Chakaria/ Fasiakhali
8	Fasiakhali- Manikpur	Fasiakhali- Dulahazara in South, Kumari- Lama in East and Manikpur-Kakara- Nolbila in North	Cox'sbazar/ Chakaria/ Fasiakhali	Cox'sbazar/ Chakaria/ Fasiakhali
9	Chunati- satgar	Satgar, Harbang, Baroitali, Daluchari, Dalu, Sarai, Tongkawati, Faitong to Chunati Wildlife Sanctuary (Chunati, Aziznagar, Harbang, Napura, Poichari, Chambal, Jaldi) Banshkhali Eco Park, Madarsha and	Chittagong Wildlife and Nature Conservation Division/ Chunati Range/ Chunati Beat	Cox'sbazar/ Chakaria/ Chittagong, Lohagara

		Kalipur Range		
10	Lalutia- Barduara	Lalutia- Dohazari-Dudpukuria- Dhopachari WS- Potiya to Barduara-Hangur- Tongkawaty-Dalu	Chittagong South FD/ Podua Range/ barduara Beat	Chittagong, satkania, Bajalia
11	Sukhbilash- Kodala	Srimai- Komolchari-Kurusia- Sukhbilas to Shilok, Kodala- Kaptai	Chittagong South Forest Division/ Khurusia Range/Sukhbilash Beat	Chittagong, Rangunia, Podua
12	Narischa- Kodala		Chittagong South Forest Division/ Rangunia Range/Narischa Beat	Chittagong, Rangunia, Podua