Secondary Data Collection for Pilot Protected Area: Teknaf Game Reserve

Task no.:
USAID Contract no.: 388-C-00-03-00050-00

Secondary Data Collection for Pilot Protected Area: Teknaf Game Reserve

Prepared for:
International Resources Group (IRG)

Prepared by:

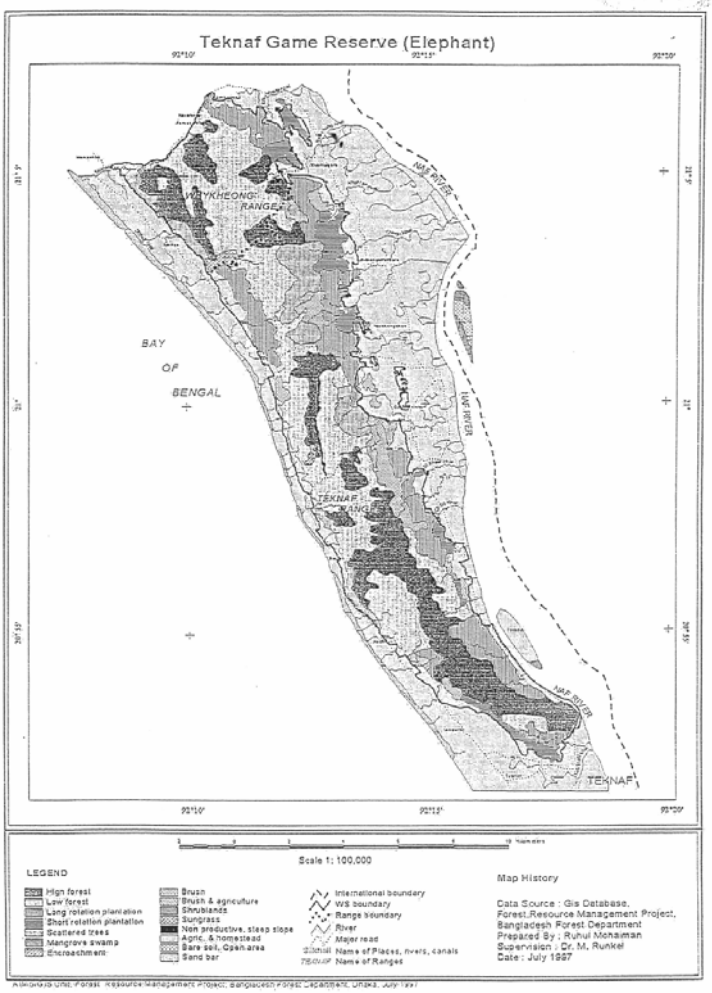
Abdul Bari
Utpal Dutta

Community Development Centre (CODEC)

January 2004

With partners: CODEC, NACOM & RDRS

Land use and land cover of at Teknaf Game Reserve



PREFACE

It is our great pleasure that we completed the task assigned by IRG to make a report on basic information on **Technaf Game Reserve**. The task was completed on the basis mostly on secondary data. It is our satisfaction that this task was completed due to the fact that **Mr. Abul Bari, Social, Community Forest and Plantation Management Specialist** gave us his valuable time to assist us as Consultant to CODEC to complete the task with care and efficiency. We are grateful to Mr. Bari.

Mr. Utpal Dutta was involved full time with Mr. Bari. Mr. Mahmud Hasan, Mr. Touhidul Hoque and Mr. Goutam Biswas of CODEC also assisted Mr. Bari to complete the task.

Our sincere gratitude and thanks to Mr. Abdul Motaleb; Chief Conservator of forest, Chittagong Circle and Mr. Abdul Mabud; Divisional Forest Officer, Coxs-Bazar South Division deserve our gratitude and thanks for their wholehearted cooperation to our Consultant Mr. Abdul Bari.

We sincerely believe that this report will be valuable documents for future implementation of any sorts of Projects in Technaf area.

All the best wishes.

Khursid Alam Ph.D.
Executive Director
CODEC
January 2004

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Acronyms

ACF	-	Assistant Conservator of Forest
ADB	-	Asian Development Bank
BBS	-	Bangladesh Bureau of Statistics
BCAS	-	Bangladesh Centre for Advanced Studies
BNH	-	Bangladesh National Herbarium
BWDB	-	Bangladesh Water Development Board
CF	-	Conservator of Forest
cft	-	Cubit feet (Volume of Timber)
cm	-	Centimeter
CITES and	-	Convention of International Trade in Endangered Species of Flora Fauna
dbh	-	Diameter at breast height (Measurement for size of trees)
DC	-	Deputy Commissioner
DFO	-	Divisional Forest Officer
FD	-	Forest Department
FAO	-	Food and Agriculture Organization
FRMP	-	Forest Resource Management Project
FSP	-	Forestry Sector Project
GoB	-	Government of Bangladesh
GR	-	Game Reserve
ha	-	Hectare (1 ha= about 2.5 acres)
INGO	-	International Non Government Organization
IUCN	-	International Union for the Conservation of Nature
MLSS	-	Menial Forest Department Laborers
mm	-	Millimeters
MoEF	-	Ministry of Environment and Forest
MP	-	Management Plan
NCS	-	National Conservation Strategy
NCSIP-1	-	National Conservation Strategy Implementation Project-1
NGO	-	Non-Government Organization
NORAD	-	Norwegian Agency for Development Cooperation
NP	-	National Park
PA	-	Protected Area
PAS	-	Protected Area System
PRA	-	Participatory Rural Appraisal
SPARSSO	-	Bangladesh Space Research and Remote Sensing Organization
spp	-	Species
TA	-	Technical Assistance
TK	-	Taka
WB	-	West Bengal
WS	-	Wildlife Sanctuary
WWF	-	World Wide Fund for Nature
MARC	-	Multidisciplinary Action Research Centre, A Project Supported by IUCN/ NORAD

Secondary Data on Teknaf Game Reserve

1. Location:

The northern end of Teknaf Game Reserve lies some 48 Kilometers south of Cox's Bazaar, between $20^0$52' – $21^0$09' North Latitude and $92^0$08' – $92^0$18' East Longitude (Rosario, 1997; Figures 1 and 2). The Reserve, which measurers roughly 28 Km from north south to 3-5 Km east west, lies in the district of Cox's Bazaar, in Teknaf Thana. It embraces 5 unions of Teknaf Thana, namely Baharchhara, Hnila, Sabrang, Teknaf and Whykong. There is no boundary demarcation or signs indicating that Teknaf GR is a protected area. Teknaf GR consists of the hilly range that forms the backbone of the narrow Teknaf Peninsula, located in Bangladesh's far southeastern corner, adjacent Myanmar. East of the GR area and the Peninsula lie the Naf River and estuary, which forms the border between the two countries Bangladesh & Myanmar. West of the Peninsula lies the Bay of Bengal.

2. Access:

The major road in the area connects Cox's Bazaar with Teknaf Township, which lies at the southern tip of the peninsula, some 82 Km to the south. The condition of the road is generally good, although narrow, and by vehicle the journey Cox's Bazaar - Teknaf takes about two hours. Small secondary roads connect villages with the major north-south artery, but there are no road connections that cross east west through the Reserve. All major towns in the region such as Whykong and Hnilla lie to the east of the Reserve along the Cox's Bazaar -Teknaf road. Regular flights connect Cox's Bazaar with Dhaka, taking about 40 minutes. A second major north-south road is currently being constructed along the western coast by the Bangladesh Army Corps of Engineers, and is scheduled to be completed by 2002. Parts of this 'Marine Drive' have already been completed, but at present the only passable route is along the beach at low tide by four wheel drive vehicles. The Forest Department (FD) has guesthouse in Teknaf (6 rooms) and Inani (3 rooms), which is located on the western coast, just north of Teknaf GR. The Tourism Department also has a large guesthouse just outside Teknaf. There is also a good guesthouse belonging to the R&H Department facing the Naf River.

3. History of establishment:

The Teknaf GR was established through Government Gazette Notification No. Xiii/For-65/83/770 dated 1st November,1983. This Game Reserve is the only one of this category in this country. It covers a comparatively large area of 11,615 ha purposely to preserve a habitat for a large diversity of wildlife. It is reported that it contains about 50% of all the mammals found in Bangladesh, which include the rare Malayan tree Shrew, 8 of the 10 primates found in the country including the Leopard, Golden Cat and Fishing Cat, Jungle Cat and Elephant.

4. Area:

The Game Reserve covers a total area of 11,615 ha. of Reserve Forest under 10 Blocks as follows:

Forest Blocks	Area (Acre/Ha.)
Raikheong Block No. 53	4,376/1,772
Shaplapur Block No. 54	2,071/ 838

Shilkhali Block No. 55	1,852/ 750
Madhyauilla Block No. 56	4,250/1,721
Dhakhin-Nilla Block No. 57	2,066/ 836
Mathabanga Block No. 58	2,110/ 854
Rajachara Block No. 59	3,340/1,352
Ledha Block No. 60	3,101/1,256
Dumdumia Block No. 61	2,548/1,032
Teknaf Block No. 62	2,974/1,204
Total	**28,688/11,615**

5. Boundary:

The Sanctuary is bounded on the North by the limits of the Raikheong and Shaplapur Forest Block No. 53 and 54, respectively; on the east by the Cox's Bazar – Teknaf Highway and the limits of Shilkhali Maddhyanilla, Dhakhin-Nilla, Mathabanga, Rajachara, Ledha, Dumdumia and Teknaf Forest Blocks on the south by the limits of Teknaf Forest Block and on the west by the limits of the aforementioned Forest Blocks, following a general South-North direction along the Cox's Bazar long beach. In the sixties forest boundaries were demarcated by survey on the ground under the "Forest settlement Survey & Demarcation Scheme" of the Government of the then East Pakistan & R.C.C. boundary pillars were fixed. Over the years the pillars have been damaged and removed by local people and now there is no boundary demarcation on the ground.

6. Legal Status and Special Regulatory provisions:

The Game Reserve was formally established inside Reserve Forest (RF) land through Gazette Notification No. xiii/For-65/83/770 dated 1st November 1983 in accordance with Article 23 of the Bangladesh Wildlife (Preservation, Amendment) Act of 1974 (Appendix 1.7). As per the provision of the Act, all the Wildlife (Plants and Animals) species found in the Game Reserve shall be protected and preserved. As such, no commercial forestry operation is allowed inside the Game Reserve.

7. Topography:

The Teknaf Game Reserve consists of the hilly Range that forms the backbone of the narrow Teknaf peninsula, located in the far southeastern corner of the country, adjacent Myanmar. East of the peninsula lies the Naf River and estuary, which form the border between Bangladesh and Myanmar. Parts of the range reach an attitude of 700 meters above sea level, and many of the hills are steep, rugged and precipitous. The GR occupies the middle part of the Teknaf Peninsula from Ukhia south to the thana town of Teknaf. It consists of gently sloping to rugged hills and cliffs running down the central part of the peninsula.

The topography is generally characterized by low mountains separated by broad valleys, making the landform extremely irregular. The hills abut directly on to the sea along the grater parts of its western boundary and cliffs have been formed due to washing of hillsides by the sea.

8. Physiography:

8.1 **Ecology:**

Geologically, the Teknaf Game Reserve area belongs to the Pliocene and Miocene epoch of the tertiary period. It encompasses three representative geological series – Surma Series, Tipam Series and Dupi Tila Series. The Surma Series is the oldest series in the area and belongs to the lower-middle Miocene epoch. It is sub-divided into four formations: Lower Middle, Upper Bhuban anf Bokabil. The hill ranges of the Teknaf Range from Monkhali down Teknaf belong to uppar Bhuban formation and are the oldest formation in the region. Rocks of this formation are exposed in the crests. Litho logically, the formation is represented by thick shale layers, with a rather broad, sandy horizon at the base and in the middle part. Sandstone are gray to yellow, fine grained to siltstones, compact porous, massive to bedded, at places layers of conglomerates are found. Shales are grey to dark grey, laminated to without lamination, and compact. The Tipam series belongs to the uppor Miocene. This is a younger formation and is also well developed in the Game Reserve. The Dupi Tila Sereis belongs to the Pliocene epoch. It occurs in the area along with two other older series – Surma and Tipam. Mostly sandstones with small amount of inter-related shale represent it. Sandstones are light grey, fine-grained, quartz at the base, to brown at the top. Inclusions of the quartz grains cemented by ferrous matrix sometimes occur at the base. The shales are light grey to bluish, at places variegated (Choudhury, 1969). The sediments are strongly erodible.

8.2 **Soils:**

The Soils developed on the unconsolidated and compacted rocks of Dupi Tila formations are usually moderately well to excessively drained, deep and probably the oldest ones in the area. They consist primarily of clay-to-clay loam on level grounds and from sandy loam to coarse sand on hilly land. The clayey and loams are highly fertile, and have been developed under forest and thickets, often having a thin layer of warm cast over the surface. Topsoil is dark grayish brown to dark brown; sandy loam to loam; moderately granular to crumbs; natural to strongly acidic when dry. Subsoil is yellowish brown to yellowish red; sandy loam to silty clay loam; moderate to strong blocky structure; strongly to very strongly acid. Some sandy soils contain a hard concretionary or indurate later tic layer at variable depth, giving it a red or yellowish tinge. Where blue shale's appears at the surface, there is little surface soil and trees do not grow well. Substratum is often weakly to strongly mottled gray, brown or red; and many contain some quartz tic gravels. In many places soils have been exposed due to the loss of vegetative cover and human interference, and the process of enhanced erosion is already severe at some place.

8.3 **Geomorphology, hydrology & erosion:**

***Geomorphology*:** The terrain of the Teknaf GR is exceedingly irregular and slopes are often precipitous. In some sections, the hills abut directly on to the sea beach along the western boundary. Deep gullies and narrow valleys are found in the area, drained by numerous streams that flow down to the Naf River towards East and Bay of Bengal to the West.. None of these channels are deep enough for navigation, and only a few are subjected to the influence of tidal water. Most of the streams are seasonal, discharging water during monsoon and drying up or flowing feebly during the dry season.

The discharge of the streams is generally clear and they serve as drinking water to the wild animals, as well as, for domestic use of the people living in and around the Reserve. The amount of discharge of the creeks could not be ascertained, and there are no records or past studies. Flow may be very heavy during monsoon periods, decreasing gradually after the rains are over, and often drying up completely or flowing very feebly during the dry season. This is partly due to the fact that the vegetation cover of the watersheds of these streams has been depleted and deteriorated, to a large extent. At places near the habitations/villages a pit is dug to accumulate water of these streams for domestic use, but also for livestock, irrigation, and horticultural areas. Local people are noticed to grow rice paddy, vegetables, betel leaf and watermelon on the sea beach, on either side of the beach drive, where saline water does not reach, particularly, during the dry season of the year.

Erosion is very common in areas devoid of tree cover, and may be very high in hilly areas where there is human interference and grazing. It is also very high along the steep western slopes facing the Bay of Bengal, where landslides are reported to occur from time to time, which has resulted in the formation of cliffs. The streams and cultivated areas are also subject to lot of erosion. The beds of some streams are lined with sandstone and shale fragments, indicating high flow rates and expulsion of suspended silt and sand during the rains, either into the Bay of Bengal or into the Naf River and estuary.

8.4 **Climate:**

Falling between latitudes $20^0$52' North and $21^0$09 North, the Teknaf Game Reserve is within the Tropics of Cancer. The Climate of the Game Reserve may be classified into three seasons, namely: spring, which covers the months of March to April, monsoon, which embraces the months of May to October and winter which encompasses the months of November to February. Spring season is generally characterized by dry and hot weather with very minimal rainfall. Monsoon season is characterized by monsoon winds, which bring moisture-laden low temperature centers. Most of the rains fall with thunderstorms during this period. And winter is marked by cooler weather with the least amount of precipitation.

The variation, amount and seasonality of rainfall, temperature, humidity, sunshine, winds and storms/cyclones during the various seasons are of primary importance or concern in relation to the proper management and development of the Game Reserve and its biodiversity.

8.5 **Rainfall:**

Rains are frequent and heavy during the monsoon season. A five-year data (1991-1996, Table 7.8) show that rains are comparatively heaviest in terms of depth during the months of May to October (monsoon period) with monthly depths ranging from 131.1 mm to 941.2 mm. Rain intensity in terms of duration and frequency is also most prominent during the monsoon season. Rain starts intensifying in the month of May and become more intense up to month of October, with June as the heaviest month and October as the lightest rainy month. Before and after the monsoon season, sporadic rains occur during the latter months of spring season (i.e., April) and early month of winter season (i.e., November). Evidently, the visitor use of the Game Reserve as well as management activities are highest during the winter and spring seasons, particularly during the months of November to April – a good 6 months for outdoor activities in the Game Reserve. A

comprehensive picture of the rainfall pattern in the Game Reserve is shown in Appendix viii.7.1.

Table 7.8 Rainfall data in the Teknaf Game Reserve (1991-1996)

Month	Average Monthly Rainfall (mm)	Ave. Number of Rainy Day
January	7.8	0.4
February	24.4	2.4
March	29.2	3.2
April	126.4	5.2
May	311.2	11.6
June	941.2	23.6
July	662.2	25.4
August	589.9	23.8
September	358.5	17.4
October	131.1	8.4
November	128.2	5.4
December	4.2	0.6
Annual	**3,314.3**	**127.4**

Source: Bangladesh Water Development Board, Surface Water Hydrology Division, and Station No. 307, Cox's Bazaar.

8.6 **Temperature:**

Temperature is another climatic factor effecting the growth and development of biological resources in the Game Reserve. Growth and Development of tropical terrestrial plants and animals are optimal at temperatures ranging from 20^0 to 34^0 C. The temperature in the Game Reserve may be classified into three and may also be associated with the three climatic seasons. Dry-hot temperature occurs during the spring season and ranges from 20.8^0C (average minimum) to 32.1^0 C (average maximum). Monthly temperature during spring can go down to as low as 19.0^0 C in the month of March and go up to as high as 32.6^0 C in the month of April, making April the hottest month of the year (Table 7.9). Humid-hot temperature occurs during the monsoon season and range from 24.50^0 C (average minimum) to 32.0^0 C (average maximum). Monthly temperature during monsoon can go down to as low as 23.2^0 C in the month of July as go up to as high 32.2^0 C in the month of May. Cold temperature occurs during winter season and range from 15.4^0 C (average minimum) to 30.0^0 C (average maximum). Monthly temperature during winter can go down to as low as 14.4^0 C in the month of January and go up to as high 30.5^0 C in the month of February. A comprehensive picture of the temperature pattern in the Game Reserve is shown in Appendix viii.7.2.

Table 7.9. Monthly temperature Data (-C) in the Teknaf Game Reserve (1990-1994) 1/

Month	Ave. Min.	Ave. Max.	Difference	Low./Highest.
January	15.4	27.0	11.6	14.4/28.4
February	17.6	28.8	11.2	16.9/30.2
March	20.8	30.4	9.6	19.0/32.3
April	24.0	32.1	8.1	22.7/32.6
Mary	25.4	32.0	6.6	24.3/32.2
June	25.4	30.1	4.7	25.0/31.2
July	25.3	29.7	4.4	25.0/30.4
August	24.8	30.1	5.3	23.2/30.3
September	25.3	30.8	5.5	25.1/31.3
October	24.5	31.4	6.9	24.0/31.6
November	20.6	30.0	9.4	18.3/30.5
December	16.6	27.7	11.1	15.8/28.7
Annual	22.3	30.1	7.8	21.1/30.8

1/ Source: Bangladesh Meteorological Department, Climate Division, Teknaf Station (Latitude 20-25A N & Longitude 92-18AE).

8.7 **Relative Humidity:**

Humidity in the Sanctuary may be classified into three and can be associated with the here climatic seasons. Low relative humidity occurs during the spring season and ranges from 27.6% (average minimum) to 98% (average maximum). Medium relative humidity is experienced during the winter season and ranges from 30.4% (average minimum) to 98.4% (average maximum). High relative humidity occurs during the monsoon season and ranges from 40.6% (average minimum) to 98.6% (average maximum). A more comprehensive profile of the relative humidity in the Game Reserve is shown in Annexure 4.

Table 7.10. Monthly Relative Humidity (%) in the Teknaf Game Reserve (1990-1994) 1/

Month	**Ave. Minimum**	**Ave. Max.**	**Ave. Monthly**	**Extreme Low/High**
January	33.4	97.6	75	24/99
February	30.4	98.2	73	15/100
March	30.8	97.4	76	13/98
April	27.6	98.0	78	-1/99
Mary	40.6	97.2	82	-1/98
June	63.4	98.4	90	56/100
July	69.4	98.6	91	63/100
August	70.2	98.6	89	68/100
September	64.8	97.6	87	58/98
October	46.6	98.0	84	45/99
November	36.0	98.0	77	30/99
December	31.0	97.4	72	21./98
Annual	54.4	97.9	81	39.9/98.2

1/ Source: Bangladesh Meteorological Department, Climate Division, Teknaf Station (Latitude 20-52A N & Longitude 92-18A E)

8.8 Sunshine:

Together with ground moisture, sunshine is a big factor in plant growth and Development through a process known as photosynthesis. Sunshine also generates that heat on the earth surface that is necessary for physiological processes in all living organisms. Very sunny period is experienced during the winter season and ranges from 24.6 to 30.6 sunny days per month with average daily duration of 7.2 to 9.0 hours. Sunny period occurs during the spring season and ranges from 24.8 to 27.8 sunny days per month with average daily duration of 8.2 to 8.8 hours. Less sunny or cloudy period happens during the monsoon period and ranges from 5.6 to 22.6 sunny days per month with average daily duration of 2.2 to 7.6 hours (Table 7.11). A comprehensive profile of sunshine in the Game Reserve is shown in Annexure 4.

Table: 7.11 Monthly Sunshine Data in the Teknaf Game Reserve

(1990-1994) 1/

Month	Ave. No. Of Sunny Days	Ave. No. of Sunny Hours/Sunny Day
January	30.6	9.0
February	25.6	8.2
March	27.8	8.2
April	24.8	8.8
Mary	19.4	7.6
June	6.4	3.3
July	5.6	2.2
August	7.2	5.0
September	12.6	5.1
October	22.6	7.3
November	24.6	7.2
December	30.4	8.7
Annual	237.6	6.8

1/ Source: Bangladesh Meteorological Department, Climate Division, Teknaf Station (Latitude 20-52A N & Longitude 92-18A E).

The recent climatological data of Teknaf Game Reserve has been collected for the years 2000, 2001 and 2002 presented in a Tabular Form below:

Month	2000				2001				2002			
	*Av. *Rf. (mm)	Av. *Temp. (c)		Av. *Hum. %	Av. Rf. (mm)	Av. Temp. (c)		Av. Hum. %	Av. Rf. (mm)	Av. Temp. (c)		Av. Hum. %
		Max.	Min.			Max.	Min.			Max.	Min.	
1	2	3	4	5	6	7	8	9	10	11	12	13
January	0.5	27.7	15.7	67	nil	27.5	14.1	64	13.0	27.3	16.7	72
February	1.0	29.1	17.6	61	26	30.3	17.4	67	nil	30.7	17.5	64
March	24.0	27.8	21.2	67	nil	33.6	21.4	64	14.333	33.1	20.8	69
April	10.125	33.1	24.1	75	6	34.7	25.1	72	15.333	32.6	23.9	78
May	26.045	31.8	23.8	81	20.473	32.7	23.9	77	24.7	32.8	25.0	82
June	31.148	31.8	25.0	87	51.285	30.5	23.8	91	24.2	32.2	25.6	87
July	55.25	31.2	24.6	87	33.807	30.1	24.5	89	37.5	31.2	25.7	91
August	38.083	30.3	25.1	86	15.481	32.1	25.8	84	24.37	31.7	25.5	86
September	16.85	30.6	25.0	86	19.59	32.4	23.5	87	13.869	32.7	25.4	83
October	28.142	32.4	24.6	81	16.5	32.6	25	86	41.25	32.1	24.4	80
November	8.0	31.8	20.4	75	9	30.3	21.9	81	35.0	30.4	21.7	82
December	nil	28.2	15.6	77	nil	28.1	16.6	73	nil	28.0	16.9	74

* Av.= Average; Rf.= Rainfall; Temp. = Temperature; Hum. = Humidity
Source: Bangladesh Meteorological department, Cox's Bazaar.
Courtesy: Mr. A. Mabud, DFO, Cox's Bazaar (South) Division.

8.9 **Winds, Storms and Cyclones:**

Wind is an important climatic factor in terms of aiding ecologic and physiograpic processes in the Game Reserve, particularly in natural seed/fruit dispersal for natural regeneration in the area. But wind when it is strong becomes very destructive and destroys infrastructures and hampers outdoor recreational activities in the game Reserve.

Based on record on storm frequency that affected Bangladesh from 1978 to 1996 supplied by the Bangladesh Meteorological Department. Storm Warning Center, Dhaka (Appendix IX), there has been as many as 9 severe storms that affected the Game Reserve which occurred mostly during the monsoon month of May and Winter month of November (Table 7.12).

Table 7.12 Frequency of Severe Storms that Affected the Teknaf Game Reserve 1/

Year	Jan-Mar.	April	May	Jun-Jul	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1978-96	0	1	4	1	0	0	0	3	0	9

1/ Source: Bangladesh Meteorological Department, Storm Warning Centre Dhaka (1997).

Specifically, the cyclonic storm that affected the Teknaf Game Reserve during the period 1978-1996 is summarized as follows:

Year	Date	Maximum Wind Speed [Km/hr.]
1983	05-09 November	136 km/hr.
1985	24-25 May	104 km/hr.
1991	25-29 April	225 km/hr.
1992	31 May –02 June	88 km/hr.
1994	20-21 May	77 km/hr.
1995	17-21 November	50 km/hr.
1996	29 April-03 May	274 km/hr.
	21-25 November	93 km/hr.
	17-0	

10. **Special Genetic and Ecological Features:**

The Game Reserve contains a unique assemblage of Garjan and evergreen trees and other secondary plant species naturally growing on a hilly to mountainous area. The Garjan and the evergreen trees regenerate profusely by seeds. Also, it harbors a diverse mammal, bird and reptile species of considerably high levels of population. As per report submitted by BCAS (1997), the Game Reserve contains about 50% of all the mammals found in Bangladesh that includes the rare Malayan tree shrew and 8 of the 10 primates found in the country. The Leopard, Golden Cat, Fishing Cat and Jungle Cat are all found in the area. The Population of Elephant in the Game Reserve is considered genetically viable. These are special assemblage of culturally valuable wildlife heritage of this country.

11. **Historical and Anthropological / Archaeological Attributes:**

As per record, the Game Reserve has a significant historical value most especially to the freedom fighters. The area, especially the western side, had been a battleground during World War II. Some tunnels of the defenders of the country still exist in the area. There is no record to indicate that the area contains archaeological or anthropologic significance.

12 **Social and Economic Setting (Regional and Local):**

12.1. **Land Use and Economic Activity:**

The Teknaf Game Reserve is situated within the Chittagong Civil Division. A good number of land uses and economic activities exist in the region. Foremost of these land uses include housing, commercial/industrial, government offices, agricultural, forestry and fishery.

Agricultural lands are found immediately around the Cities of Chittagong and Cox's Bazaar and the various town of the region. Agricultural activities are seasonal. The main sources of household income of the populace in these agricultural areas include own-agricultural land, sharecropping, livestock, household labour, small-scale business, fishing, handloom, non-mechanized transport, forestry, and others.

12.2. **Existing Land Uses and Economic Activities Inside the Game Reserve:**

A rugged mountainous area, there are few economic activities inside the Game Reserve which include small-scale cultivation of agricultural crops on the valleys, grazing,

gathering of firewood and bamboos, and tapping of Garjan Oil. This is not, however, legalized by the Forest Department. These activities have been a long-time problem in the proper management of the Game Reserve.

12.3 **Transportation and Communication Systems**:

The transport system in the region is quite efficient. It is comprised of air, railway and road transports. People traveling to Chittagong may take the airplane, train or any land transport vehicle. To reach Cox's Bazar City one may take the airplane, any land transport vehicle and a boat from Chittagong.

Situated in the mountainous areas south of Cox's Bazar City, along the western side of the Cox's Bazar -Teknaf Highway, the Game Reserve is accessible by land transport throughout the year. There is no service road within the Game Reserve and one has to walk to penetrate deep into the area.

12.4 **Population Centers**:

The Thanas of Teknaf and Ukhia are the most important population centers that must be given more attention and consideration in the conservation management of the Game Reserve, particularly in the conduct of information and education, campaign for the proper conservation of the Game Reserve. These Thanas have a combined population of 274,071 people (1991 Census) that are directly affected by the Game Reserve. It is expected that most of the local people entering the Game Reserve come from these Thanas.

12.5 **Population Trends of Population Centers**:

This reflects the sex and age and profile of the population centers around the Game Reserve. It appears that there are more males (52%) than females (48%). The Children (5-9 yrs) (19%) outnumber the young (10-17 yrs) (12%) and the adults (18 + yrs) (69%) outnumber both the children and the young ones. This is a viable situation in terms of labor source of the Game Reserve's Development Projects.

12.6 **Literacy Status:**

Literacy in terms of percentage of total population and level of education of the People residing around the Sanctuary is a big factor to account in relation to the management of the forest resources and the people themselves. As experienced, the transfer of knowledge and information beneficial or supportive of the Game Reserve project is better when the level of capability of people to receive and understand information is high. Along this line, it is unfortunate that the percentage of literacy (16.7%) and level (primary, class 1-5 and secondary, class 5-10) of education are low.

12.7 **Employment Status:**

Around the Game Reserve, there is no visible major employer. There are a few small-time or seasonal employers in the area. These are the owners of agricultural land and fishing boats who employ farm and fishing laborers, respectively, and household

laborers. Evidently, there is not enough source of employment in the area. To augment their household income, most of the people do small-scale farming, cattle raising, fishing, rickshaw plying, bullock cart plying and cart pushing. Those who have not any livelihood activity migrate to Cox's Bazaar City, Chittagong City, and even in Dhaka City.

[5] *During the PRA conducted by NCSIP-1, 1998 it is found that there were 26594 households at Teknaf in 1998. The data were based on a census carried out at Teknaf in 1998. The BBS Office, Teknaf, provided this information. According to the Census report published by BBS in 1996 the No. of total households is 23675.*

(Ref: Biodiversity Management Plan, NCSIP- I, MOEF, GOB in cooperation with IUCN, Feb. 2001)

15.2 **Population:**

The Teknaf peninsula has resident population of approximately 60,000 with a population density of more than 1000 per km^2, which is higher than average of Bangladesh (Hughes 1993). According to BBS (1996), total population of Teknaf Thana is 152,557 (Census: 1991) while the number of rural people is 125,651, among which 64,530 are males and 61,121 are females. There are 143 villages[6] in Teknaf, and the number of households of these villages' totals 19,241 (Table 8). The majority of the people are Muslims (121,781), followed by Buddhists (2,625), Hindus (1,119), Others (122) and Christian (5). The number of tribal people in the area is 3,642.

According to (1997), 97.3% of population at Teknaf is Bengali, 2.6% Santal and 0.1% is Burmese. Observations and PRAs during the fieldwork revealed that this is not consistent throughout the area, and that there are local differences. More than 70% of inhabitants of the village named Naitongpara are Burmese Muslims (known as Rohingya). In this village, The Bangladesh's have erected small hut and have rented them out of the Rohingya, who have migrated as refugees from Myanmar. This village is known as "Rohingya Para". There is about 25-30, Raikhan (tribal) household at Teknaf as well. The average household size is 6.47 and average age of household head is 41.68. About 32.72% of the population is under 10 years of age (BCAS, 1997).

Table 8. <u>Demographic characteristics of Teknaf</u>

Demographic Characteristics	Numbers
Total Population	152,557
Total Urban Population	26,906
Total Rural Population	125,651
Total Male Population	79,037
Total Female Population	73,520

(Source: BBS Report, 1996)

15.3 Education:

The educational situation of Teknaf is characteristic of the more general situation existing in the area, namely a very high rate of illiteracy. The most common level of education attained by the people is primary education (Table 9). Some 55% of the people in the area are illiterate while 9.20% went to school and studied up to primary level. 3.20% have completed secondary education, while 1.60% have higher secondary (BCAS, 1997:24). The new types of educational institutions at Teknaf are indicated in Table 10.

Table 9.Educational Status of Family Members above 7 Years of Age

Education	Male (N=1884)	Female (N=1702)
Illiterate	34.18	46.77
Can read only	18.20	18.16
Primary Education	27.81	23.15
S.S.C.	13.53	8.23
H.S.C.	2.49	1.82
H.S.C. above	3.76	1.88

(Source: Adapted from BCAS, 1997:24)

Table 10. Number and Types of Educational Institutes at Teknaf

No.	Educational Institutes (type)	Government	Non-Government
1	Primary School	34	15
2	High School	4	-
3	Junior High School	5	-
4	College	1	-
5	Junior Madrasa	17	-
6	Senior Madrasa	2	-

15.4 **Income:**

Most of the persons in the Teknaf peninsula are poor to very poor. Almost 70% of the households have a total income in the range of Tk. 15,000-45,000 per year, which is equivalent to about USD 288-865 per household, or USD 50 to USD 150 per capita (BCAS, 1997;Table 11) Most of these are farmers, fisher folk, daily laborers or rickshaw pullers (Table 12)

Table 11. Annual Income of the Household Heads

Income Group (In Taka)	Percentage (%)
6001-15000	7.20
15001-25000	33.00
25001-35000	25.70
35001-45000	11.10
45001-55000	7.90
55001-65000	4.50
65001-75000	2.60
75000+	8.10
75000-85000	2.20
85001-95000	0.70
95001-105000	1.00
105001-115000	1.30
115001-125000	0.30
125001 or more	2.60
Total	100.00
Mean	37.602
Per capita income (Tk.)	5811.0

(Source: Adapted from BCAS, 1997:29)

Table 12.
Annual Income and Primary Occupation of Household Heads

Income Group (Tk.)	Farming (N=294)	Daily Lab our (N=193)	Business (N=86)	Service (N=37)	Rikshaw Puller (N=12)	Salt Producer (N=9)	Fishing (N=13)	Fprest Resource Coll. (N=10)	Others (N=14)
6001-15000	6.5	9.8	3.5	-	-	-	4.2	-	25.0
15001-25000	27.6	52.8	18.6	1305	16.7	-	37.5	31.6	25.0
25001-35000	27.6	24.9	19.8	1602	33.3	-	37.5	57.9	18.8
35001-45000	12.6	5.7	12.8	21.7	25.0	75.0	8.3	-	6.3
45001-55000	10.9	2.1	9.3	10.8	16.7	-	4.2	10.5	6.3
55001-65000	5.1	2.1	4.7	13.5	8.3	-	-	-	12.5
65001-75000	3.7	1.0	1.2	2.7	-	-	-	-	6.3
75001-85000	1.0	1.0	7.0	8.1	-	25.0	-	-	-
85001-95000	1.0	-	2.3	-	-	-	-	-	-
95001-105000	7	-	5.8	-	-	-	-	-	-
105001-115000	1.4	.5	4.7	-	-	-	-	-	-
115001-125000	-	-	1.2	2.7	-	-	-	-	-
125000+	2.0	-	9.3	10.8	-	-	-	-	-
Total	100	100	100	100	100	100	100	100	100
Mean	37895	25698	60550	59195	26718				

(Source: Adapted from BCAS, 1997:32)

15.5 **Land Tenure and Status:**

According to local BBS Teknaf, two-third of all farms are less than one hectare (2.5 acre) in size (table 13), and almost one third almost one third are less than 0.2 hectare. The small size of these holdings undoubtedly contributes to the fact that the majority of farming households can be considered poor to very poor (Table 12).

Table 13.patterns of agricultural land ownership

Area of land wondered (in acres)	Households (%)
0.0-0.49	31.28
0.5-0.99	12.46
1.00-1.49	9.50
1.50-2.49	13.88
2.50-7.49	25.99
7.50 and above	6.56
Mean = 1.23 acres	

Table 14.Types and number of farmer households

Large Farmer Households	Middle Farmer Households	Small Farmer Households	Agricultural Landless Farmer Households	Landless Farmer Households
640(3.8 %)	2534(15.0%)	6577(39.0 %)	7045(41.7)	83 (0.5 %)

15.6 **Settlement/Land Encroachment:**

Settlement is done by encroaching on the flat and gentle slopes of Teknaf from the main roadside along the beach and from the Whykong-Saplapur Road on the north side of the reserve. Settlement of people is notoced at a few places along the side of the beach drive, around Jahajpura near Silkhali Forest Beat. Office records of DFO Cox's bazaar (South) shows the number of encroachers to be 2,367. While personally contacted with the DFO Cox's Bazaar (South), Mr. Abdul Mabud stated that he has the impression that the actual number of encroachers is much more. With the increase of population, clearing of land for cultivation and encroachment inside the forest areas also increased. The situation went out of control with the influx of Rohingya (Burmese) Refugees from adjoining Arakan province of Myanmar and establishes settlements in the forest since December 1991. In 1992 the number of these Rohingya rose up to 2,64,116 (source: Noyapara Rohingya Camp, Teknaf). It is worthwhile to mention here that there was an earlier influx in 1978 but the problem was solved politically and most of the Refugees were repatriated. Camp construction damaged forest land and huge quantity of forest produce (BCAS, 1997). The Refugees consumed about 1,30,000 cu.m. of fuel wood and timber by August, 1992 equivalent to appr. 1,625ha. of productive forest.

By 1993, about 2,33,000 Rohingyas had been resettled in Myanmar and some 30,000 remained in Cox's Bazaar most of them in Teknaf. Many of them married Bangladeshi women and living in this tract permanently.

Forest villagers who were originally recruited by FD as plantation labour and given land for house construction and paddy cultivation increased in number and grabbed more land.

One category of encroachers is those who have lost their houses and/or land due to construction of the Marine Drive Road. Some of them have built houses atop the hills and destroying forest downwards.

15.7. **Infrastructure:**

The road network in the area is fairly limited. The main road connecting Teknaf – Hnilla Whykong with Cox's Bazar is paved and good quality, but it is very narrow and rather dangerous, with sloping shoulders. Apart from this main road there are few roads in the area, and the main one are all on the eastern side of the Teknaf range, linking the Teknaf – Cox's Bazar road with smaller villages. Near Inani there is one road running east west across the peninsula. The Bangladesh Army corps of Engineers is constructing a road along the west coast, from Cox's Bazar down to Teknaf. Sections of this have been completed, and the entire "marine drive" is scheduled to be ready by 2002. Increased access is likely to contribute to an ever-greater rate of resource depletion in the areas.

Only 2.9% of all households in Teknaf Thana have electricity, which is low compared to national standards, and just 10% have sanitary latrines. Regarding drinking water, 56% have tube well water, under 0.5% have access to tap water, while 27% are dependent on wells for drinking water supplies.

15.8**. Land use & Economic Activities:**

The Teknaf Game Reserve encompasses a rugged hilly terrain. Though, once the area was covers with primary forest; much of the area is now denuded and bared, covered with only brushwoods. The land use pattern within the Teknaf GR is very wide and is reflected in Table 15. Theses are forestry, agriculture, fisheries, livestock, trade and commerce and housing, with the largest categories being forestry (42% of land area) and agriculture (46.5%). Agricultural activities are highly seasonal. The main source of income are cultivating is own land, share cropping, livestock, small-scale cultivation of agriculture crops in valley, betel leaf farming, livestock grazing; collecting fuel wood, bamboo, stake, popes, yams and trapping of Garjan oil. Some are engaged in illegal harvesting of timber. Collection of fuel wood, bamboo and stakes is an age old practice allowed against issuance of permits for the collection of this minor forest produce, as these are termed, have been stopped after declaration of the Game reserve.

Other economic activities around are shrimp and fish farming, and shrimp hatcheries, poultry farming, agricultural crop and vegetable production, horticulture, saltpan industry, brickfield industry, road transport business and other trade. It appeared that brickfields are fully depended on wood, which is a threat for forest.

Table 15. Land use in Teknaf

Land use categories	**Area (ha)**	**Percentage**
Forest Area	19,477	42.1
River Area	220	0.4
Cultivated Area	21,517	46.5
Permanent Crop Area	2,061	4.5
TOTAL	46,268	100.0

Source: BBS, Teknaf

15.9 **Type of Economic Activities:**

According to BCAS (1997), the primary occupation of the people living in Teknaf region is agriculture (Table16). PRAs, however, reveal that agriculture is not the primary occupation, since major parts of croplands yield only one crop a year, i.e. mono-cropping farmland. This is due to a lack of opportunities and resources for irrigation, which would otherwise allow a second crop. According to the census of 1998,[1] 63.46% of all families depend on agriculture for their livelihood. Of them, 4% are large farmers while 15% belong to the middle group. Beside, 39% are marginal farmers and 42% are landless farmers. They are although engaged in farming yet they cannot depend on farming alone for their livelihood around the year. Besides occasional farming, they therefore carry out small-scale vending, daily labor in the salt field/ sand fields, shrimp fry catching or they simply remain without any work. According to our PRA respondents 2% farmer own more than 7 acres of land, 25%-30% own 2 acres while 70%-80% farmer are landless. About 10% are timber traders, 5% are petty traders, 1% are service holders, 2% are fish trader, 5% are permanent fisherman while the rest are occasional fishermen and/ or laborers. From the PRAs it is clear that for the majority of households, a large amount of family income comes from forest resource.

[1] A small-scale census was carried out at Teknaf in 1998, data obtained from the BBS, Teknaf Office.

When the jobless condition becomes acute in the month of Bhadra – Kartik (mid-September to mid November) some of them (20%) migrate to the other areas for three to four months. A good number of the rest go to other places in search of work for 2-3days a week. Agricultural laborers also remain engaged in farming for six months a year and rest they engage themselves likewise. During their six months in farming they extract bamboo and wood from the forest for fuel, engage in house repairing and tending betel vine nurseries. When their total yearly family income is considered, it is evident that the majority of them earn more from the forest than from any other sources. This is bit contrary to the report of BCAS (1997), which indicated that one fifth of their family income come from the forest and only 2.75 extracted forest resources as their primary occupation. If it is considered in terms of yearly working hours, they spend more hours in forest. From this point of View it appears that although they are engaged in various income generating activities like farming, caching, shrimp fries, fishing, working in the salt field or lifting sand yet forest is their main source of earning. Most of house who are termed as "Doing nothing" in the BCAS report are actually engaged in extraction of the forest resource.

Table 16. Primary occupation of Households (N=696)

Occupation	**Percentage**
Farming (headed by Male)	42.20
Daily wage labor	27.70
Farming (Headed by Female)	1.60
Business	12.40
Service	5.30
Rickshaw puller	1.70
Salt producer	-
Extracting forest resource	2.70
Fishing	3.40
Others	2.30
Total	100

Source: Adapted from BCAS, 1997

16. **Economic Importance of Forest produce**:

In the Teknaf area, landless agricultural labourers rarely find work every day during their six months working period, and their working days remain the maximum level of about 20 days a month. During lull in farming activities, and when opportunities in other sectors are lacking, local persons resort to extraction of forest produce, extracting fuel wood and bamboo from the forest, which is then sold in the local market. Respondents informed that they usually sell this produce at twice a week. Women and children of such families extract forest resources for selling purpose to meet their basic necessities. In general, when other income generating areas become uncertain, the forest provides them with some assured earnings, with which they can safeguard their livelihood. Surprisingly, when there total yearly family income is considered, it is evident that majority of them earn more from the forest than from any other single source.

Timber smugglers utilize wage labourers for illegal felling and smuggling timber from the forest. Besides scattered felling, it is also done in a large-scale and organized way. The

timber traders and smugglers send a group of woodcutters, at times consisting of up to 100 individuals, far into the forested hills. Each labourer is paid at the rate of Tk. 100 per day. The labourers spend the whole day to reach deep in the forest. They work at night, under the light of kerosene torches. They size the logs in predefined measurements, and later they are sawn into planks. The next day they bring these logs to the areas of the hill from where descending can be easier. At nightfall these are carried by pickups or trucks.

17. **Threats to Teknaf GR:**

- Continued unsustainable harvesting of most forest resources, including timber, fuel wood and bamboo fro Reserve, which has already lead to the disappearance of all natural forest. Local communities, organized illegal loggers and Rohingya refugees, are carrying out extraction without any effective control by Forest Department.
- Continued pressures (e.g. fuel wood collecting) on secondary scrub is preventing regeneration of natural forests.
- Repeated burning, collecting of firewood and clearing of poles in undestroyed vegetation is preventing regeneration of the few remnant natural forests (e.g. at Silkhali).
- Heavy and illegal use of fuel wood by adjacent brickfields.
- Hunting of wildlife, especially sambar deer and barking deer, but also elephant (for ivory), is leading to a depletion of these species.
- Widespread habitat destruction is leading to a loss of forest dwelling wildlife species.
- Encroachment by agriculture, and conversion of forest (i.e. to betel leaf plantations) is further eroding the possibilities for the forest generation.
- Grazing by cattle, buffalo, goats and sheep, which eliminated seedlings and prevents forest generation.
- Lack of understanding of conservation issues, wildlife protection and management of protected areas by the Forest Department.
- Forest Department has actively introduced exotic tree species is most of its plantations in the GR wrong management practices.

18. **Sanctuary Management Plans (History of Management Planning at Teknaf Game Reserve)**:

During the fist phase of NCSIP-1-from March 1996-October 1997, a series of Studies were carried out throughout the country, including the forests south of Chittagong. Four national Study Teams implemented these: the Bangladesh Centre for Advanced Studies (BCAS) Bangladesh Space Research and Remote Sensing Organization (SPARRSO), Bangladesh National Herbarium (BNH) and the Department of Zoology, University of Dhaka (DoZ).

These studies culminated in a series of reports on socio-economics (BCAS, 1997), plant resources (BNH, 1997), fauna (DoZ, 1997) and a series of 1:20,000 scale land cover/land use maps (SPARRSO, 1997).

Under the World Bank- aided Forest Resources Management Project (FRMP) of the Forest Department, a management plan was drafted for Teknaf Game Reserve in 1997(Rosario, 1997) While this document a significant amount of background material relevant to management of the Reserve, it has a number of very significant shortcomings.

It was drafted in relative isolation, without proper consultation and active involvement of relevant stakeholders. Notably, the Forest Department has no ownership of the plan, it has never been translated, and is unknown to all Reserve staff based at Teknaf GR. The FRMP management plan does not identify threats, nor does it priorities actions to counter these. Although drafted in 1997, when degradation had undoubtedly already progressed significantly, the document falls far short of signaling the very significant problems facing the Reserve. Notably, the FRMP document reports on habitat Quality (Rosario, 1997,2.7.2.p.135):

"The remaining natural forest habitat found on the hilly and mountainous section of the Game Reserve is generally preserved for the folivorous and frugivorous arboreal and hooved animals in the area. The Forest guards generally control cutting of timber. But, unfortunately, the gathering of forest products such as fuel wood, tapping of Garjan oil, and others by the people residing inside and around the Game Reserve and more so the clearing of areas of the cultivation of agricultural crops have been adversely affecting the quality of the wildlife habitats in the area."

The FRMP plan does not provide a proper evaluation of the areas, its values, and the main issues.

A Biodiversity Management Plan was developed in January-February 2001 by a NCSIP-1 team consisting 0f Dr.Jahangir Haider Chowdhury (Forester), Dr. Sultana Mustafa Khanum (Anthropologist), M. Abdul Wahab (Wildlife Biologist), A. Jamir (Economist) and Wim Giesen (Biodiversity Expert). (Biodiversity Management Plan for South Chittagong Forest Areas including Chunati with special emphasis on management of the Teknaf Game Reserve. National Conservation Strategy (NCS) implementation Project I, MOEF, GOB and IUCN, Feb. 2001).

19**. Management:**

Teknaf GR is managed by Cox's Bazaar (South) Forest Division, which has a Range Office in Teknaf Township and one in Whykong, responsible for day-to-day management of Reserve. The Reserve is divided into nine "beats", and in all about 40 Forest Department staff are responsible for the area. This includes an Assistant Conservator of Forest (ACF), a Rang Officer and two MLSS based at the Teknaf Range Office. Although management plans have been prepared for the Reserve (see 1.2), none is being implemented by the FD staff based at Teknaf GR, which manage the area as any other forest reserve. No specific measures are taken for wildlife conservation and there is no wildlife management plan. The Forest Management Plan for 1991-1992 to 2000-2001 (Choudhury, 1993) only mentions:

"These statutory areas have been set aside for preservation of wildlife, biodiversity and ecology of the areas so specified. The Range and Beat staff will ensure the implementation of the Wildlife Amendment (Preservation) Act 1974 to the full extent for the protection of wildlife and habitat."

Unfortunately, the Act 1974 is not specific when treating Game Reserves. None of the Reserves Staff have received training in conservation or wildlife management. The Teknaf GR has not yet been handed over to the newly created wildlife and nature Conservation Division, Chittagong.

20. **Plantation/production forestry of FD:**

Forest in the GR area used to be managed under the clear felling system by laying out annual coupes as per prescription of approved Management Plans and plantations used to be raised artificially with species including many exotics. Forest villagers used to take a major part in planting activity. For maintenance hired labourers used to be engaged. Timber used to be marked by FD and sold standing in open auction. Currently this practice has been stopped and no felling is done in the RF due to Governmental ban. Plantations used to be raised under normal revenue budget and development projects. Under the FSP 56.0 ha. of enrichment planting has been done in blank areas of the Sanctuary and there is a target for raising 150 ha. during the next fiscal years. Only indigenous species are used in these plantings to meet local needs.

21. **Exploitation of Resources**:

Currently there is no legal exploitation of resources from the GR. Earlier the FD had regular exploitation by laying out annual clear felling coupes and regeneration by artificial planting which has been stopped due to the moratorium imposed by the Government. Felling of trees from the Reserve forests has been banned. FD used to issue permits for collection of fuel wood, poles and bamboos, which has also been stopped on declaration of the WL Sanctuary.

But illegal cutting of timbers, poles, firewood, bamboos and thatch by the local people and sometimes organized by dishonest traders is going on unabated.

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Annexure 1
List of Flora In The Teknaf Game Reserve 1/

FAMILY NAME	SCIENTIFIC NAME	ENGLISH/COMMON NAME
TREES		
Anacardiaceae	Lannea coromandelica	Bhadi/Jiulbhadi
Anacardiaceae	Mangefira sylvatiya	Uriam
Bombacacae	Heterophragma adenophyllum	
Boragiaceae	Bombax ceiba	
Borginaceae	Cordia muxa	
Buraseracae	Bursera serrata	
Combretaceae	Anogeissus acunminata	
	Terminalie Chebula	Haritaki
Dilleniaceae	Dillenia indica	
	Dillenia pentasyna	Hargaza
Dipterocarpacea	Dipterocarpus turbinatus	Baittya/Garjan
	Hopea odorata	Telsur/Tersol
Elaeocarpaceae	Elaeocarpus rebustes	
Euphorbiaceae	bridelia retusa	
	Glochidion lanceolarium	
	Glochidion multiloculare	
	Macaranga denticulate	
	Phyllanthus acidus	
	Phyllantus reticulates	
	Sapium baccatum	
	Trewia nudiflora	pitali
Fagaceae	Castanopsis tribuliodes	Batana/Batna
	Quercus spicata	
Lauraceae	Litsea sebifera	
Leguminosae	Albizia chinensis	Chakua/Chakkua-korai
	Alibizia odoratissimums	Tetura koroi
	Albizia procera	koroi
	Cassia fistula	Shourala/Sonalu
Lythraceae	Lagerstroemia speciosa	Jarul/kanta Jarul
Meliaceae	Aphanamixis polistachya	pitraj
Moraceae	Artocarpus chaplasha	Cham/Chapalish
	Artocarpus chaplasha	
	Artocarpus lacuaha	
	Ficus heterophlla	
	Ficus microcarpa	
	Ficus hispada	
	Ficus microcarpa	Jir
	Streblus asper	
Myrsinaceae	Mesea rementacea	
Myrtaceae	Syzygium formosanum	
	Syzygium grande	Dhakijam
Rhamnaceae	Zizyphus oenoplia	
	Anthocepalus chinensis	
	Randia dumetorum	
Rutaceae	Zanthoxylum rhatsa	
Sterculiaceae	pterospermum acerifolium	kanak-cuampa/Moos
	Pterospermnm semisaggittatum	
Tiliaceae	Grewia laevigata	
	Grewia microcos	
	Microcos paniculata	
Uimaceae	Trema orienatils	
Verbenaceae	Vitex peduncularis	Arsol/Awal/Goda/Hornia
	Actinodaphne angustifolia	Madanmasta
	Chickrasia velutina	korkoizza pitra
Laurceae	cinnamomum cecidodaphre	kasturi/Tejbohal
	Erythrina indiaca	palita Mader
Lauraceae	Erytrina spinosa	kata Madar

FAMILY NAME	SCIENTIFIC NAME	ENGLISH/COMMON NAME
Flacourtiaceae	Flacourtia cataphracta	
	Holigrana caustica	Barela
Guttiferae	Mesua ferrea	Nageswar/Nagkesar
Sapotaceae	Myristica longfolia	
Sapotaceae	Palaquim Polyanthum	Dudya/Tali
Anacardiaceae	Spondias dulcis	
Myrtaceae	Syzygum claviflorum	
SHRUBS		
Apocynaceae	Tebernaemontana recurva	
Leguminosae	Mimosa pudica	
Malvaceae	Hiviscus tiliaceus	Bhola
Melastomataceae	Melastoma Malabathrica	
Rubiaceae	Mitragyne parviflora	
	Mussaenda glabrata	
	Pavettaindia	
Rutaceae	Glycosmis arbarea	
Sapindaceae	Aphania danura	
Verbenaceae	Clerodendrum inerme	Sitka/Sitrki
	Clerodendrum nerifolium	
	Clerodendrum infortunatum	
PALM (ERECT&CLIMBING)		
Plamae	Caryota urens	
CLIMBERS		
Acanthaceae	Thunbergia grandiflora	Nillata
Apocynaceae	Ichnocarpus frutescens	
Compositae	Mikanika cordatd	
Convolvulaceae	Paedria foetida	
Discoreaceae	Discorea bulbifera	
	Discorea glabra	
Leguminosae	Derris seandeas	
	Entada rheedie	
	Mucuna pruriens	
Liliaceae	Smilax macrophylla	
Piperaceae	Piper betel	Pan,Tambuli
Vitaceae	Vitis oxyphylla	
Discoraceae	Dioscorea oppositifolia	
Compositae	Eupatorium odoratum	
Euporbiaceae	Saipum insigne	
Liliaceae	Smilax aspera	
HERBS		
Acanthaceae	Lepidagathis hyaline	
Anacardiaceae	Swintonia floribunda	Am-Chundal/Civit
Aracere	Alicasia indica	
	Colocasia rymphaefolia	
Compositae	Ageratum conyzoides	
	Spilanthes acmella	
Cyperaceae	Cyperus iria	
Leguminosae	Cajanus cajan	
	Cassia tora	
	Tephrosia purpurea	
Liliaceae	Curculigo recurvata	
Musaceae	Musa rosacea	
Rubiaceae	Borreia artularis	
Zingiberaceae	Alpinia galanga	
	Alipinia malacensis	
	Zingiber purpureum	
Orchidaceae	Cymbidium aloifolium	
	Pholidota pallida	
GRASS		
Poaceae	Melocanna baccifera	

Thysannolaena
Gleichenia pectinata

Annexure 2

List of Fanua In The Teknaf Game Reserve 1/

FAMILY NAME	SCIENTIFIC NAME	ENGLISH/COMMON NAME
Mammals		
Canidae	Canis aureus	Jackal/Shial
	Vulpes bengalensis	Bengal Fox/Shial
Felidae	Felis chaus	Jungle-Cat/Ban Biral
	Panthera pardus	Indian Leapard/Chita Bagh
Megadermatidae	Megaderma lyra	Bat, Indian False Vampire/Daini Badur
Muridae	Bandicota bengalensis	Lesser Bandicot Rat/Chika
	Mus booduga	Little Field Mouse/Chika
	Mus musculus	Indian House-mouse /Chika
Pteropodiadae	Pteropus giganteus	Flying-fox, Common /Badur
Viverridae `	Herpestes edwardsii	Commom Grey Mongoose/Beji
Birds		
Accipitridae	Circus aeruginosus	Western Marsh-Harrier
	Elanus caeruleus	Black-winged kite/sada Baj
	Gyps bengalensis	White-rumped Vulture /Shakun
	Haliastur Indus	Brahminy Kite/Shankachil
	Milvus migrans	Black Kite /Bhuban Chil
Alcedinidae	Alcedo atthis	Common Kingfisher/Machranga
	Halcyan smyrnensis	White throated Kingfisher/Machranga
Ardeidae	Ardeola grayii	Indian Pond-Heron/Kani Bok
	Bubulcus ibis	Cattle Egret/Gobok
	Egretta garzetta	Little Egret/Bok
Charadriidae	Vanellus atronuchalis	Red-wattled Lapwing/Hot tiii
Ciconiidae	Anastomus oscitans	Asian Openbill/Shamuk Bhanga
Columbidae	Columba livia	Rock Pigeon/Jalali Kabutar
	Streptopelia chinensis	Spotted Dove/Tila Ghughu
	Streptopelia decaota	Dove, Indian Ring, Collared/Raj Ghughu
Corvidae	Corvus macrorhynchos	Large-billed crow/Dar Kank
	Corvus splendens	House Crow/Pati Kank
	Dendrocitta vagabunda	Rufous Treepie/Kutum Pakkhi
Dicruridae	Dicrurus adsimilis	Black Drongo/Finge
	Dicrurus aeneus	Bronzed Drongo /Finge
Hirundinidae	Hirundo rustica	Barn Swallow/Ababil
Laniidae	Lanius Cristatus	Brown Shrike/Koshai Pokhi
Meropidae	Merops orientalis	Little Green Bee-eater/Shui Chura
Motacilliadae	Anthus hodgsoni	Olive-backed pipit/Khanjan
	Anthus novaeseelandiae	Australasian Pipit/Khanjan
	Motacilla alba	White Wagtail/Khanjan
Muscicapidae	Acrocephalus dumetorum	Blyth's Reed-Warbler
	Megalurus palusris	Bristed Marsh Warsh Warbler
	Saxicola tarquata	Collared Bush Chat
Oriolidae	Oriolus xanthornus	Block-hooded oriole/Haldey Pakhi
Picidae	Dinopium bengalense	Woodpecker, Red-backed/Kat Tukra

1/ Source: Bangladesh Center for Advance Studies Report (1997)

Annexure 3

List Of Protected Animal Species Found In The Teknaf Game Reserve

Animal Group & Family	Scientific name	English name/ Local Name
Mamals(3)		
Felidae	Felis chau	Jangle- Cat/Ban Biral
Felidae	Panthera Pardus	Indian Leapard/ Mongoose/ Beji
Viverridae	Herpestes edwardsii	Common Grey Mongoose / Beji
BIRDS(29)		
Accipitridae	Circus aeruginosus	Western Marsh- Harrier
Accipitridae	Elanus caeruleus	Black- Winged kite/ Sada Beji
Accipitridae	Gyps bengalensis	White- rumped Vulture/ Shakun
Accipitridae	Haliastur Indus	Brahminy Kite/ Shankachil
Accipitridae	Milvus migrans	Black kite/ Bhuban Chil
Accipitridae	Alcedo atthis	Common Kitgfisher/ Machranga
Accipitridae	Halcyon smurnensis	White- throated kingfisher/ Machranga
Ciconiidae	Anastomus oscitans	Asian Openbill/ Shamuk Bhanga
Columbidae	Columba livia	Rock Pigeon/ Jalali Kabutar
Columbidae	Streptopelia chinensis	Spotted Bove/ Tila Ghughu
Corvidae	Corvus macrorhynchos	Larige- Billed Crow/ Der Kenk
Corvidae	Dendrocitta Vagabunda	Rufous treepie/ kutum Pakkhi
Dicruridae	Dicrurus adsimili	Black Drongo/Finge
Dicruridae	Dicrurus aeneus	Bronzed Drongo/ Finge
Hirundinidae	Hirundo rustice	Barn Shike/ Ababil
Laniidae	Lanius cristatus	Brown Shrike/ Abadil
Meropidae	Merops orientalis	Little Gerrn Bee-earter /Shui Chura
Motacillidae	Anthus hodgsoni	Olive- backed Pipot/ khanjan
Motacillidae	Motaclla alba	White Wagtail/khanjan
Muscicapidae	Acrocehalus	
Muscicapidae	Megalurus palusris	bristed marsh warbler
Muscicapidae	Saxicola Tarquata	Collared Bush Chat
Picidae	Dinopium Bengalense	Woodpecker,Red-backed/kat Tukra
Ploceidae	ploceus beugalense	Blak- breasred Waebler
Pycnontidae	Pycnonoitus cafer	Red- vented Bulbul/ Bulbuli
Scolopacidae	Tringa hypoleucos	Common Sandpiper/
Strunidae	Acridotheres tristi	Common Myna/ Bhat Shlik
Trunidae	Sturnus contra	Asian Pied Starling
REPTILES (1)		
Varanidae	Varanus Bengalenensis	Bengal monitor lizard/ kalo guil

FAMILY NAME	SCIENTIFIC NAME	ENGLISH/ COMMON NAME
Ploceidae	Lonchura Malacca	Black- headed Munia
	Passer domesticus	House Sparrow /Charui
	Passer Montanus	Eurasian Tree Sparrow
	Ploceus benghalensis	Black-breasted Weaver/Bobui
Pycnonotidae	Pycnonotus cafer	Red-vented Bulbul/Bulbuli
Scolopacidae	Tringa hypoleucos	Common Sandpiper/
Strunidae	Acridotheres tristis	Common Myna/Bhat Shalik
	Sturnus contra	Asian Pied Starling
Sylviidae	Orthotomus sutorius	Common Tailorbird/Tuntuni
Reptilia		
Agamidae	Calotes Versicolor	Monitor Lizard /Anjan
Colubridae	Atretium schistosum	Keelback, Olivaceous/Maitta Shap
	Ptyas mucosus	Common Rat Snake/Daras
	Xenochrophis piscator	Checkered keelback/Dhora
Elaphidae	Naja kaouthia	Cobra/Kokra
	Ophiophagus Hannah	King Cobra/Raj Gokra
Gekkonidae	Hemidactylus brokii	House Lizard
	Hemidactylus frenatus	Wall Lizard /Tiktiki
Scincidae	Mabuya carinata	Mabuya/Shapermai
Varanidae	Varanus bengalensis	Bengal monitor lizard/Kalo guil
Amphibians		
Ardeidae	Ardeola striatus	Little Green Heron
Bufonidae	Bufo melanostictus	Common toad/Kuno Beng
Ranidae	Rana cyanophlyctis	Skipper frog/Kotkoti Beng
	Rana tigrina	Bull frog/Kola Beng

Annexure 4

Climatic Data of The Teknaf Game Reserve

7.1 Monthly and Annual Rainfall in Millimeter (a) & Number of Rainy Days (b) (1991-1996) 1/

Year		Apr.	**May**	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
1991-92	(a)	275.0	215.0	1544.0	91.3	711.0	503.0	252.0	18.0	13.0	0.0	24.0	0.0	3646.3
	(b)	8	12	26	28	24	19	11	3	1	0	7	0	139
1992-93	(a)	0	141.8	763.0	821.5	454.0	328.0	237.0	103.0	8.0	34.0	0.0	112.0	3002.3
	(b)	0	8	20	24	20	20	12	6	2	1	0	7	120
1993-94	(a)	96.0	610.0	717.0	651.5	598.5	245.5	103.0	26.0	0.0	5.0	1.2	23.9	3177.6
	(b)	6	18	23	23	24	18	7	2	0	1	1	5	128
1994-95	(a)	237.0	259.0	1029.0	801.5	521.0	260.0	8.5	32.0	0.0	0.0	0.0	8.0	3156
	(b)	9	12	24	26	28	16	6	3	0	0	0	3	127
1995-96	(a)	24.0	330.0	653.0	945.0	565.0	456.0	55.0	462.0	0	0	83.0	2.0	3575
	(b)	3	8	25	26	23	14	6	13	0	0	4	1	123
Mean	(a)	126.4	311.2	941.2	662.2	589.9	358.5	131.1	128.2	4.2	7.8	24.4	29.2	3314.3
	(b)	5.2	11.6	23.6	25.4	23.8	17.4	8.4	5.4	0.6	0.4	2.4	3.2	127.4

1/ Source: Bangladesh Water Development Board, Surface Water Hydrology Division, Station 307, Cox's Bazar.

7.2. Monthly and Annual Minimum (a) & Maximum (b) Temperatures (Degree Celsius) (1991-1994) 2/

Year		Jan.	Feb.	Mar.	April	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1990	(a)	15.2	17.5	19.0	23.2	25.2	25.4	25.3	25.2	25.4	24.2	22.2	17.5	22.2
	(b)	27.3	29.0	29.0	31.0	31.7	29.8	29.3	30.3	30.7	31.4	30.3	27.4	29.8
1991	(a)	16.7	17.7	22.4	24.9	25.7	25.5	25.3	25.2	25.2	24.9	20.2	16.5	22.6
	(b)	25.5	30.2	32.3	32.6	32.2	29.8	29.7	29.9	30.6	31.0	29.3	27.5	30.2
1992	(a)	14.4	18.4	21.6	24.9	24.9	25.7	25.0	25.3	25.2	24.0	21.7	16.1	22.3
	(b)	26.2	26.4	29.7	32.5	32.0	31.2	29.2	30.3	30.7	31.1	29.4	26.7	29.7
1993	(a)	15.1	16.9	19.6	22.7	24.3	25.0	25.6	24.8	25.1	24.7	20.1	16.8	21.8
	(b)	26.4	28.2	30.3	32.2	31.8	29.6	30.4	29.6	30.7	31.7	30.5	28.7	30.1
1994	(a)	15.3	17.1	21.2	23.9	26.9	25.3	25.1	23.2	-	24.8	18.3	15.8	-
	(b)	28.4	30.1	30.6	32.0	32.2	29.9	29.7	30.3	31.3	31.6	30.4	28.1	30.4
Mean	(a)	15.4	17.6	20.8	24.0	25.4	25.4	25.3	24.8	25.3	24.5	20.6	16.6	22.3
	(b)	27.0	28.8	30.4	32.1	32.0	30.1	29.7	30.1	30.8	31.4	30.0	27.7	30.1

1/ Source: Bangladesh Meteorological Department, Climate Division Teknaf Station (Latitude 20 52o N & Longitude 92 180' E).

7.3. Monthly and Annual Minimum (a) & Maximum (b) Humidifies (%) (1990-1994) 2/

Year		Jan.	Feb.	Mar.	April	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1990	(a)	24	28	42	29	36	56	75	70	67	48	30	40	45.42
	(b)	99	100	97	99	97	97	97	98	98	98	99	96	97.92
1991	(a)	31	15	24	-1	59	68	68	70	70	45	31	29	42.42
	(b)	98	99	97	97	97	99	98	98	97	99	98	98	97.92
1992	(a)	41	67	57	40	63	60	63	68	63	46	46	30	53.67
	(b)	97	98	98	98	97	98	98	99	97	97	98	98	97.75
1993	(a)	44	24	18	30	46	66	69	71	66.0	45	30	35	45.33
	(b)	97	98	98	98	97	98	100	98	98	98	97	97	97.83
1994	(a)	27	18	13	40	-1	67	72	72	58	49	43	21	39.92
	(b)	97	96	97	98	98	100.0	100	100	98	98	98	98	98.17
Mean	(a)	33.4	30.4	30.8	27.6	40.6	63.4	69.4	70.2	64.8	46.6	36	31	45.35
	(b)	97.6	98.2	97.4	98	97.20	98.4	98.6	98.6	97.6	98	98	97.4	97.92

2/ Sources: Bangladesh Meteorological Department, Climate Division Teknaf Station (Latitude 20 520' N & Longitude 180 E).

7.4. Average Monthly and Annual Humidities (%) (1990-1994) 2/

Year	Jan.	Feb.	Mar.	April	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1990	74	75	78	78	78	89	91	86	84	80	77	73	80
1991	71	68	70	75	79	90	91	90	88	84	75	70	79
1992	81	94	87	78	93	91	90	88	87	84	81	75	86
1993	80	73	71	79	81	89	89	91	88	84	75	71	81
1994	69	57	76	80	81	92	93	91	88	86	79	69	80
Mean	75	73	76	78	82	90	91	89	87	84	77	72	81

2/ Source: Bangladesh Meteorological Department, Climate Division Dhaka Station (Latitude 200 520' N & Longitude 920 18' E).

1.5 Average Monthly and Annual Sunshine Hours Per Sunny Day (1990-1994) 2/

Year	Jan.	Feb.	Mar.	April	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1990	8.9	7.4	7.3	8.4	6.5	3.4	0.7	11.6	5.7	7.8	7.1	8.7	7.0
1991	9.4	9.6	9.2	8.3	7.4	2.7	2.3	2.9	4.2	6.7	7.5	8.3	6.6
1992	8.4	6.1	8.1	8.1	7.6	5.4	2.6	4.0	4.9	7.0	6.1	8.7	6.5
1993	8.5	8.2	8.1	9.5	8.0	3.2	3.2	2.2	5.4	7.6	7.1	9.3	6.7
1994	9.3	9.2	8.0	9.2	8.5	1.7	1.7	4.3	5.2	7.1	7.8	8.0	6.7
Mean	9.0	8.2	8.2	8.8	7.6	3.3	2.2	5.0	5.1	7.3	7.2	8.7	6.8

2/ Source: Bangladesh Meteorological Department, Climate Division Chittagong Station (Latitude 220 16' N & Longitude 910 49' E).

Annexure 5

Wild Life Development Project taken up after 1971:

1. Development of Wildlife Management and Game Reserves, GoB funded 1975-76-to 1979-80.

   Cost allocation Taka 20.00 Lakh.

   Copy of PP submitted.

2. Wildlife Development Project Phase-II
   GoB 1980-81 to 1984-85

   Cost allocation Taka 20.00 Lakh.

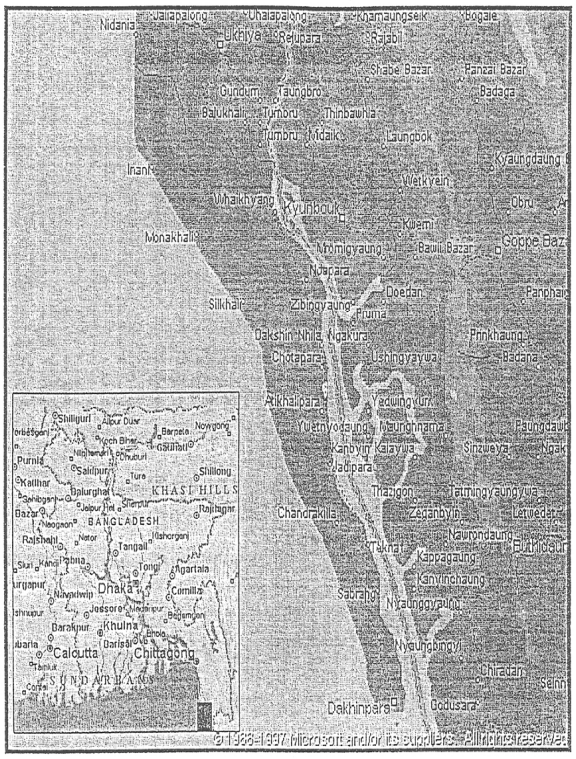
   Copy of PP submitted.

3. Development of Wildlife Conservation and Management
   GoB, 1993-94 to 1994-95

   Cost allocation Taka 560.74 Lakh.

   Copy of PP Submitted.

   Copy of PP submitted.

Annexure 6

General location of Teknaf Game Reserve