

Appendix-C15

Photo collection

(1) Power plant sites and surrounding areas



Project Site (Rainy Season)



Project Site (Dry Season)



Sea Side of the Project Site



Port near the Project Site



Roads near the Project Site



Local Transportation near the Project Site



Villages near the Project Site



Stores near the Project Site



Construction Sites of Steel Towers for Transmission Line

(Source: JICA Study Team)

(2) Photos of Fish Species:



Hilsha (*Tenulosa ilisha*)



(Source: http://en.bdfish.org/2011/06/pangas-catfish-pangasius-pangasius-hamilton-1822/pangasius_pangasius/)

Yellowtail catfish (*Pangasius pangasius*)



Bombay duck (*Harpadon nehereus*)



Silver pomfret (*Pampus argenteus*)



Poa Fish (*Otolithoides pama*)



Black Tiger shrimp (*Penaeus monodini*)



White prawn (*Penaeus merguensis*)



(Source: http://www.fisheries.gov.bd/album_details/505)

Mackerel (Scombridae)



Jait Bata (Mugilidae)



Alua (*Coilia* sp.)



Datina (Sparidae)



Phasya (Engraulidae)



Kucha chingri (*Acetes* sp.)
(Source: JICA Study Team)

(3) Birds



Pied Starling



House sparrow



Drongo



Wagtail



Great Egret



Little Egret



Common Redshank



Marsh Sandpiper



Black-capped Kingfisher



Pied Kingfisher



Red-necked Stint



Common Sandpiper



Whimbrel



Wood Sandpiper



Little Cormorant



White-winged Tern

(Source: JICA Study Team)

(4) Threatened Species



Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*)



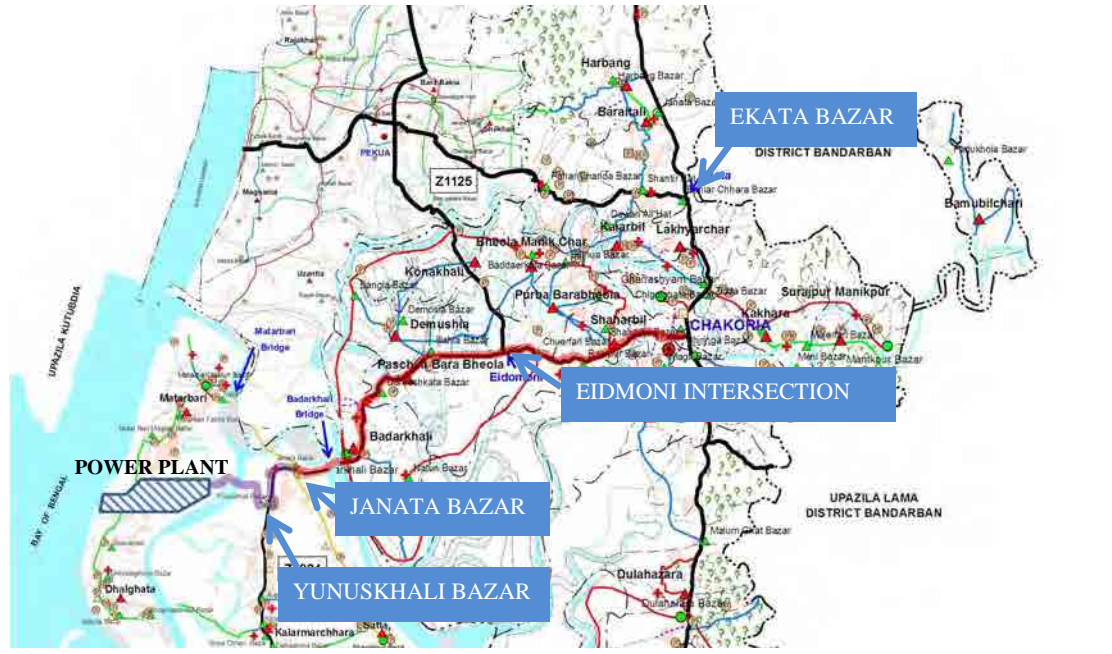
Olive Ridley Turtle (*Lepidochelys olivacea*)

(Source: JICA Study Team)

Appendix-C15.1-1

Current Condition of Candidate Route

Candidate 1



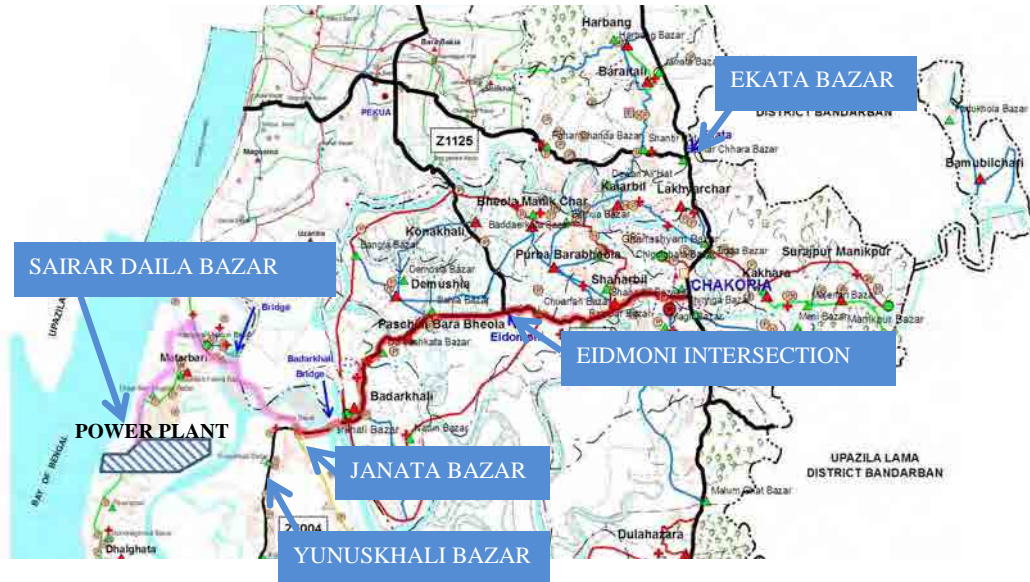
OUTLINE	From Chakoria via Regional road 172 , Badarkhali Bredge and new road & bridge to the Power Plant Site					
ROUTE	N1(Eakota)~Choakoria Bazar~Eidmony Intersection~Janata Bazar~Yunuskhali Bazar ~New road~New Br.~P.P					
Distance	Current Road Distance	23.30km	Rehabilitation Road	18.65km	New Road	3.81km
	Reconstruction Bridge	0.20km	New Bridge	0.64km		

Point at issue

1.Chakoria Bazar : Very small intersection , intricacy

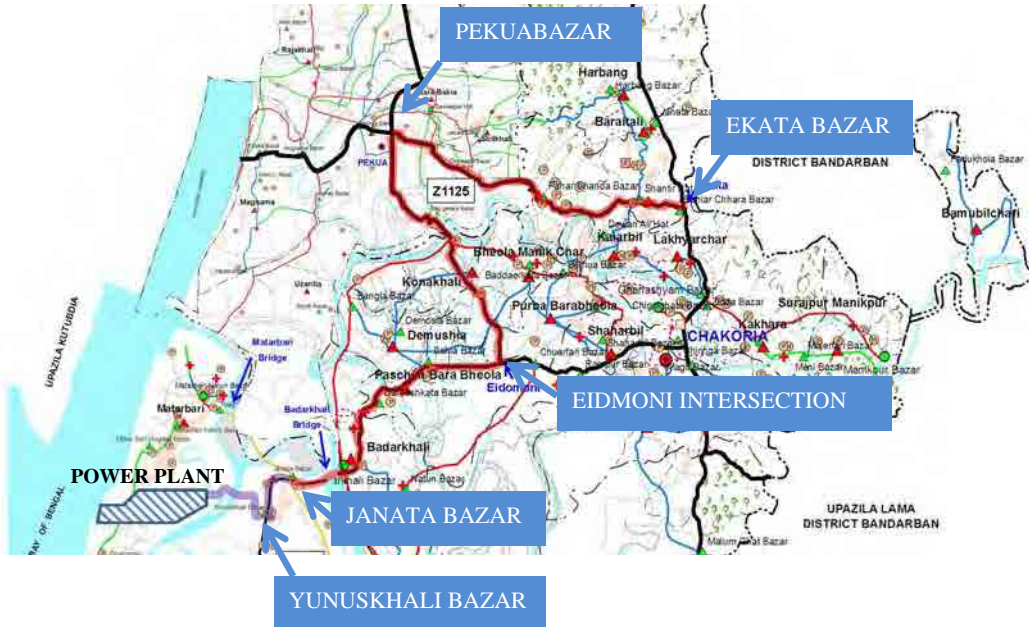
2.Existing Bridge : Narrow and Strength poverty







Candidate 2



OUTLINE	From Chakoria via Regional road , Badarkhali Bridge , Upazila road , Matarbari Bridge and Union road to the Power Plant Site					
ROUTE	N1(Eakota)~Chakoria Bazar~Eidmony Intersection~Janata Bazar~Matrabari Br.~Sairar Dail Bazar~P.P					
Distance	Current Road Distance	28.59km	Rehabilitation Road	18.65km	Widen Road	9.30km
	Reconstrucion Matarbari Bridge	0.44km	Reconstruction Bridge	0.20km		
Point at issue	<p>1.Chakoria BAZAR : Very small intersection , intricacy</p>  <p>2.Existing Bridge : Narrow and Strength poverty</p> 					

Candidate 3



OUTLINE	From Kakota Bazar via Zila road 1125 , Pwkuia Bazar , Badarkhali Bridge and new road & bridge to the Power Plant Site					
ROUTE	N1 Eakota Bazar ~ Pekua Bazar ~ Eidmony Intersection ~ Maheshkhali Bazar ~ Yunuskhali ~ New Bridge ~ P.P					
Distance	Current Road Distance	37.80km	Rehabilitation Road	33.35km	New Road	3.81km
	New Bridge	0.64km				
Point at issue	1.Pekua Bazar : Small intersection , intricacy					
						
	2.Repair Surface(Pekua Bazar ~ Eidmony Intersection)					
						







Candidate 4



OUTLINE	From Eakota Bazar via Zila road 1125, Pekua Bazar, Badarkhali Bridge, Upazila road, Matarbari Bridge and Union road to the Power Plant Site					
ROUTE	N1 Eakota Bazar ~ Pekua Bazar ~ Eidmony Intersection ~ Maheshkhali Bazar ~ Yunuskhali Bazar ~ New Bridge ~ P.P					
Distance	Current Road Distance	43.09km	Rehabilitation Road	33.35km	New Road	0.0km
	Widen Road	9.3km	Reconstruction Matarbari Bridge	0.44km		
Point at issue	1. Pekua Bazar : Small intersection, intricacy					
	2. Repair Surface (Pekua Bazar ~ Eidmony Bazar)					

Candidate 5



OUTLINE	From Chittagon via Regional road 170 and Pekua Bazar , Zila road(Pekua) , Union Road(Pekua) , new bridge and Union road to Power Plant Site					
ROUTE	R170(Chittagon) ~ Pekua Bazar ~ Zila Road ~ Union Road 2006 ~ Kutubdia Channel ~ New Bridge ~ Union Road ~ Matabari Natun Bazar ~ P.P					
Distance	Current Road Distance	28.75km	Rehabilitation Road	3.73km	Widen Road	18.07km
	New Road	6.35km	New Bridge	0.60km		
Point at issue	1.Pekua Bazar : Small intersection , intricacy					
						
	2.Broken Bridge					
						

Appendix-C15.1-2

Inventory of Selected Route

Road Inventory 01

Section	Ekota Bazaar to Pekua Bazaar		
Road classification	Z1125	Distance	11.80km
Width of Carriageway	5.36m~10.06m	Width of Shoulder	1.22m~4.17m
Condition of Road Surface	Good		

Section No. 1-1 :

Starting Pont of Ekota Bazaar to Pekua Bazaar

Ch:0+00	→ W2 W4 W3		W1 = 10.06 m	H1 = 3.66 m
H1	H2	H3	W2 = 2.82 m	H2 = 1.40 m
← 20m		← 20m		W3 = 3.66 m
Condition of Road Surface		Good		H3 = 1.50 m
				H4 = 1.83 m



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 2-2 :

1Km away from Ekota Bazaar to Pekua Bazaar

	W1 = 5.49 m	H1 = 1.98 m
	W2 = 3.05 m	H2 = 1.45 m
	W3 = 4.17 m	H3 = 1.91 m
		H4 = 1.93 m
Condition of Road Surface		Good



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side

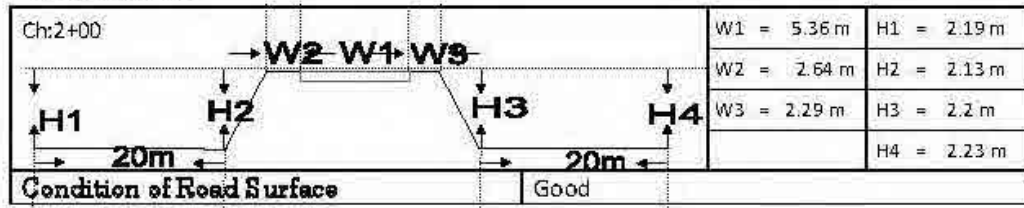


No. 6 Land use on Left side

Section No. 3-3 :

2Km away from Ekota Bazaar to Pekua Bazaar

Date:12-02-2013



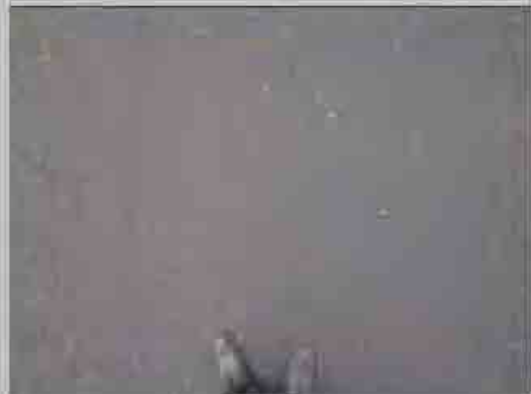
No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 4-4 :

3Km away from Ekota Bazaar to Pekua Bazaar

	W1 = 5.49 m	H1 = 2.52 m
	W2 = 3.05 m	H2 = 2.29 m
	W3 = 2.13 m	H3 = 2.13 m
		H4 = 2.59 m
Condition of Road Surface		Good



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



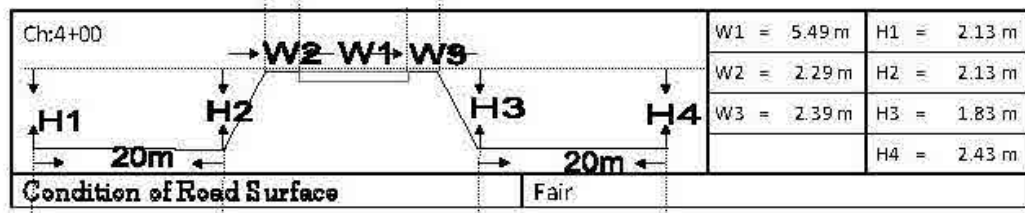
No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 5-5 :

4Km away from Ekota Bazaar to Pekua Bazaar



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



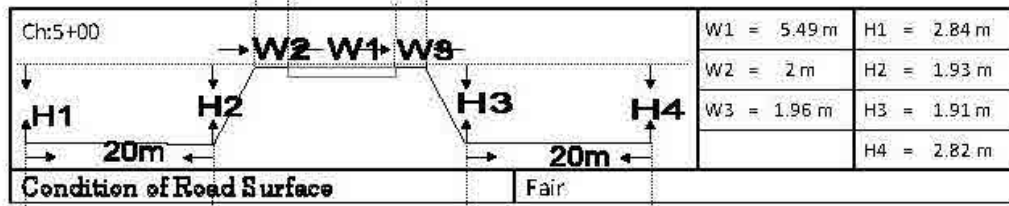
No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 6-6 :

5Km away from Ekota Bazaar to Pekua Bazaar



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 7-7 :

6Km away from Ekota Bazaar to Pekua Bazaar

Ch:6+00		W1 = 5.49 m	H1 = 1.42 m
		W2 = 1.41 m	H2 = 1.37 m
		W3 = 1.22 m	H3 = 1.58 m
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 8-8 : 7Km away from Ekota Bazaar to Pekua Bazaar

Ch:7+00		W1 = 5.44 m	H1 = 4.88 m
→ W2 W1 W3 →		W2 = 1.6 m	H2 = .76 m
H1	H2	W3 = 1.22 m	H3 = 1.37 m
← 20m ←			H4 = 1.40 m
← 20m ←			
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 9-9 : 8Km away from Ekota Bazaar to Pekua Bazaar

Ch:8+00		W1 = 5.62 m	H1 = 1.42 m
		W2 = 1.22 m	H2 = 1.40 m
		W3 = 1.91 m	H3 = 0.91 m
			H4 = 1.22 m
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 9-9 : 8Km away from Ekota Bazaar to Pekua Bazaar

Ch:8+00		W1 = 5.62 m	H1 = 1.42 m
		W2 = 1.22 m	H2 = 1.40 m
		W3 = 1.91 m	H3 = 0.91 m
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 10-10 :

9Km away from Ekota Bazaar to Pekua Bazaar

Ch:9+00		W2	W1	W3	W1 = 5.64 m	H1 = m
H1	H2				W2 = 2.44m	H2 = m
20m		H3	H4			
					W3 = 2.13 m	H3 = m
						H4 = M
Condition of Road Surface				Good		



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 11-11 :

10Km away from Ekota Bazaar to Pekua Bazaar

Ch:10+00		W1 = 5.64 m	H1 = 2.26 m
→ W2 W1 W3 →		W2 = 2.44 m	H2 = 2.21 m
H1	H2	W3 = 1.70 m	H3 = 1.27 m
← 20m →			H4 = 5.79 m
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right.



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 12-12 :

11Km away from Ekota Bazaar to Pekua Bazaar

Ch:11+00		W1 = 5.79 m	H1 = 1.22 m
→ W2 W1 W3 →		W2 = 1.83 m	H2 = 1.22 m
H1	H2	W3 = 3.05 m	H3 = m
← 20m ←			H4 = m
← 20m ←			
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 13-13 :

Pekua Bazaar Intersection to Ekota Bazaar

Ch:12+00 	W1 = 7.90 m	H1 = m
	W2 = 1.68 m	H2 = m
	W3 = 1.68 m	H3 = m
		H4 = m
Condition of Road Surface	Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Road Inventory 02

Section	Pekua Bazaar to Eidmoni Intersection		
Road classification	Z170	Distance	10.90km
Width of Carriageway	5.34m~5.74m	Width of Shoulder	0.91m~3.58m
Condition of Road Surface	Very Bad ~ Good		

Section No. 14-14 : Pekua Bazaar Intersection to Eidmoni Intersection

Ch: 12+100		W1 = 5.49 m	H1 = m
		W2 = 1.52 m	H2 = m
		W3 = 1.83 m	H3 = m
			H4 = M
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 15-15 : 1 Km away from Pekua Bazaar to Eidmoni

Ch: 13+00		W1 = 5.49 m	H1 = 2.75 m
→ W2 — VV — W3 ←		W2 = 0.91 m	H2 = 1.31 m
H1	H2	W3 = 0.91 m	H3 = 1.07 m
← 20m →			H4 = 1.98 m
← 20m →			
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 16-16 :

2Km away from Pekua Bazaar to Eidmoni

Ch: 14+00		W1 = 5.49 m	H1 = 2.54 m
		W2 = 1.35 m	H2 = 1.37 m
		W3 = 2.13 m	H3 = 2.13 m
			H4 = 4.57 m
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No.17-17 :

3Km away from Pekua Bazaar to Eidmoni

Ch: 15+00		W1 = 5.74 m	H1 = 2.44m
		W2 = 1.62 m	H2 = 2.13 m
		W3 = 0.91 m	H3 = 1.83 m
Condition of Road Surface		Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No.18-18 :

4 Km away from Pekua Bazaar to Eidmoni

Ch: 16+00		W1 = 5.59 m	H1 = 0.99 m
		W2 = 1.83 m	H2 = 0.99 m
		W3 = 1.83 m	H3 = 0.91 m
			H4 = 2.21 m
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 19-19 : 5Km away from Pekua Bazaar to Eidmoni

Ch: 17+00		W1 = 5.72 m	H1 = 3.96 m
		W2 = 0.91 m	H2 = 2.11 m
		W3 = 2.59 m	H3 = 1.63 m
			H4 = 3.41 m
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 20-20 : 6Km away from Pekua Bazaar to Eidmoni

Ch: 18+00		W1 = 5.49 m	H1 = 3.20 m
		W2 = 1.07 m	H2 = 1.91 m
		W3 = 0.91 m	H3 = 1.91 m
			H4 = 2.08 m
Condition of Road Surface		Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 21-21 :

7Km away from Pekua Bazaar to Eidmoni

Ch: 19+00		W1 = 5.64 m	H1 = 4.21 m
→ W2—W1—W3 →		W2 = 1.91 m	H2 = 1.80 m
H1	H2	W3 = 1.83 m	H3 = 1.70 m
← 20m →		← 20m →	
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 22-22 :

8Km away from Pekua Bazaar to Eidmoni

Ch: 20+00		W1 = 5.34 m	H1 = 1.52 m
		W2 = 3.58 m	H2 = 1.37 m
		W3 = 1.83 m	H3 = 1.65 m
			H4 = 1.83 m
Condition of Road Surface		Fair	



No. 1: Distance view to the forward



No. 2: Distance view to the forward right



No. 3: Distance view to the forward left



No. 4 Condition of road surface:



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 23-23 :

9Km away from Pekua Bazaar to Eidmoni

Ch: 21+00		W1 = 5.74 m	H1 = 1.83 m
		W2 = 1.04 m	H2 = 1.60 m
		W3 = 1.52 m	H3 = 1.65 m
			H4 = 2.90 m
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 24-24 :

10Km away from Pekua Bazaar to Eidmoni

Ch: 22+00		W1 = 5.69 m	H1 = 3.66 m
		W2 = 2.13 m	H2 = 2.06 m
		W3 = 2.74 m	H3 = 1.96 m
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Road Inventory 03

Section	Eidmoni Intersection to Badarkhali Br. to Yunuskhali Intersection		
Road classification	Z170/Z1004	Distance	10.65km
Width of Carriageway	3.70m~6.10m	Width of Shoulder	0.00m~2.74m
Condition of Road Surface	Very Bad ~ Good		

Section No. 25-25 : 850m away from Eidmoni Intersection to Badarkhali Bridge

Ch:22+850		W1 = 5.30 m	H1 = 3.50 m
		W2 = 0.00 m	H2 = 2.00 m
		W3 = 0.00 m	H3 = 1.50 m
			H4 = 2.00 m
Condition of Road Surface		Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 26-26 :1950m away from Eidmoni Intersection to Badarkhali Bridge

Ch:23+950		W1 = 5.45 m	H1 = 2.00 m
→ W2-W4 W3 →		W2 = 0.00 m	H2 = 0.50 m
H1	H2	W3 = 0.60 m	H3 = 0.50 m
← 20m →			H4 = 3.00 m
← 20m →			
Condition of Road Surface		Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 27-27 : 2810m away from Eidmoni Intersection to Badarkhali Bridge

Ch:24+810		W1 = 6.10 m	H1 = 0.00 m
		W2 = 0.60 m	H2 = 0.50 m
		W3 = 0.40 m	H3 = 0.50 m
			H4 = 0.50 m
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 28-28 : 3800m away from Eidmoni Intersection to Badarkhali Bridge

Chr:25+800		W1 = 5.75 m	H1 = 3.50 m
→ W2 — W4 — W3 →		W2 = 0.00 m	H2 = 0.25 m
H1	H2	W3 = 0.00 m	H3 = 0.25 m
← 20m →			H4 = 4.50 m
← 20m →			
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 29-29 : 4130m away from Eidmoni Intersection to Badarkhali Bridge

	W1 = 5.75 m	H1 = 0.00 m
	W2 = 0.00 m	H2 = 0.00 m
	W3 = 0.00 m	H3 = 0.10 m
		H4 = 0.20 m
Condition of Road Surface		Good



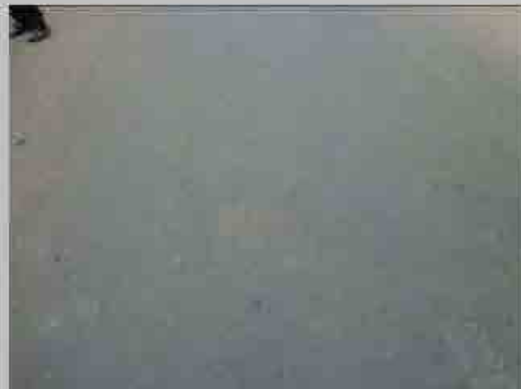
No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 30-30 : 4560m away from Eidmoni Intersection to Badarkhali Bridge

Ch:26+560		W1 = 5.50 m	H1 = 1.50 m
→ W2—W4—W3 ←		W2 = 0.60 m	H2 = 0.15 m
H1	H2	W3 = 0.10 m	H3 = 2.50 m
← 20m →		← 20m →	
H3		H4 = 5.00 m	
H4			
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 31-31 : 5760m away from Eidmoni Intersection to Badarkhali Bridge

Ch:27+760		W1 = 5.70 m	H1 = 3.50 m
		W2 = 0.60 m	H2 = 1.50 m
		W3 = 0.60 m	H3 = 1.50 m
			H4 = 3.00 m
Condition of Road Surface		Good	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 32-32 : 6210m away from Eidmoni Intersection to Badarkhali Bridge

Ch:28+210		W1 = 5.90 m	H1 = 3.50 m
		W2 = 0.00 m	H2 = 1.00 m
		W3 = 0.00 m	H3 = 2.00 m
			H4 = 3.50 m
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right.



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 33-33 : 7430m away from Eidmoni Intersection to Badarkhali Bridge

Ch:29+430		W1 = 5.70 m	H1 = 2.00 m
→ W2 — W4 — W3 →		W2 = 0.60 m	H2 = 0.10 m
H1	H2	W3 = 0.30 m	H3 = 0.10 m
← 20m →			H4 = 4.50 m
← 20m →			
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 34-34 : 8050m away from Eidmoni Intersection to Badarkhali Bridge

	W1 = 4.90 m	H1 = 4.50 m
	W2 = 0.00 m	H2 = 1.50 m
	W3 = 0.00 m	H3 = 1.00 m
		H4 = 3.00 m
Condition of Road Surface		Bad



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 35-35 : 8670m away from Eidmoni Intersection to Badarkhali Bridge

Ch:30+670		W1 = 5.60 m	H1 = 0.00 m
→ W2 — W4 — W3 →		W2 = 0.60 m	H2 = 0.00 m
H1	H2	W3 = 0.60 m	H3 = 0.00 m
← 20m →			H4 = 0.00 m
← 20m →			
Condition of Road Surface		Fair	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 36-36 :

Just Before Badarkhali Bridge to Jetty Ghat

	W1 = 5.49 m	H1 = 3.05 m
	W2 = 0.99 m	H2 = 0.66 m
	W3 = 0.99 m	H3 = 0.38 m
		H4 = 3.05 m
Condition of Road Surface		Bad



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 37-37 : 850 m away from Badarkhali Bridge to Jetty Ghat

Ch:31+690		W1 = 5.49 m	H1 = 2.13 m
		W2 = 2.74 m	H2 = 1.93 m
		W3 = 2.74 m	H3 = 1.88 m
			H4 = 1.96 m
Condition of Road Surface		Very Good	



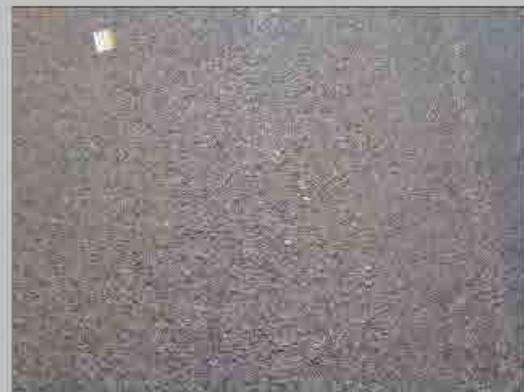
No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 38-38 :

1500m away from Badar khali Bridge to Jetty Ghat

Chr:32+340		W1 = 3.96 m	H1 = 1.04 m
→ W2 — W4 — W3 →		W2 = 1.35 m	H2 = 0.46 m
H1	H2	W3 = 1.12 m	H3 = 0.46 m
← 20m →			H4 = M
← 20m →			
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 39-39 : 2Km away from Ba darkhali Bridge to Jetty Ghat

Chr:32+840		W1 = 3.96 m	H1 = m
→ W2 — W4 — W3 →		W2 = 1.32 m	H2 = m
H1	H2	H3	H4
20m		20m	
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 40-40 : 2560m away from Badarkhali Bridge to Jetty Ghat

	W1 = 3.85 m	H1 = 0m
	W2 = 1.20 m	H2 = 0m
	W3 = 1.20 m	H3 = 0m
		H4 = 0m
Condition of Road Surface		Very Bad



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 41-41 : 2960m away from Badarkhali Bridge to Jetty Ghat

Ch:33+800		W1 = 3.70 m	H1 = 1.00 m
→ W2 — VV4 — W3 →		W2 = 0.00 m	H2 = 0.50 m
H1	H2	W3 = 0.10 m	H3 = 0.50 m
← 20m →			H4 = 1.00 m
← 20m →			
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 42-42 : Intersection of Yunuskhali Bazaar to Jetty Ghat

Ch:34+40		W1 = 4.00 m	H1 = 0.10 m
→ W2 — VV4 — W3 ←		W2 = 2.00 m	H2 = 0.10 m
H1	H2	W3 = 0.60 m	H3 = 0.20 m
← 20m →			H4 = 0.50 m
← 20m →			
Condition of Road Surface		Very Bad.	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Road Inventory 04

Section	Yunuskhali Intersection to Jetty point		
Road classification	Village Road	Distance	1.70km
Width of Carriageway	2.50m~4.20m	Width of Shoulder	0.00m~1.00m
Condition of Road Surface	Very Bad		

Section No. 43-43 : 70m away from Yunuskhali Bazaar to Jetty Ghat

Ch:34+110		W1 = 3.00 m	H1 = 1.50 m
		W2 = 1.00 m	H2 = 0.50 m
		W3 = 0.50 m	H3 = 0.45 m
			H4 = 0.50 m
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 44-44 : 340m away from Yunuskhali Bazaar to Jetty Ghat

Ch:34+380		W1 = 3.00 m	H1 = 2.50 m
→ W2 — VV — W3 →		W2 = 0.60 m	H2 = 1.50 m
H1	H2	W3 = 0.40 m	H3 = 1.00 m
← 20m →			H4 = 1.50 m
← 20m →			
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 45-45 : 460m away from Yunuskhali Bazaar to Jetty Ghat

Ch:34+500		W1 = 4.20 m	H1 = 5.00 m
		W2 = 0 m	H2 = 1.50 m
		W3 = 0 m	H3 = 0.50 m
			H4 = 0.55 m
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right

No. 3 Distance view to the forward left

No. 4 Condition of road surface

No. 5 Land use on right side

No. 6 Land use on Left side

Section No. 46-46 : 770m away from Yunuskhali Bazaar to Jetty Ghat

Ch:34+810		W1 = 3.00 m	H1 = 2.00 m
		W2 = 0 m	H2 = 0.50 m
		W3 = 0 m	H3 = 0.50 m
			H4 = 1.00 m
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 47-47 : 940m away from Yunuskhali Bazaar to Jetty Ghat

Ch:34+980		W1 = 4.00 m	H1 = 3.00 m
		W2 = 0 m	H2 = 0.50 m
		W3 = 0 m	H3 = 0.50 m
			H4 = 2.00 m
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Section No. 48-48 : 1270m away from Yunuskhali Bazaar to Jetty Ghat

Ch:35+310	→ W2—W4 W3 ←	W1 = 2.50 m	H1 = 1.50 m
H1	H2	W2 = 0 m	H2 = 0.50 m
← 20m →	H3	W3 = 0 m	H3 = 0.50 m
	H4		H4 = 1.50 m
Condition of Road Surface		Very Bad	



No. 1 Distance view to the forward



No. 2 Distance view to the forward right



No. 3 Distance view to the forward left



No. 4 Condition of road surface



No. 5 Land use on right side



No. 6 Land use on Left side

Appendix-C15.2

Environmental regulation

(1) Environmental Regulation

Details of the environmental standards applicable in Bangladesh are described in the Environmental Conservation Rules (ECR). Regulated areas cover all industries, and regulated items are air quality, water quality (surface water, drinking water), noise (boundary, source), emissions from motor vehicles or ships, odor, sewage discharge, waste from industrial units and industrial effluents or emissions. Items and standards, which are related to the construction and operation of coal-fired power plants, are listed below. Tables and annotations of environmental regulations are described as textual descriptions of ECR.

ECR is currently in the process of amendment. There is a possibility that the environmental regulations of the following items will be amended, but the current regulations are applicable until the amendment process is completed.

In addition to ECR, this project will also comply with IFC (International Finance Corporation) EHS (Environmental, Health and Safety) Guideline “General”, “Thermal power” and “Transmission and Distribution”.

1) Air quality

Table-1 shows the air quality standards in Bangladesh. Air quality standards adhere to WHO guidelines, also mentioned in the table below.

Table-1 Standards for air quality in Bangladesh ¹

No.	Parameter	Concentration (mg/m ³)		Exposure Time
		ECR	IFC Guideline (General: 2007)*	
a)	Carbon Mono-oxide	10	-	8 hours
		40	-	1 hour
b)	Lead (Pb)	0.5	-	Year
c)	Nitrogen Oxide	0.1	0.04	Year
		-	0.2	1 hour
		-	0.2	1 hour
d)	Suspended Particulate Matter (SPM)	0.2	-	8 hours
e)	Particulate Matter 10µm (PM ₁₀)	0.05	0.02	Year
		0.15	0.05	24 hours
f)	Particulate Matter 2.5µm (PM _{2.5})	0.015	0.01	Year
		0.065	0.025	24 hours
g)	Ozone	0.235	-	1 hour
		0.157	0.160	8 hours
h)	Sulfur Dioxide	0.08	-	Year
		0.365	0.125	24 hours

Notes: * Air quality standard of IFC Guideline is quoted from WHO Guideline.

(Source: Bangladesh Gazette July 19, 2005, IFC Environmental Health and Safety Guidelines 2007)

¹ Not exceed one time per year

Table-2 shows gas emission standards for industrial facilities in Bangladesh, and Table-3 shows gas emission standards for industrial boilers in Bangladesh.

Table-2 Gas emission standards for industrial facilities

No.	Parameter	Unit	Standard Limit
1	Particulates		
	a) Electric Power plants of 200 Megawatts and above	mg/Nm ³	150
	b) Electric Power plants less than 200 Megawatts	mg/Nm ³	350
2	Chlorine	mg/Nm ³	150
3	Hydrochloric Acid gas & mist	mg/Nm ³	350
4	Total Fluoride (F)	mg/Nm ³	25
5	Sulfuric Acid mist	mg/Nm ³	50
6	Lead particles	mg/Nm ³	10
7	Mercury particles	mg/Nm ³	0.2
8	Sulfur Dioxide		
	a) Sulfuric Acid manufacture (DCDA process)	kg/ton	4
	b) Sulfuric Acid manufacture (SCSA process)		
	Minimum Stack height for Sulfuric Acid emissions	kg/ton	10
	Lowest height of stack for dispersion of sulfuric acid		
	a) Coal Fired Electric Power plants		
	i) 500 Megawatts & above	m ²	275
	ii) 200-500 Megawatts	m	220
	iii) Below 200 Megawatts	m	14 (Q) ^{0.3}
	b) Boilers		
i) For Steam up to 15 tons/hour	m	11	
ii) For steam above 15 tons/hour	m	14 (Q) ^{0.3}	
9	Nitrogen Oxides		
	a) Nitric Acid manufacture	kg/ton	3
	b) Gas Fired Electric Power plants		
	i) 500 Megawatts & above	ppm	50
	ii) 200-500 Megawatts	ppm	40
	iii) Less than 200 Megawatts	ppm	30
c) Metal Treatment Furnace	ppm	200	
10	Soot & Dust Particles		
	a) Air Ventilated Furnaces	mg/Nm ³	500
	b) Brick-fields	mg/Nm ³	1000
	c) Cooking Furnaces	mg/Nm ³	500
	d) Limestone Furnaces	mg/Nm ³	250

(Source: The Environmental Conservation Rules, 1997)

Table-3 Gas emission standard for industrial boiler

No.	Parameters	Standard for presence in a unit of mg/Nm ³
1	Soot and particulates (fuel based)	
	a) Coal	500
	b) Gas	100

² Lowest height of stack is defined

³ Q=SO₂ emission in kg/hour

No.	Parameters	Standard for presence in a unit of mg/Nm ³
	c) Oil	30
2	Oxides of Nitrogen (fuel based)	
	a) Coal	60
	b) Gas	15
	c) Oil	30

(Source: The Environmental Conservation Rules, 1997)

A coal-fired power plant utilizes coal (main fuel) and oil (auxiliary fuel for startup). Since the planned output of the power plant is 600MW, the emission standard limit of particulates is 150mg/Nm³. For Sulfur Dioxide, if a stack of 275m height is installed, there are no standard limits of emissions densities and amount limits. The emission standard limit of Oxides of Nitrogen shown in Table-3 is 600 mg/Nm³ in the case of coal-firing and 300 mg/Nm³ in the case of oil firing.

It is common to set emission standards to SO₂ based on global standards. Table-4 shows a comparison of the flue gas emission standards of Bangladesh to the World Bank (IFC). A new coal-fired power plant should consider these world standards.

Table-4 Comparison of flue gas emission standards between Bangladesh and IFC

Parameters	Bangladesh Standard	IFC Guidelines (Thermal Power: 2008)
SO ₂	- ⁴	850mg/m ³ ⁵
NO _x	600 mg/m ³	510 mg/m ³
Particulate Matter (PM)	500mg/m ³	50mg/m ³
Dry Gas , Excess O ₂ Content	-	6%

(Source: The Environmental Conservation Rules 1997, IFC Environmental Health and Safety Guidelines 2008)

2) Water quality

Table-5 shows ambient water quality standards (inland surface water), Table-6 shows environmental water quality standards (drinking water), and Table-7 shows waste water standard parameters in Bangladesh. For drinking water standards and waste water standards, WHO standards are also stated in the tables below for comparison. World Bank (IFC) guidelines stipulate monitoring necessary heavy metals according to the characteristics of each thermal power plant.

⁴ Lowest height of stack is defined

⁵ As the high limit in non-degraded airsheds

Table-5 Ambient water quality standards (inland surface water)⁶

No.	Best Practice Based Classification	pH	BOD mg/l	Dissolved Oxygen (DO), mg/l	Total Coliform Bacteria quantity/ml
a)	Potable water source supply after	6.5-8.5	2 or less	6 or above	50 or less
b)	Water used for recreation	6.5-8.5	3 or less	5 or above	200 or less
c)	Potable water source supply after	6.5-8.5	3 or less	6 or above	5000 or less
d)	Water used for pisci-culture	6.5-8.5	6 or less	5 or above	5000 or less
e)	Industrial use water including chilling & other processes	6.5-8.5	10 or less	5 or above	
f)	Water used for irrigation	6.5-8.5	10 or less	5 or above	1000 or less

(Source : The Environmental Conservation Rules,1997)

Table-6 Environmental water quality standards (drinking water)

No.	Parameter	Unit	Standard Limit	WHO Guidelines
1	Aluminum	mg/l	0.2	0.2
2	Ammonia (NH ₃)	mg/l	0.5	-
3	Arsenic	mg/l	0.05	0.01
4	Barium	mg/l	0.01	0.7
5	Benzene	mg/l	0.01	0.01
6	BOD ₅ 20 ^o C	mg/l	0.2	-
7	Boron	mg/l	1.0	0.5
8	Cadmium	mg/l	0.005	0.003
9	Calcium	mg/l	75	-
10	Chloride	mg/l	150-600	-
11	Chlorinated Alkanes			-
	Carbon Tetrachloride	mg/l	0.01	-
	1.1 Dichloroethylene	mg/l	0.001	-
	1.2 Dichloroethylene	mg/l	0.03	-
	Tetrachloroethylene	mg/l	0.03	-
	Trichloroethylene	mg/l	0.09	-
12	Chlorinated Phenols			-
	Pentachlorophenol	mg/l	0.03	-
	2.4.6 Trichlorophenol	mg/l	0.03	-
13	Chlorine (residual)	mg/l	0.2	-
14	Chloroform	mg/l	0.09	0.3
15	Chromium (hexavalent)	mg/l	0.05	-
16	Chromium (total)	mg/l	0.05	0.05
17	COD	mg/l	4	-
18	Coliform (fecal)	n/100 ml	0	-
19	Coliform (total)	n/100 ml	0	-
20	Color	Huyghens unit	15	-
21	Copper	mg/l	1	-
22	Cyanide	mg/l	0.1	-
23	Detergents	mg/l	0.2	-
24	DO	mg/l	6	-
25	Fluoride	mg/l	1	1.5
26	Hardness (as CaCO ₃)	mg/l	200-500	-
27	Iron	mg/l	0.3-1.0	-

⁶ Textual annotations are as follows.

(1) Maximum amount of ammonia presence in water is 1.2 mg/l (as nitrogen molecule) which is used for pisciculture.

(2) For water used in irrigation, Electrical Conductivity-2250 micro mho/cm (at 25oC). Sodium less than 26 mg/l, Boron less than 2 mg/l

No.	Parameter	Unit	Standard Limit	WHO Guidelines
28	Nitrogen (Total)	mg/l	1	-
29	Lead	mg/l	0.05	0.01
30	Magnesium	mg/l	30-35	-
31	Manganese	mg/l	0.1	0.4
32	Mercury	mg/l	0.001	0.006
33	Nickel	mg/l	0.1	0.07
34	Nitrate	mg/l	10	3
35	Nitrite	mg/l	Less than 1	-
36	Odor		Odorless	-
37	Oil & Grease	mg/l	0.01	-
38	pH		6.5-8.5	-
39	Phenolic compounds	mg/l	0.002	-
40	Phosphate	mg/l	6	-
41	Phosphorus	mg/l	0	-
42	Potassium	mg/l	12	-
43	Radioactive Materials (gross alpha)	Bq/l	0.01	-
44	Radioactive Materials (gross beta)	mg/l	0.1	-
45	Selenium	mg/l	0.01	-
46	Silver	mg/l	0.02	-
47	Sodium	mg/l	200	-
48	Suspended particulate matters	mg/l	10	-
49	Sulfide	mg/l	0	-
50	Sulfate	mg/l	400	-
51	Total dissolved solids	mg/l	1000	1000
52	Temperature	°C	20-30	-
53	Tin	mg/l	2	-
54	Turbidity	JTU	10	-
55	Zinc	mg/l	5	-

(Source: The Environmental Conservation Rules 1997, Guidelines for Drinking-water Quality WHO 2008)

Table-7 Wastewater Discharge Standards ⁷

No.	Parameter	Unit	Inland Surface Water	Public Sewer at Secondary Treatment plant	Irrigated Land	IFC Guideline (Thermal power: 2008)
1	Ammoniacal Nitrogen (N molecule)	mg/l	50	75	75	-
2	Ammonia (free ammonia)	mg/l	5	5	15	-
3	Arsenic (As)	mg/l	0.2	0.05	0.2	0.5
4	BOD ₅ 20°C	mg/l	50	250	100	-
5	Boron	mg/l	2	2	2	-

⁷ Textual annotations are as follows.

- (1) These standards shall be applicable to industrial units or projects other than those given under Quality Standards for Classified Industries (Schedule 12).
- (2) These quality standards must be ensured at the moment of going into trial production for industrial units and at the moment of going into trial production for industrial units and at the moment of going into operation for other projects.
- (3) The value must not exceed the quality standard during spot checks at any time; if required, the quality standards may be stricter to meet the environment terms in certain areas.
- (4) Inland Surface Water shall mean drains, ponds, tanks, water bodies or water holes, canals, rivers, springs and estuaries.
- (5) Public sewer shall mean sewers connected with fully combined processing plant including primary and secondary treatment.
- (6) Irrigated land shall mean appropriately irrigated plantation areas of specified crops based on quantity and quality of waste water.
- (7) Inland Surface Quality Standards (Schedule 13) shall be applicable for any discharge taking place in public sewers or land not defined in Notes 5

No.	Parameter	Unit	Inland Surface Water	Public Sewer at Secondary Treatment plant	Irrigated Land	IFC Guideline (Thermal power: 2008)
6	Cadmium (Cd)	mg/l	0.05	0.5	0.5	0.1
7	Chloride	mg/l	600	600	600	-
8	Chromium (total Cr)	mg/l	0.5	1.0	1.0	0.5
9	COD	mg/l	200	400	400	-
10	Cr ⁶⁺ (hexavalent Cr)	mg/l	0.1	1.0	1.0	-
11	Copper (Cu)	mg/l	0.5	3.0	3.0	0.5
12	Dissolved Oxygen (DO)	mg/l	4.5-8	4.5-8	4.5-8	-
13	Electrical Conductivity	micro mho/cm	1200	1200	1200	-
14	Total Dissolved Solids (TDS)	mg/l	2,100	2,100	2,100	-
15	Fluoride (F)	mg/l	7	15	10	-
16	Sulfide (S)	mg/l	1	2	2	-
17	Iron (Fe)	mg/l	2	2	2	1
18	Total Kjeldahl Nitrogen (N)	mg/l	100	100	100	-
19	Lead (Pb)	mg/l	0.1	1.0	0.1	0.5
20	Manganese (Mn)	mg/l	5	5	5	-
21	Mercury (Hg)	mg/l	0.01	0.01	0.01	0.005
22	Nickel (Ni)	mg/l	1.0	2.0	1.0	-
23	Nitrate (N molecule)	mg/l	10.00	Undetermined	10	-
24	Oil & grease	mg/l	10	20	10	10
25	Phenol compounds (C ₆ H ₅ OH)	mg/l	1.0	5	1	-
26	Dissolved Phosphorus (P)	mg/l	8	8	10	-
27	Radioactive Materials.	As determined by Bangladesh Atomic Energy Commission				-
28	pH		6-9	6-9	6-9	6-9
29	Selenium	mg/l	0.05	0.05	0.05	-
30	Zn (Zn)	mg/l	5.0	10.0	10.0	1
31	Total Dissolved solid	mg/l	2,100	2,100	2,100	-
32	Temperature	Centigrade	40	40	40-Summer	-
			45	45	45-Winter	-
33	Total Suspended Solid (TSS)	mg/l	150	500	200	50
34	Cyanide (CN)	mg/l	0.1	2.0	0.2	-

(Source: The Environmental Conservation Rules 1997. IFC Environmental Health and Safety Guidelines 2008)

3) Noise and Odor

In regards to noise, the standard limit is set for every category of zone class. Table-8 shows the noise standards in Bangladesh.

Table-8 Standards for Noise ⁸

No	Zone Class	Limits in dBA			
		ECR		IFC Guideline (General: 2007)	
		Day	Night	Day	Night
a)	Silent Zone	50	40	55	45
b)	Residential Zone	55	45		
c)	Mixed Zone (this area is used combining residential, commercial and industrial purposes)	60	50	70	70
d)	Commercial Zone	70	60		
e)	Industrial Zone	75	70		

(Source: Bangladesh Gazette September 7, 2006, IFC Environmental Health and Safety Guidelines 2008)

Ammonia is used in SCR, which is possible to be introduced for the purpose of nitrogen oxide reduction. Including ammonia, Table-9 shows the odor emission standards in Bangladesh.

Table-9 Standards for Odor ⁹

Parameter	Unit	Standard Limit
Acetaldehyde	ppm	0.5 - 5
Ammonia	ppm	1 - 5
Hydrogen Sulfide	ppm	0.02 - 0.2
Methyl Disulfide	ppm	0.009 - 0.1
Methyl Sulfide	Ppm	0.01 - 0.2
Styrene	Ppm	0.4 - 2.0
Trim ethylamine	Ppm	0.005 - 0.07

(Source: The Environmental Conservation Rules 1997)

4) Electric and magnetic fields

IFC EHS Guideline (Electric Power Transmission and Distribution; 2007) recommends the following methods for managing EMF (Electric and magnetic fields) generated by

⁸ Textual annotations are as follows.

(1) Day time is considered from 6 a.m. to 9 p.m. and night time is from 9 p.m. to 6 a.m.

(2) From 9 at night to 6 in the morning is considered night time.

(3) Areas within 100 meters of hospitals, education institutions, educational institutions or government designated / to be designated / specific institution / establishments are considered Silent Zones. Use of motor vehicle horns or other signals and loudspeaker are forbidden in Silent Zones.

⁹ Textual annotations are as follows.

(1) Following regulatory limits shall be generally applicable to emission/exhaust outlet pipes of above 5 meter height: $Q = 0.108 \times He^2Cm$ (Where Q = Gas Emission rate Nm³/hour)

He = Height of exhaust outlet pipe (m)

Cm = Above mentioned limit (ppm)

(2) In cases where a special parameter has been mentioned, the lower limit shall be applicable for warning purposes, and the higher limit shall be applicable for prosecution purposes or punitive measures.

transmission line.

- Evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Average and peak exposure levels should remain below the ICNIRP recommendation for General Public Exposure (Table-10).
- Considering siting new facilities so as to avoid or minimize exposure to the public. Installation of transmission lines or other high voltage equipment above or adjacent to residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or offices), should be avoided;
- If EMF levels are confirmed or expected to be the recommended exposure limits (Table-10), application of engineering techniques should be considered to reduce the EMF produced by power lines, substations, or transformers. Examples of these techniques include:
 - o Shielding with specific metal alloys
 - o Burying transmission lines
 - o Increasing height of transmission towers
 - o Modifications to size, spacing, and configuration of conductors

Table 10. Recommended exposure limits for general public exposure to electric and magnetic fields (IFC Guideline: “Transmission and Distribution”, 2007)

Frequency	Electric Field (V/m)	Magnetic Field (μT)
50 Hz	5,000	100
60 HZ	4,150	83

(Source: International Commission on Non-Ionizing Radiation Protection (1998): “Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).)

(2) Protected areas and environmentally controlled areas

Classification of protected areas and environmentally-controlled areas in Bangladesh are shown in Table-11. These areas are declared as National Parks, Wildlife Sanctuaries, Game Reserves, Botanical Gardens and Eco-parks under the Wildlife (Preservation) Order, Reserved Forests and Protected Forests under the Forest Act and Ecologically Critical Areas (ECA) notified under the Environmental Conservation Act.

Table-11 Classification of protected areas and environmentally controlled areas

Classification		Competent Authority	Governing law
A	National Parks	Department of Forest	Wildlife (Preservation) Order
B	Wildlife Sanctuaries		
C	Game Reserves		

Classification		Competent Authority	Governing law
D	Botanical Gardens, Eco-parks		
E	Reserved Forests, Protected Forests		Forest Act
F	Ecologically Critical Areas	Department of Environment	Environmental Conservation Act

(Source: Power System Master Plan 2010)

There are fifteen national parks, thirteen wildlife sanctuaries, five botanical gardens and eco-parks in Bangladesh classified under the Wildlife (Preservation) Order, having a total area of 2,702.2 km². A list of the protected areas and environmentally-controlled areas declared under the Wildlife (Preservation) Order are shown in Table-12.

There are nine ECAs with a total area of 8,063.2 km² excluding the Gulshan–Banani-Baridhara Lake in Dhaka. Table-13 shows a list of ECA designated areas under the Bangladesh Environmental Conservation Act (BECA). BECA provides for ECA declarations by the Director General of the Department of Environment in cases where an ecosystem or biodiversity area is considered to be threatened to reach a critical state. Along with the ECA declaration, each ECA has notifications declared in which specific activities to be restricted in that ECA are specified.

Table-12 List of protected areas and environmentally controlled areas

Item	No	Name	Place	Size (km ²)
A	1	Bhawal National Park	Gazipur	50.2
	2	Modhupur National Park	Tangail/ Mymensingh	84.4
	3	Ramsagar National Park	Dinajpur	0.3
	4	Himchari National Park	Cox's Bazar	17.3
	5	Lawachara National Park	Moulavibazar	12.5
	6	Kaptai National Park	Chittagong Hill Tracts	54.6
	7	Nijhum Dweep National Park	Noakhali	163.5
	8	Medha Kachhapia National Park	Cox's Bazar	4.0
	9	Satchari National Park	Habigonj	2.4
	10	Khadim Nagar National Park	Sylhet	6.8
	11	Baraiyadhala National Park	Chittagong	29.3
	12	Kuakata National Park	Patuakhali	16.1
	13	Nababgonj National Park	Dinajpur	5.2
	14	Shingra National Park	Dinajpur	3.1
	15	Kadigarh National Park	Mymensingh	3.4
B	1	Rema-Kalenga Wildlife Sanctuary	Hobigonj	18.0
	2	Char Kukri-Mukri Wildlife Sanctuary	Bhola	0.4
	3	Sundarban (East) Wildlife Sanctuary	Bagerhat	312.3
	4	Sundarban (West) Wildlife Sanctuary	Satkhira	715.0
	5	Sundarban (South) Wildlife Sanctuary	Khulna	369.7
	6	Pablakhali Wildlife Sanctuary	Chittagong Hill Tracts	420.9
	7	Chunati Wildlife Sanctuary	Chittagong	77.6
	8	Fashiakhali Wildlife Sanctuary	Cox's Bazar	32.2
	9	Dudh Pukuria-Dhopachari Wildlife	Chittagong	47.2

Item	No	Name	Place	Size (km ²)
		Sanctuary		
	10	Hazarikhil Wildlife Sanctuary	Chittagong	29.1
	11	Sangu Wildlife Sanctuary	Bandarban	57.6
	12	Teknaf Wildlife Sanctuary	Cox's Bazar	116.2
	13	Tengragiri Wildlife Sanctuary	Barguna	40.5
D	1	National Botanical Garden	Dhaka	0.8
	2	Baldha Garden	Dhaka	-
	3	Madhabkunda Eco-Park	Moulavibazar	2.7
	4	Sitakunda Botanical Garden and Eco-park	Chittagong	8.1
	5	Dulahazara Safari Parks	Cox's Bazar	6.0

(Source: <http://www.bforest.gov.bd/conservation.php>, accessed January 2011)

Table-13 List of Environmental Critical Areas

Item	No	Name	Place	Size (km ²)
F	1	The Sundarbans	Bagerhat, Khulna, Satkhira	7,620.3
	2	Cox's Bazar (Teknaf, Sea beach)	Cox's Bazar	104.7
	3	St. Martin Island	Cox's Bazar	5.9
	4	Sonadia Island	Cox's Bazar	49.2
	5	Hakaluki Haor	Moulavi Bazar	183.8
	6	Tanguar Haor	Sumamganj	97.3
	7	Marjat Baor	Jhinaidha	2
	8	Gulshan-Banani-Baridhara Lake	Dhaka	-
	9	Rivers (Buriganga, Turag, Sitalakhya and Balu) around Dhaka city	Dhaka	-

(Source: Biodiversity National Assessment and Programme of Action 2020, DOE Bangladesh, 2010)

Appendix-C15.5-1

Results of the survey on natural environment

(Pollution control)

(1) Air quality

Table-1(1) Results of air quality survey (Rainy season)

(19 - 20/October/2012)

Parameter	Unit	Results			Ambient Air Quality Standards	IFC EHS Guideline (General: 2007)
		AN1	AN2	AN-3		
SPM	µg/m ³	54	56	42	200 (8hr) PM ₁₀ : 150 (24hr) PM ₁₀ : 50 (year)	SPM: - PM ₁₀ : 150 (24hr) PM ₁₀ : 70 (year)
SO ₂	µg/m ³	3.2	3.4	3.0	365 (24hr) 80 (year)	500 (10min) 125 (24hr)
NO ₂	µg/m ³	6.2	6.5	6.0	100 (year)	200 (1hr) 40 (year)

(Source: JICA Study Team)

Table-1(2) Results of air quality survey (Dry season)

(29 - 30/January/2013)

Parameter	Unit	Results			Ambient Air Quality Standards	IFC EHS Guideline (General: 2007)
		AN1	AN2	AN-3		
SPM	µg/m ³	59	62	45	200 (8hr) PM ₁₀ : 150 (24hr) PM ₁₀ : 50 (year)	SPM: - PM ₁₀ : 150 (24hr) PM ₁₀ : 70 (year)
SO ₂	µg/m ³	4.0	4.1	3.0	365 (24hr) 80 (year)	500 (10min) 125 (24hr)
NO ₂	µg/m ³	7.4	7.6	5.0	100 (year)	200 (1hr) 40 (year)

(Source: JICA Study Team)

(2) Water quality

1) Sea water

Table-2(1) Results of sea water quality survey (Rainy season)

(6 - 7/October/2012)

Parameter	Unit	SP-1			SP-2			SP-3		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	m	0.5	4.5	8.0	0.5	6.5	12.0	0.5	6.5	12.0
Temperature	°C	30.0	28.8	29.0	30.0	29.0	28.5	30.5	29.5	28.5
Salinity	-	35.3	17.5	18.5	16.5	18.0	18.5	16.3	16.5	17.2
pH	-	8.19	8.26	8.11	7.90	8.10	8.00	8.13	8.10	8.12
DO	mg/L	5.4	5.3	5.0	5.5	5.3	5.1	5.6	5.4	5.1
BOD	mg/L	1.0	0.7	0.6	1.0	0.8	0.7	0.8	0.7	0.6
COD	mg/L	180	182	160	184	182	182	178	180	180
Oil & Grease	mg/L	5.5	3.0	0.5	5.4	3.1	0.5	4.5	3.0	0.5
SS	mg/L	782	641	834	780	640	835	776	688	795
T-Cr	mg/L	0.011	0.014	0.057	0.019	0.023	0.050	0.009	0.010	0.016
Cu	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fe	mg/L	2.24	4.59	60.50	13.30	21.60	51.90	2.50	4.10	8.72
Zn	mg/L	0.1	0.1	0.13	0.1	0.1	0.11	0.1	0.1	0.1
Pb	mg/L	0.01	0.01	0.018	0.01	0.01	0.019	0.01	0.01	0.01
Cd	mg/L	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Hg	mg/L	0.003	0.002	0.006	0.002	0.003	0.005	0.004	0.005	0.005

Parameter	Unit	SP-1			SP-2			SP-3		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
As	mg/L	0.005	0.008	0.010	0.007	0.005	0.009	0.005	0.008	0.005

Parameter	Unit	SP-4			SP-5			Average		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	m	0.5	8.5	16.0	0.5	6.5	12.0	-	-	-
Temperature	°C	29.0	28.5	30.0	30.5	30.5	29.0	30.0	29.3	29.0
Salinity	-	19.6	20.1	20.2	20.8	21.2	21.6	17.8	18.7	19.2
pH	-	8.15	8.00	8.20	8.18	8.15	7.95	8.11	8.12	8.08
DO	mg/L	5.4	5.2	4.9	5.4	4.9	4.6	5.5	5.2	4.9
BOD	mg/L	1.1	0.8	0.7	1.1	0.8	0.8	1.0	0.8	0.7
COD	mg/L	191	193	193	196	197	195	186	187	182
Oil & Grease	mg/L	4.4	3.0	0.5	5.5	3.0	0.5	5.1	3.0	0.5
SS	mg/L	770	752	883	782	761	910	778	696	851
T-Cr	mg/L	0.012	0.015	0.027	0.013	0.017	0.017	0.013	0.016	0.033
Cu	mg/L	0.1	0.1	0.23	0.1	0.1	0.1	0.10	0.10	0.13
Fe	mg/L	5.00	10.20	25.70	5.17	10.60	11.60	5.64	10.22	31.68
Zn	mg/L	0.1	0.1	1.21	0.1	0.1	0.1	0.10	0.10	0.33
Pb	mg/L	0.01	0.01	0.130	0.01	0.01	0.01	0.010	0.010	0.037
Cd	mg/L	0.002	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Hg	mg/L	0.003	0.004	0.008	0.005	0.003	0.004	0.003	0.003	0.006
As	mg/L	0.019	0.005	0.037	0.014	0.014	0.005	0.010	0.008	0.013

(Source: JICA Study Team)

Table-2(2) Results of sea water quality survey (Dry season)

(29/January/2013)

Parameter	Unit	SP-1			SP-2			SP-3		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	m	0.5	5.0	9.0	0.5	5.0	9.0	0.5	4.5	8.0
Temperature	°C	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0
Salinity	-	37.3	35.8	35.3	35.2	36.2	35.7	35.0	35.8	34.9
pH	-	8.03	8.01	7.91	7.86	7.91	8.02	8.00	7.82	7.85
DO	mg/L	6.0	5.8	5.4	6.1	5.9	5.4	6.2	6.0	5.8
BOD	mg/L	0.2	0.4	0.6	0.2	0.4	0.5	0.2	0.3	0.5
COD	mg/L	207	209	226	205	211	231	205	208	230
Oil&Grease	mg/L	4.4	3.0	0.5	4.3	3.1	0.5	4.2	3.0	0.5
SS	mg/L	52	73	281	49	84	293	51	81	308
T-Cr	mg/L	0.035	0.050	0.050	0.105	0.061	0.052	0.035	0.048	0.037
Cu	mg/L	0.1	0.11	0.31	0.1	0.58	0.54	0.1	0.30	0.31
Fe	mg/L	4.17	10.8	27.2	25.4	28.6	18.1	18.3	25.8	26.1
Zn	mg/L	0.05	0.10	0.18	0.05	0.16	0.12	0.05	0.11	0.14
Pb	mg/L	0.01	0.01	0.02	0.01	0.03	0.06	0.01	0.02	0.017
Cd	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Hg	mg/L	0.016	0.022	0.018	0.018	0.029	0.014	0.018	0.021	0.009
As	mg/L	0.005	0.005	0.007	0.007	0.010	0.005	0.006	0.005	0.008

Parameter	Unit	SP-4			SP-5			Average		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	m	0.5	7.8	14.6	0.5	7.8	14.6	-	-	-
Temperature	°C	18.0	18.0	18.0	18.0	18.0	18.0	18.2	18.2	18.2

Parameter	Unit	SP-4			SP-5			Average		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Salinity	-	34.4	35.4	34.3	34.4	34.7	34.8	35.3	35.6	35.0
pH	-	7.95	8.02	7.84	7.85	7.86	8.01	7.94	7.92	7.93
DO	mg/L	6.4	6.1	5.8	6.2	6.0	5.7	6.2	6.0	5.6
BOD	mg/L	0.2	0.3	0.5	0.3	0.4	0.6	0.2	0.4	0.5
COD	mg/L	205	211	223	203	212	235	205	210	229
Oil&Grease	mg/L	4.2	3.1	0.5	4.0	3.0	0.5	4.2	3.0	0.5
SS	mg/L	48	79	312	46	81	329	49	80	305
T-Cr	mg/L	0.021	0.027	0.057	0.019	0.039	0.055	0.043	0.045	0.050
Cu	mg/L	0.1	0.17	0.38	0.1	0.28	0.12	0.10	0.29	0.33
Fe	mg/L	3.25	3.88	45.2	2.97	32.1	25.0	10.82	20.24	28.32
Zn	mg/L	0.05	0.08	0.18	0.05	0.21	0.12	0.05	0.13	0.15
Pb	mg/L	0.01	0.01	0.02	0.01	0.018	0.01	0.010	0.018	0.025
Cd	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Hg	mg/L	0.008	0.007	0.011	0.005	0.007	0.007	0.013	0.017	0.012
As	mg/L	0.005	0.005	0.012	0.005	0.009	0.007	0.006	0.007	0.008

(Source: JICA Study Team)

2) Surface water

Table-3 Results of the surface water quality survey

Parameter	Unit	Results		Standards for Inland Surface Water					
		Rainy season: 7/Oct/2012	Dry season: 30/Jan/2013	A	B	C	D	E	F
Depth	M	0.5	0.5	-	-	-	-	-	-
Temperature	°C	30.6	18.0	-	-	-	-	-	-
Salinity	-	9.8	35.8	-	-	-	-	-	-
pH	-	7.82	8.00	6.5-8.5	6.5-8.6	6.5-8.7	6.5-8.8	6.5-8.9	6.5-8.9
DO	mg/L	5.5	5.8	6 or above	5 or above	6 or above	5 or above	5 or above	5 or above
BOD	mg/L	0.8	0.4	2 or less	3 or less	3 or less	6 or less	10 or less	10 or less
COD	mg/L	97	241	-	-	-	-	-	-
Oil&Grease	mg/L	4.2	-	-	-	-	-	-	-
SS	mg/L	613	-	-	-	-	-	-	-

Notes: Category of water body is as below.

- A: Potable water source supply after bacteria freeing only
- B: Water used for recreational purposes
- C: Potable water source supply after conventional processing
- D: Water used for pisciculture
- E: Industrial use water including chilling and other processes
- F: Water used for irrigation

(Source: JICA Study Team)

3) Ground water

Table-4 Results of the ground water quality survey

Parameter	Unit	Results		Standards for Drinking Water
		Rainy season 7/October/2012	Dry season 30/January/2013	
Temperature	°C	29.7	20.1	20 – 30
pH	-	7.48	7.20	6.5 8.5
Chloride	mg/L	167	167	150 – 600
NH ₃	mg/L	0.04	0.04	0.5
Iron (Fe)	mg/L	0.92	0.92	0.3 1.0
Hardness	mg/L	164	164	200 – 500
Arsenic (As)	mg/L	0.01	0.01	0.05
DO	mg/L	3.5	4.7	6.0
BOD	mg/L	0.4	0.2	0.2
COD	mg/L	0	0	4.0
SS	mg/L	0.2	-	10
Coliform	N/100mL	0	-	0
Salinity	-	0.3	0.7	-

(Source: JICA Study Team)

(3) Noise

Table-5 Results of the noise measurement survey

(Unit: dBA)

Survey phase	Results			Standards for Noise				
	St.1	St.2	St.3	A	B	C	D	E
Rainy season 19 20/October/2012	57.0	57.3	49.5	Day (6AM-9PM): 45 Night (9PM-6AM): 35	Day: 50 Night: 40	Day: 60 Night: 50	Day: 70 Night: 60	Day: 70 Night: 70
Dry Season 29 30/January/2013	56.0	57.0	45.3					

Notes: Category of areas is as below.

A: Silent zone

B: Residential area

C: Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes)

D: Commercial area

E: Industrial area

(Source: JICA Study Team)

Reference: IFC/EHS guidelines

Receptor	Day 07:00-22:00	Night 22:00-07:00
Residential, institutional, educational area	55	45
Industrial, commercial area	70	70

(Source: IFC/EHS General Guidelines, 2007)

(4) Sea bottom sediment (heavy metals)

Table-6 Results of the sea bottom sediment survey (Heavy metals)

Parameter	Unit	Results		Guideline of NOAA	
		Rainy season 15/October /2012	Dry season 28/January /2013	ERL	ERM
Hg	mg/kg	0.142	0.456	0.15	0.71
Cd	mg/kg	0.032	0.05	1.2	9.6
Pb	mg/kg	11.6	3.39	46.7	218
As	mg/kg	4.45	2.91	8.2	70
Cu	mg/kg	23.8	3.75	34	270
Zn	mg/kg	63.7	20.2	410	410
Fe	mg/kg	27,400	11,183	-	-

(Source; JICA Study Team)

Appendix-C15.5-2

Results of the survey on natural environment

(Marine organisms)

(1) Plankton

1) Phyto-plankton

Table-1(1) Results of phyto-plankton survey (Rainy season)

(6 - 7/October/2012)

(Unit: cells/L)

Species	SP.1			SP.2			SP.3		
	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth (m)	0.5	4.5	8.0	0.5	6.5	12.0	0.5	6.5	12.0
CYANOPHYTA									
1 <i>Nostoc</i> sp.	200								
DINOPHYTA									
2 <i>Ceratium</i> sp.		25			100				
HETEROKONTOPHYTA									
3 <i>Diatoma</i> sp.									
4 <i>Skeletonema</i> sp.								50	
5 <i>Coscinodiscus</i> sp.		50	75			50	125		1,400
6 <i>Rhizosolenia</i> sp.				750	1,075			25	600
7 <i>Biddulphia</i> sp.	1,725	300	300	200	950	625	400	625	2,050
8 <i>Ditylum</i> sp.									
9 <i>Thalassiothrix</i> sp.	1,675	1,475	3,000	2,550	6,100	1,875	1,725	1,300	5,650
10 <i>Flagillaria</i> sp.			300	150		350	50		500
11 <i>Thalassionema</i> sp.				300	225				
12 <i>Nitzschia</i> sp.			500	200	125	250		125	500
13 <i>Pleurosigma</i> sp.							50		
HAPTOPHYTA									
14 <i>Coccolith</i> sp.		50					100		
PROCHLOROPHYTA									
15 <i>Tetraedron</i> sp.		25					50		
N. of species	3	6	5	6	6	5	7	5	6
Total	3,600	1,925	4,175	4,150	8,575	3,150	2,500	2,125	10,700

Species	SP.4			SP.5			Average		
	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth (m)	0.5	8.5	16.0	0.5	6.5	12.0	-	-	-
CYANOPHYTA									
1 <i>Nostoc</i> sp.							40		
DINOPHYTA									
2 <i>Ceratium</i> sp.								25	
HETEROKONTOPHYTA									
3 <i>Diatoma</i> sp.						50			10
4 <i>Skeletonema</i> sp.						100		10	20
5 <i>Coscinodiscus</i> sp.	175	100	250	50	3,200		70	670	355
6 <i>Rhizosolenia</i> sp.	1,800	650	500				510	350	220
7 <i>Biddulphia</i> sp.	1,825	750	2,400	4,175	450	1,900	1,665	615	1,455
8 <i>Ditylum</i> sp.	50						10		
9 <i>Thalassiothrix</i> sp.	1,650	4,200	2,750	4,250	200	1,625	2,370	2,655	2,980
10 <i>Flagillaria</i> sp.	200	200	100	325			145	40	250
11 <i>Thalassionema</i> sp.		200					60	85	
12 <i>Nitzschia</i> sp.		100	475		325	225	40	135	390

Species	SP.4			SP.5			Average		
	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
13 <i>Pleurosigma</i> sp.	150						40		
HAPTOPHYTA									
14 <i>Coccolith</i> sp.					50		20	20	
PROCHLOROPHYTA									
15 <i>Tetraedron</i> sp.							10	5	
N. of species	7	7	6	4	5	5	12	11	8
Total	5,850	6,200	6,475	8,800	4,225	3,900	4,980	4,610	5,680

(Source: JICA Study Team)

Table-1(2) Results of phyto-plankton survey (Dry season)

(29/January/2013)

(Unit: cells/L)

Species	SP.1			SP.2			SP.3		
	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth (m)	0.5	5.0	9.0	0.5	5.0	9.0	0.5	4.5	8.0
CHLOROPHYTA									
1 <i>Cosmarium</i> sp.									
CYANOPHYTA									
2 <i>Nostoc</i> sp.	50								
HETEROKONTOPHYTA									
3 <i>Coscinodiscus</i> sp.	250	150	225	50		100	200	175	225
4 <i>Rhizosolenia</i> sp.	150	650	675		125	150	675	575	475
5 <i>Biddulphia</i> sp.	700	2,725	8,375	775	650	450	6,475	3,875	425
6 <i>Thalassiothrix</i> sp.	1,100	1,575	825	400	950	1,425	1,575	875	1,250
7 <i>Nitzschia</i> sp.		325	350						
8 <i>Surirella</i> sp.							100		
N. of species	5	5	5	3	3	4	5	4	4
Total	2,250	5,425	10,450	1,225	1,725	2,125	9,025	5,500	2,375

Species	SP.4			SP.5			Average		
	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth (m)	0.5	7.8	14.6	0.5	7.8	14.6	-	-	-
CHLOROPHYTA									
1 <i>Cosmarium</i> sp.						25			5
CYANOPHYTA									
2 <i>Nostoc</i> sp.							10		
HETEROKONTOPHYTA									
3 <i>Coscinodiscus</i> sp.	50	125	225	300	125	150	155	150	165
4 <i>Rhizosolenia</i> sp.	175	75	925	175	75	325	385	320	340
5 <i>Biddulphia</i> sp.	600	1800	2025	1925	700	1350	2,115	2,195	2,260
6 <i>Thalassiothrix</i> sp.	1175	4400	1550	1575	1025	1975	1,160	1,875	1,300
7 <i>Nitzschia</i> sp.								65	70
8 <i>Surirella</i> sp.							20		
N. of species	4	4	5	4	4	4	6	5	6
Total	2,000	6,400	4,725	3,975	1,925	3,825	3,845	4,605	4,140

(Source: JICA Study Team)

2) Zoo-plankton

Table-2(1) Results of zoo-plankton survey (Rainy season)

(6 - 7/October/2012)) (Unit: Individual/m³)

Species	SP.1		SP.2		SP.3	
	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1
COELENTERATA						
1 <i>Pleurobrachia</i> sp.	1		4	2	1	
MOLLUSCA						
2 Bivalve larvae		1			40	
ANNELIDA						
3 <i>Sagitta</i> sp.	57	153	160	282	42	14
ARTHROPODA						
4 Copepoda	120	600	560	520	140	154
5 Caridea	30					
6 <i>Acetes</i> sp.		38				
7 Lucifer	5		12			
8 Shrimp larvae			7	28	2	5
9 Crab Zoea		1	1	5	4	
10 Mysidae						3
VERTEBRATA						
11 Fish larvae			12		3	
N. of species	5	5	7	5	7	4
Total	213	793	756	837	232	176

Species	SP.4		SP.5		Average	
	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1
COELENTERATA						
1 <i>Pleurobrachia</i> sp.	2	2	2	1	2	1
MOLLUSCA						
2 Bivalve larvae					8	
ANNELIDA						
3 <i>Sagitta</i> sp.	27	68	48	96	67	123
ARTHROPODA						
4 Copepoda	320	308	1,060		440	316
5 Caridea					6	
6 <i>Acetes</i> sp.	4	18	17	20	4	15
7 Lucifer	6		6	1	6	
8 Shrimp larvae	3		34		9	7
9 Crab Zoea	1	2	1	326	1	67
10 Mysidae		21		15		8
VERTEBRATA						
11 Fish larvae					3	
N. of species	7	6	7	6	10	7
Total	363	419	1,168	459	546	537

(Source: JICA Study Team)

Table-2(2) Results of zoo-plankton survey (Dry season)

(29/January/2013)

(Unit: Individual/m³)

Species	SP.1		SP.2		SP.3	
	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1
MOLLUSCA						
1 Gastropod					1	
2 Sepia Larvae						
ANNELIDA						
3 <i>Sagitta</i> sp.	36	120	124	135	8	85
ARTHROPODA						
4 Copepoda	406	683	1,216	760	934	458
5 <i>Acetes</i> sp.	1		5		17	
6 Daphnia	124	17	44		3	8
7 Lucifer			10	2	11	
8 Shrimp larvae		37	25	32	22	39
9 Lobster larvae						
10 Crab zoea		9	3	3	7	4
VERTEBRATA						
11 <i>Cynoglossus</i> larvae						4
12 Fish larvae		7	2			4
N. of species	4	6	8	5	8	7
Total	567	898	1,429	994	1,003	602

Species	SP.4		SP.5		Average	
	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1	0 <- 5	5 <- B+1
MOLLUSCA						
1 Gastropod						
2 Sepia Larvae	1				0	
ANNELIDA						
3 <i>Sagitta</i> sp.		87	312	210	96	127
ARTHROPODA						
4 Copepoda		927	4,976	248	1,506	615
5 <i>Acetes</i> sp.					5	
6 Daphnia		13	82	28	51	13
7 Lucifer			37	2	12	1
8 Shrimp larvae	6	8	6	10	12	25
9 Lobster larvae	3				1	
10 Crab zoea		6	7	2	3	5
VERTEBRATA						
11 <i>Cynoglossus</i> larvae						1
12 Fish larvae		3	5	2	1	3
N. of species	3	6	7	7	6	6
Total	12	1,058	5,425	507	1,687	812

(Source: JICA Study Team)

(3) Benthos (Sea bottom)

Table-3(1) Results of the macro-benthos survey on the sea bottom (Rainy season)

(15/October/2012) (Unit: Individuals/m²)

Group	SP-1	SP-2	SP-3	SP-4	SP-5	Total
1 Gastropoda		2			30	6
2 Bivalvia	2	5	14	2	306	66
3 Polychaeta		10	2	14		5
4 Crustacea	1		2		2	1
Total	3	17	18	16	338	78

(Source: JICA Study Team)

Table-3(2) Results of the macro-benthos survey on the sea bottom (Dry season)

(28/January/2013) (Unit: Individuals/m²)

Species	SP-1	SP-2	SP-3	SP-4	SP-5	Total
Gastropoda						
1 <i>Mactra</i> sp.				2	1	1
Polychete						
2 <i>Duplex</i> sp.	5					1
3 <i>Nematode</i> sp.	1				89	18
4 <i>Lumbrineris</i> sp.		14	22	43		16
Total	6	14	22	45	90	35

(Source: JICA Study Team)

(4) Benthos (Mudflat)

Table-4(1) Results of the macro-benthos survey of the mudflats (Rainy season)

(November/2012) (Unit: Individuals/m²)

Group	Species	Area		
		Kutubdia	Dhalghata	Sonadia
Nematoda	Nematoda	1		
Gastropoda	<i>Umbonium vestiarium</i>		3	
	<i>Batillaria angulifera</i>	1		
	<i>Batillaria</i> sp.			1
	<i>Cerithidea cingulata</i>	1		23
	<i>Cerithidea quadrata</i>	1		
	<i>Nodilittorina thocchridos</i>			1
	<i>Polinices</i> sp.		1	
	<i>Oliva carneola</i>		1	
	<i>Heliacus areola</i>			1
	<i>Atrina</i> sp.		13	
Bivalve	<i>Mactra</i> sp.		2	1
	<i>Barbatia bistrigata</i>	1		
	<i>Anadara antiquate</i>		1	
	<i>Anadara nodifera</i>	1		
	<i>Scapharca pilula</i>	1		
	<i>Anadara scapha</i>		1	

Group	Species	Area		
		Kutubdia	Dhalghata	Sonadia
	<i>Atrina vexillum</i>	1		
	<i>Apolymetis edentula</i>	1		
	<i>Apolymetis identula</i>		1	
	<i>Donax carinatus</i>		1	
	<i>Tellina tenuis</i>		1	
	<i>Sanguinolaria acuminata</i>			1
	<i>Dosivia variegata</i>	1		
Polycheta	Unidentified			4
	<i>Lumbrinereis</i> sp.	1		
	Unidentified		3	10
Number of species		11	11	8
Total		11	28	42

(Source: JICA Study Team)

Table-4(2) Results of the macro-benthos survey of the mudflats (Dry season-1)

(January/2013)

(Unit: Individuals/m²)

Group	Species	Area		
		Kutubdia	Dhalghata	Sonadia
Gastropoda	<i>Umbonium vestiarium</i>		16	
	<i>Pythia</i> sp.		2	
	<i>Cerithium</i> sp.		22	
	<i>Thais</i> sp.		1	
	<i>Bullia</i> sp.		6	
	<i>Telescopium</i> sp.		4	
Bivalve	<i>Cerithudea cingulata</i>	9		
	<i>Donax carinatus</i>		23	
	<i>Mactra</i> sp.		28	
	<i>Tellina tenuis</i>		10	
	<i>Barbatia bistrigata</i>		2	
	<i>Pholas</i> sp.		1	
Polychaete	<i>Nematode</i> sp.	14		37
Number of species		2	11	1
Total		23	115	37

(Source: JICA Study Team)

Table-4(3) Results of the macro-benthos survey of the mudflats (Dry season-2)

(March/2013)

(Unit: Individuals/m²)

Group	Species	Area		
		Kutubdia	Dhalghata	Sonadia
Gastropod	<i>Rhinoclavis</i> sp.		45	
	<i>Batillaria</i> sp.		1	
	<i>Umbonium vestiarium</i>	3	8	
	Unidentified gastropod larvae			2
Bivalve	<i>Dosinia</i> sp.		2	
	<i>Trachycardium</i> sp.	8	1	

Group	Species	Area		
		Kutubdia	Dhalghata	Sonadia
	<i>Scapharsa</i> sp.		2	
	<i>Mactra</i> sp.	6	1	
	<i>Tellina</i> sp.		15	
	<i>Donax</i> sp.	5	2	
Polychete	<i>Lycasteries indica</i>			32
	<i>Nereis</i> sp			66
	<i>Lumbrineris</i> sp.	68		284
	Unidentified species			31
Sipuncula	Unidentified species			62
Arthropoda	Sepia larvae			6
Number of species		5	9	7
Total		90	77	452

(Source: JICA Study Team)

(5) Fish and Nekton

Table-5(1) Results of the fish and nekton survey (Rainy season)

(16/November/2012)

(Unit: N=Individuals/haul, W=g/haul)

Species	Dhalghata		Matarbari		Sonadia		Kutubdia		
	N	W	N	W	N	W	N	W	
DECAPODIFORMES									
1	<i>Sepia</i> sp.	2	24.96			8	99.84		
2	<i>Loligo</i> sp.	5	16.35	2	3.27	65	212.55	1	3.27
STOMATOPODA									
3	<i>Squilla</i> sp.	17	13.09			357	274.89	148	113.96
DECAPODA									
4	<i>Solenocera</i> sp.					68	992.80		
5	<i>Metapenaeus lysianassa</i>			30	42.60	65	95.36	10	14.20
6	<i>Metapenaeus monoceros</i>	61	100.65	68	112.20				
7	<i>Parapenaeopsis sculptilis</i>							98	230.30
8	<i>Acetes</i> sp.					424	42.01	616	141.68
9	<i>Exopalaemon peliferus</i>							61	59.78
10	<i>Exopalaemon styliferus</i>	187	287.98	213	328.02	14	9.55		
BRACHYURA									
11	<i>Matuta planipes</i>					8	3.04		
12	<i>Charybdis natator</i>					166	141.10	14	11.90
13	<i>Scylla</i> sp.			1	14.55				
14	<i>Acanthopotamon martensi</i>	7	28.08	11	55.88				
OSTEICHTHYES									
15	<i>Pisodonophis boro</i>	1	7.97	1	7.97	1	7.97		
16	<i>Harpadon nehereus</i>					785	2,001.75	362	923.10
17	<i>Coilia dussumieri</i>					10	10.21		
18	<i>Coilia peliferus</i>							5	17.00
19	<i>Setipinna phasa</i>							1	26.04
20	<i>Stolephorus tri</i>	100	150.00	3	4.50	30	16.62		
21	<i>Liza</i> sp.	4	29.96	7	52.43				
22	<i>Valamugil speigleri</i>	1	10.70	2	21.40				
23	<i>Strongylura strongylura</i>			6	11.52				
24	<i>Ambassis</i> sp.			1	3.98				
25	<i>Boleophthalmus viridis</i>	2	6.26						
26	<i>Eleutheronema tetradactylum</i>	1	7.61						
27	<i>Glossogobius giuris</i>	24	96.48	15	60.30				
28	<i>Lates calcarifer</i>			2	110.06				
29	<i>Lepturacanthus savala</i>					17	242.25	2	28.50
30	<i>Lutjanus johnii</i>	1	0.86	1	0.86	26	22.36		
31	<i>Odontamblyopus rubicundus</i>	14	78.96	1	5.64	2	1.44		
32	<i>Pampus argenteus</i>					1	1.50		
33	<i>Polynemus paradiseus</i>							3	45.42
34	<i>Scatophagus argus</i>			1	23.66				
35	<i>Sillago domina</i>							1	17.69
36	<i>Trypauchen vagina</i>	7	19.32	9	24.84	1	2.70		
37	<i>Pseudapocryptes elongates</i>	1	9.12	2	18.24				
38	<i>Terapon jarbua</i>	35	573.65	11	180.29				
39	<i>Cynoglossus cynoglossus</i>	1	3.32						
40	<i>Cynoglossus lingua</i>					1	1.88		

Species		Dhalghata		Matarbari		Sonadia		Kutubdia	
		N	W	N	W	N	W	N	W
41	<i>Paraplagusia bilineata</i>	1	8.48			4	54.20		
42	<i>Arius</i> sp.					1	2.70	3	40.72
43	<i>Syngnathoides</i> sp.	4	5.72						
44	<i>Chelonodon patoca</i>					6	13.58		
Total		476	1,479.52	387	1,082.21	2,060	4,250.30	1,325	1,673.56
Number of species		21		20		22		14	

(Source: JICA Study Team)

Table-5(2) Results of the fish and nekton survey (Dry season-1)

(17/January/2013)

(Unit: N=Individuals/haul, W=g/haul)

Species		Dhalghata		Matarbari		Sonadia		Kutubdia	
		N	W	N	W	N	W	N	W
DECAPODIFORMES									
1	<i>Sepia</i> sp.	10	152.77	2	7.85			4	61.11
2	<i>Histioteuthis celelaria pacifica</i>					14	30.73		
3	<i>Loligo</i> sp.	3	25.45	17	168.42	2	13.96		
OCTOPODIFORMES									
4	<i>Octopus</i> sp.	3	25.22						
STOMATOPODA									
5	<i>Orantosquilla inornata</i>	6	20.87	112	371.99				
6	<i>Squilla</i> sp.							42	292.22
DECAPODA									
7	<i>Solenocera melantho</i>			61	87.84				
8	<i>Solenocera</i> sp.					10	3.83		
9	<i>Penaeus affinis</i>	2	0.29	11	1.97				
10	<i>Penaeus merguensis</i>	1	11.46						
11	<i>Penaeus semisulcatus</i>			10	13.10				
12	<i>Penulirus</i> sp.							17	3.58
13	<i>Metapenaeus brevicornis</i>					2	0.98	14	56.70
14	<i>Metapenaeus lysianassa</i>					24	8.65	70	72.10
15	<i>Metapenaeus monoceros</i>	103	232.75					51	23.29
16	<i>Metapenaeus tenuipes</i>	11	25.80	12	5.48				
17	<i>Trachypenaeus</i> sp.					43	28.02		
18	<i>Acetes</i> sp.	243	27.86	5,020	379.85	254	19.22	3,720	281.48
19	<i>Panulirus ornatus</i>	1	0.44	3	2.01				
BRACHYURA									
20	<i>Matuta planipes</i>			117	226.55	15	11.15	16	11.89
21	<i>Scylla olivacea</i>			56	10.64			29	5.51
22	<i>Portunus sanguinolentus</i>	28	213.83						
OSTEICHTHYES									
22	<i>Gymnothorax punctatus</i>							1	357.00
23	<i>Congresox talabonoides</i>							1	0.39
24	<i>Muraenesox bagio</i>							1	1.24
25	<i>Thyrsoidea macruna</i>			6	3.01				
26	<i>Harpadon nehereus</i>	7	48.51	71	272.78			9	13.96
27	<i>Pellona dichella</i>	20	107.79						
28	<i>Sardinella fimbriata</i>							6	12.68
29	<i>Sardinella melanura</i>			19	9.69			1	0.49

Species	Dhalghata		Matarbari		Sonadia		Kutubdia	
	N	W	N	W	N	W	N	W
30			1	1.60	5	11.71		
31	74	295.65	14	13.55			4	8.78
32					9	15.88		
33	2	24.09					1	4.79
34							1	3.79
35			153	96.90			25	15.83
36	1	1.86						
37	57	65.45	7	9.76			2	1.83
38			2	0.76	2	0.51		
39	1	3.85	2	2.35				
40			1	2.42	1	1.28		
41	1	7.21	13	12.39			5	4.77
42			16	32.20				
43	25	58.80	72	44.78				
44	2	11.63			6	26.56	1	2.56
45			1	0.45				
46	8	16.04	3	4.94	14	23.04		
47	1	6.00	1	0.39				
48			52	576.59	4	13.45	18	60.53
49	12	91.70						
50	11	82.56	22	169.76	2	1.38	5	37.53
51	7	11.20			2	0.85	1	1.60
Total	640	1,569.08	5,877	2,530.02	409	211.20	4,045	1,335.65
Number of species	26		29		17		25	

(Source: JICA Study Team)

Table-5(3) Results of the fish and nekton survey (Dry season-2)

(March/2013)

(Unit: N=Individuals/haul, W=g/haul)

Species	Dhalghata		Matarbari		Sonadia		Kutubdia	
	N	W	N	W	N	W	N	W
DECAPODIFORMES								
1	<i>Sepia</i> sp.	3	9.84	1	67.62			
2	<i>Loligo</i> sp.	2	22.73	2	4.67	11	44.40	
OCTOPODIFORMES								
3	<i>Octopus</i> sp.	2	7.38			1	1.97	1
STOMATOPODA								
4	<i>Squilla</i> sp.	9	58.67	9	64.83	228	4.70	4
DECAPODA								
5	<i>Solenocera</i> sp.	2	5.35	14	24.59			
6	<i>Penaeus monodon</i>			9	51.67			
7	<i>Metapenaeus affinis</i>	5	43.31			3	2.29	
8	<i>Metapenaeus lysianassa</i>					13	4.98	5
9	<i>Parapenaeopsis hardwickii</i>			14	24.58			7
10	<i>Acetes</i> sp.	55	21.49	347	95.08	234	77.41	457
11	<i>Alpheus</i> sp.	2	0.68	3	2.59			1
BRACHYURA								
12	<i>Matuta planipes</i>	14	163.41	3	15.00			2
13	<i>Scylla olivacea</i>					21	22.01	99

Species		Dhalghata		Matarbari		Sonadia		Kutubdia	
		N	W	N	W	N	W	N	W
14	<i>Acthopotamon</i> sp.			55	9.00				
OSTEICHTHYES									
15	<i>Gymnothorax punctatus</i>			5	28.07				
16	<i>Lamnostoma orientalis</i>	1	10.79	2	13.63				
17	<i>Coilia desumeri</i>	16	35.83	23	75.34			7	30.57
18	<i>Thryssa hamiltoni</i>					34	61.71		
19	<i>Setipinna phasa</i>			2	16.77				
20	<i>Setipinna taty</i>	1	22.63			2	10.58	1	17.54
21	<i>Stelopherus tri</i>	2	9.94	15	26.90	2	2.59	9	14.78
22	<i>Surdinella gibbosa</i>					12	47.96		
23	<i>Securicola gora</i>					10	12.22		
24	<i>Harpodon neherus</i>	47	79.64	4	15.94			53	22.88
25	<i>Valamugil</i> sp.	1	4.18						
26	<i>Sillago domina</i>	1	3.34	1	4.91				
27	<i>Atropus atropas</i>			3	18.48	8	39.38		
28	<i>Lutjanus johnii</i>					3	2.11		
29	<i>Johnius argentatus</i>	2	3.01					6	18.60
30	<i>Otolithoides pama</i>			30	41.78			68	94.69
31	<i>Drepane punctata</i>							6	1.03
32	<i>Boleophthalmus boddarti</i>					1	1.06		
33	<i>Glossogobius</i> sp.					2	3.17		
34	<i>Odontamblyopus rubicundus</i>	4	6.59						
35	<i>Parapocryptes batoides</i>	6	6.70						
36	<i>Lepturacanthus savala</i>	7	34.54	3	22.30	10	98.38	2	10.43
37	<i>Scambaromorus guttatus</i>			1	2.64				
38	<i>Rastrelliger</i> sp.			1	5.10				
39	<i>Cynoglossus cynoglossus</i>	2	11.26			3	17.71		
40	<i>Cynoglossus lingua</i>	3	11.96	1	3.74				
41	<i>Chilondon patoca</i>	1	6.45	2	12.08	7	47.27		
42	Unidentified sp.1					46	45.03		
43	Unidentified sp.2					1	1.34		
Total		188	579.70	550	647.31	652	548.27	728	458.18
N.of species		23		24		21		16	

(Source: JICA Study Team)

Appendix-C15.5-3

Results of the survey on natural environment

(List of terrestrial wildlife in power plant site)

Table-1(1) Terrestrial flora (Power plant site; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local status	
1	<i>Abelmoschus esculentus</i> (L.) Moench.	Bhendi	Okra	Malvaceae	√						
2	<i>Acacia auriculiformis</i> Benth.	Akashmoni	Darwin black wattle	Mimosaceae	√	√	√				
3	<i>Acacia mangium</i> Willd.	Mangium	Wattle	Mimosaceae	√						
4	<i>Acanthes ilicifolius</i> L.	Hargoza	Holy-leaved acanthus	Acanthaceae				√			
5	<i>Achyranthes aspera</i> L.	Apang	Red chaff tree	Amaranthaceae		√	√	√			
6	<i>Aegiceras corniculatum</i> (L.) Blanco.	Koilsha		Myrsinaceae			√				
7	<i>Aegle marmlos</i> (L.) Corr. Serr.	Bel	Wood apple	Rutaceae		√	√				
8	<i>Ageratum conyzoides</i> (L.) L.	Ochunti	Goat weed	Asteraceae	√	√					
9	<i>Albizia lebbek</i> (L.) Benth.	Sirish	Parrot tree	Mimosaceae		√	√				
10	<i>Albizia saman</i> (Jacq.) Merr.	Raintree	Monkey pod	Mimosaceae	√						
11	<i>Alocasia cucullata</i> (Lour.) G. Don	Bishkachu	Chinese taro	Araceae	√						
12	<i>Alstonia macrophylla</i> Wall. Ex G. Don	Baro Chhatim	Devil's tree	Apocynaceae			√				
13	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Helencha	Alligator weed	Amaranthaceae	√						
14	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Chanchi	Sessile joyweed	Amaranthaceae		√					
15	<i>Amaranthus spinosus</i> L.	Katamaris	Spiny pigweed	Amaranthaceae		√					
16	<i>Amaranthus viridis</i> L.	Notey	Green pigweed	Amaranthaceae		√	√				

Table-1(1) Terrestrial flora (Power plant site; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local status	
17	<i>Ananus comosus</i> (L.) Merr.	Anaros	Pineapple	Bromeliaceae			√				
18	<i>Arecha catechu</i> L.	Supari	Arecha palm	Arecaceae	√						
19	<i>Artocarpus heterophyllus</i> Lam.	Kathal	Jack fruit	Moraceae		√	√				
20	<i>Averrhoa carambola</i> L.	Kamranga shim	Carambola apple	Fabaceae	√		√				
21	<i>Avicennia alba</i> Blume	Barabaen		Verbenaceae		√		√			
22	<i>Avicennia officinalis</i> L.	Baen		Verbenaceae		√		√			
23	<i>Bambusa tulda</i> Roxb.	Mitinga	Indian bamboo	Poaceae	√	√	√				
24	<i>Barringtonia acutangula</i> (L.) Gaertn.	Hijol	Indian oak	Lecythidaceae			√				
25	<i>Basella rubra</i> L.	Puishak	Indian Spinach	Basellaceae	√						
26	<i>Benincasa hispida</i> (Thumb.) Cogn.	Chalkumra	White gourd	Cucurbitaceae			√				
27	<i>Blumea lacera</i> (Burm. F.) Dc.	Barakukshima		Asteraceae		√					
28	<i>Bombax ceiba</i> L.	Simul	Red silk cotton tree	Bombacaceae			√				
29	<i>Borassus flabellifer</i> L.	Tal	Barb tree	Arecaceae	√		√				
30	<i>Bougainvillea glabra</i> Choisy	Baganbilas	Bougainvillea	Nyctaginaceae	√		√				
31	<i>Calamus guruba</i> Buch.-Ham.	Jalibet	Cane	Arecaceae	√					TH	
32	<i>Calotropis gigantea</i> (L.) Ait.f.	Akand	Shallow tree	Asclepiadaceae	√						
33	<i>Carica papaya</i> L.	Pepe	Papaya	Caricaceae	√	v	√				
34	<i>Cassia alata</i>	Dadmordon				√	√				
35	<i>Cassia fistula</i> L.	Sonalu	Burging fistula	Caesalpiniaceae	√						
36	<i>Centella asiatica</i> (L.) Urban	Thankuni	Indian pennywort	Apiaceae	√						

Table-1(1) Terrestrial flora (Power plant site; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local status	
37	<i>Cestrum nocturnum</i> L.	Hasna hena	Night jasmin	Solanaceae	√						
38	<i>Cheliocostus speciosus</i> (J.Koenig) Specht	Keumol, Tiatot	Canereed	Costaceae	√						
39	<i>Chrysopogon aciculatus</i> (retz.) Trin.	Premkata	Love grass	Poaceae			√				
40	<i>Citrus maxima</i> (Burm. F.)Merr.	Jambura	Pummelo	Rutaceae		√	√	√			
41	<i>Citrus aurantifolia</i> (Christm.)Swingle.	Lebu	Lime	Rutaceae	√						
42	<i>Cocos nucifera</i> L.	Nairkel	Coconut palm	Arecaceae	√	√					
43	<i>Colocasia esculenta</i> (L.) Schott	Kachu	Cocoyam	Araceae	√		√				
44	<i>Commelina benghalensis</i> L.	Kansira	Day flower	Commelinaceae	√						
45	<i>Corchorus olitorius</i> L.	Toshapat	Jute	Tiliaceae	√						
46	<i>Crotolaria juncea</i> L.	Shonpat	Sunn hemp	Fabaceae	√						
47	<i>Cynodon dactylon</i> (L.) Pers.	Durba grass	Star grass, Couch grass	Poaceae	√						
48	<i>Cyperus rotandus</i> L.	Mutha	Nut grass	Cyperaceae	√						
49	<i>Dalbergia sissoo</i> Dc.	Shishoo	Rosewood	Fabaceae	√						
50	<i>Delonix regia</i> (hook.) Raf.	Krishnachura	Peacock flower	Caesalpiniaceae	√						
51	<i>Erioglossum rubinosum</i> Bl.	Rirha		Sapindaceae	√						
52	<i>Eryngium foetidum</i> L.	Bilati dhone	Wild coriender	Apiaceae	√						
53	<i>Erythrina variegta</i> var. <i>picta</i> Maheshw.	Mandar	Indian coral tree	Fabaceae	√	√	√				
54	<i>Eucalyptus globulus</i> Labill	Globu eucalyptus		Myrtaceae	√	√	√				

Table-1(1) Terrestrial flora (Power plant site; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local status	
55	<i>Eupatorium antiquorum</i> L.	Tesramansa	Malayan spurge	Euphorbiaceae	√						
56	<i>Eyithrina suberosa</i> Roxb.	Madar		Fabaceae	√						
57	<i>Ficus hispida</i> L.f.	Dumur	opposite leave fig	Moraceae		√	√				
58	<i>Glycosmis pentaphylla</i> (Retz.) A.DC.	Ashsaora	Motar tree	Rutaceae	√						
59	<i>Gmelina arborea</i> Roxb.	Gamari	White teak	Verbenaceae		√					
60	<i>Heliotropium indicum</i> L.	Hatishur	Indian heliotrope	Boraginaceae	√						
61	<i>Hibiscus rosa sinensis</i> L.	Joba	China rose	Malvaceae	√	√	√				
62	<i>Ipomoea aquatica</i> Forssk.	Kolmi	Swamp cabbage	Convolvulaceae	√						
63	<i>Ipomoea fistulosa</i> Mart.ex Choisy	Dol kolmi		Convolvulaceae	√	√	√				
64	<i>Justicia gendarussa</i> Burm.f.	Jagatmadan	gendarussa	Acanthaceae	√						
65	<i>Lablab purpureus subsp. Bengalensis</i> (Jacq.) Verdc.	Bangla shim	Bean	Fabaceae	√						
66	<i>Lagernaria siceraria</i> (Molina) Standl.	Kadu	Club gourd	Cucurbitaceae	√						
67	<i>Lantana camara</i> L.	Lantana	Lantana	Verbenaceae	√						
68	<i>Leucaena leucocephala</i> (Lam.) de Wit	Ipil –Ipil	wild tamarind	Mimosaceae	√						
69	<i>Leucana leucocephala</i> (Lam.) de Wit	Epil-epil	Horse tamarind	Mimosaceae	√						
70	<i>Lindernia ciliata</i> (Colsmann) Pennell	Vuiokra	Fringed false pimpernel	Scrophulariaceae	√						

Table-1(1) Terrestrial flora (Power plant site; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local status	
71	<i>Ludwigia hyssopifolia</i> (G.Don) Exell.	Zaikura	Seedbox	Onagraceae	√	√	√				
72	<i>Malvaviscus arboreus</i> Dill.ex Cav.	Lanka joba	Tree malvaviscus	Malvaceae	√						
73	<i>Mangifera indica</i> L.	Aam	Mango	Anacardiaceae	√	√	√				
74	<i>Melastoma malabathricum</i> L.	Datranga	Indian rhoddodendron	Melastomataceae	√						
75	<i>Melia azederach</i> L.	Ghoranim	Bead tree	Meliaceae		√	√				
76	<i>Mikania micrantha</i> kunth	Asamlata	heartleaf	Asteraceae		√					
77	<i>Mimosa pudica</i> L.	Lajjabati	Sensitive plant	Mimosaceae	√						
78	<i>Momordica charantia</i> L. var. <i>Charantia</i>	Tita corolla	Bitter melon	Cucurbitaceae		√	√				
79	<i>Moringa olifera</i> Lam.	Sajna	Horse radish tree	Moringaceae	√	√	√				
80	<i>Musa itinerans</i> Cheesman	Atikola	Banana	Musaceae	√						
81	<i>Musa paradisiaca</i> L.	Kacha kola	banana	Musaceae	√	√	√				
82	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajur	Date sugar palm	Arecaceae	√		√				
83	<i>Phyllanthus acidus</i> (L.) Skeels	Horboroi	Country gooseberry	Euphorbiaceae			√				
84	<i>Phyllanthus emblica</i> L.	Amloki	Indian gooseberry	Euphorbiaceae	√						
85	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Khoibabla	Madras thron	Mimosaceae	√						
86	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Debdaru	Cemetry tree	Annonaceae	√						

Table-1(1) Terrestrial flora (Power plant site; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local status	
87	<i>Pongamia pinnata</i> (L.) Pierre	Koronja	indian beach	Fabaceae		√	√				
88	<i>Psidium guajava</i> L.	Peyara	Guava	Myrtaceae	√	√					
89	<i>Psophocarpus tetragonolobus</i> (L.) DC.	Kamranga shim	Goa bean	Fabaceae	√						
90	<i>Ricinus communis</i> L.	Verenda	Castor	Euphorbiaceae	√						
91	<i>Scoparia dulcis</i> L.	Bondhoney	Sweet broom	Scrophulariaceae	√						
92	<i>Sesbania sesban</i> (L.) Merr	Dhaincha	Common sesban	Fabaceae	√						
93	<i>Sida acuta</i> Burm.f.	Kureta	Spinyhead sida	Malvaceae	√						
94	<i>Snedrella nodiflora</i> (L.) gaertn.	Relanodi	Nodeweed	Asteraceae	√						
95	<i>Solanum americanum</i> Mill.	Tit begun		Solanaceae			√				
96	<i>Solanum melongena</i> L.	Begun	Brinjal	Solanaceae			√				
97	<i>Spilanthus acmella</i> (L.) L.	Marhatitika		Asteraceae		√					
98	<i>Spondius pinnata</i> (L.f.) kurz	Amra	Hog-plum	Anacardiaceae	√						
99	<i>Sterculia foetida</i> L.	Udal	Wild almond	Sterculiaceae	√						
100	<i>Streblus asper</i> lour.	Shaora	toothbrush tree	Moraceae	√						
101	<i>Swietenia mahagoni</i> (L.) Jacq.	Mahogany	Spanish mahogany	Meliaceae		√	√				
102	<i>Tamarindus indica</i> L.	Tetul	Tamarind tree	Tamaricaceae	√		√				
103	<i>Terminalia arjuna</i> (Roxb.ex Dc.) Wight& Arn.	Arjun	Arjun	Combretaceae	√						
104	<i>Trichosanthes cordata</i> Roxb.	Data chichinga	Snake guard	Cucurbitaceae	√					TH	
105	<i>Urena lobata</i> L.	Batapuran	Aramina fibre	Malvaceae	√						

Table-1(1) Terrestrial flora (Power plant site; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local status	
106	<i>Vernonia elliptica</i> DC.	Patavernon	Curtain creeper	Asteraceae	√						
107	<i>Vigna unguiculata</i> (L.) Walp.	Borboti	Yard long bean	Fabaceae	√						
108	<i>Vitex negundo</i> L.	Nishinda	Chaste tree	Verbenaceae		√					
109	<i>Ziziphus mauritiana</i> Lam.	Kul	Plum	Rhamnaceae	√		√				

(Source: JICA Study Team)

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
1	<i>Acacia auriculiformis</i> Benth.	Akashmoni	Darwin black wattle	Mimosaceae	√	√	√		-		
2	<i>Acacia mangium</i> Willd.	Mangium	Wattle	Mimosaceae	√				-		
3	<i>Acanthes ilicifolius</i> L.	Hargoza	Holy-leaved acanthus	Acanthaceae				√	-		
4	<i>Achyranthes aspera</i> L.	Apang	Red chaff tree	Amaranthaceae		√	√	√	-		
5	<i>Aegiceras corniculatum</i> (L.) Blanco.	Koilsha		Myrsinaceae			√		-		
6	<i>Aegle marmlos</i> (L.) Corr. Serr.	Bel	Wood apple	Rutaceae		√	√		-		
7	<i>Ageratum conyzoides</i> (L.) L.	Ochunti	Goat weed	Asteraceae	√	√			-		
8	<i>Albizia lebbek</i> (L.) Benth.	Sirish	Parrot tree	Mimosaceae	√				-		
9	<i>Albizia saman</i> (Jacq.) Merr.	Raintree	Monkey pod	Mimosaceae	√				-		
10	<i>Allium cepa</i> L.	Piaj	Onion	Liliaceae		√			-		
11	<i>Allium sativum</i> L.	Rusun	Garlic	Liliaceae		√			-		
12	<i>Alocasia cucullata</i> (Lour.) G. Don	Bishkachu	Chinese taro	Araceae	√				-		
13	<i>Alstonia macrophylla</i> Wall. Ex G. Don	Baro Chhatim	Devil's tree	Apocynaceae			√		-		
14	<i>Alternanthera sessilis</i> (L.) R.Br.ex DC.	Chanchi	Sessile joyweed	Amaranthaceae		√			-		

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
15	<i>Amaranthus tricolor</i> L.	Lalshak	Josep's coat	Amaranthaceae		√			-		
16	<i>Amaranthus viridis</i> L.	Notey	Green pigweed	Amaranthaceae					-		
17	<i>Ananus comosus</i> (L.) Merr.	Anaros	Pineapple	Bromeliaceae			√		-		
18	<i>Arecha catechu</i> L.	Supari	Arecha palm	Arecaceae	√				-		
19	<i>Artocarpus heterophyllus</i> Lam.	Kathal	Jack fruit	Moraceae		√	√		-		
20	<i>Averrhoa carambola</i> L.	Kamranga shim	Carambola apple	Fabaceae	√		√		--		
21	<i>Avicennia alba</i> Blume	Barabaen		Verbenaceae		√		√	-		
22	<i>Avicennia officinalis</i> L.	Baen		Verbenaceae		√		√	-		
23	<i>Bambusa tulda</i> Roxb.	Mitinga	Indian bamboo	Poaceae	√	√	√		-		
24	<i>Barringtonia acutangula</i> (L.) Gaertn.	Hijol	Indian oak	Lecythidaceae			√		-	TH	
26	<i>Benincasa hispida</i> (Thumb.) Cogn.	Chalkumra	White gourd	Cucurbitaceae			√		-		
27	<i>Blumea lacera</i> (Burm. F.) Dc.	Barakukshima		Asteraceae		√			-		
28	<i>Bombax ceiba</i> L.	Simul	Red silk cotton tree	Bombacaceae			√		-		
29	<i>Borassus flabellifer</i> L.	Tal	Barb tree	Arecaceae	√		√		-		
30	<i>Bougainvillea glabra</i> Choisy	Baganbilas	Bougainvillea	Nyctaginaceae	√		√		-		
31	<i>Brassica juncea</i> (L.) Czern.	Raisarisha	Chinese mustard	Brassicaceae		√			-		
32	<i>Brassica oleracea</i> var. <i>botrytis</i> L.	Phulkofi	Cauliflower	Brassicaceae		√			-		
33	<i>Brassica oleracea</i> var. <i>capitata</i> L.	Bandhakofi	Cabbage	Brassicaceae		√			-		

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
34	<i>Calamus guruba</i> Buch.-Ham.	Jalibet	Cane	Arecaceae	√				-	TH	
35	<i>Calotropis gigantea</i> (L.) Ait.f.	Akand	Shallow tree	Asclepiadaceae	√				-		
36	<i>Carica papaya</i> L.	Pepe	Papaya	Caricaceae	√	V	√		-		
37	<i>Cassia alata</i>	Dadmordon				√	√		-		
38	<i>Cassia fistula</i> L.	Sonalu	Burging fistula	Caesalpiniaceae	√				-		
39	<i>Centella asiatica</i> (L.) Urban	Thankuni	Indian pennywort	Apiaceae	√				-		
40	<i>Cestrum nocturnum</i> L.	Hasna hena	Night jasmin	Solanaceae	√				-		
41	<i>Cheliocostus speciosus</i> (J.Koenig) Specht	Keumol, Tiatot	Canereed	Costaceae	√				-		
42	<i>Chrysopogon aciculatus</i> (retz.) Trin.	Premkata	Love grass	Poaceae			√		-		
43	<i>Citrus maxima</i> (Burm. F.)Merr.	Jambura	Pummelo	Rutaceae		√	√	√	-		
44	<i>Citrus aurantifolia</i> (Christm.)Swingle.	Lebu	Lime	Rutaceae	√				-		
45	<i>Cocos nucifera</i> L.	Nairkel	Coconut palm	Arecaceae	√	√			-		
46	<i>Colocasia esculenta</i> (L.) Schott	Kachu	Cocoyam	Araceae			√		-		
47	<i>Crotolaria juncea</i> L.	Shonpat	Sunn hemp	Fabaceae	√				-		
48	<i>Crotolaria pallida</i> Aiton	Jhunjhuni		Fabaceae		√			-		
49	<i>Cucurbita maxima</i> Duchesne	Kumra	Sweet gourd	Cucurbitaceae		√			-		

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
50	<i>Dalbergia sissoo</i> Dc.	Shishoo	Rosewood	Fabaceae	√				-		
51	<i>Delonix regia</i> (hook.) Raf.	Krishnachura	Peacock flower	Caesalpiniaceae	√				-		
52	<i>Erioglossum rubiginosum</i> Bl.	Rirha		Sapindaceae	√				-		
53	<i>Eryngium foetidum</i> L.	Bilati dhone	Wild coriender	Apiaceae	√				-		
54	<i>Erythrina variegata</i> var. <i>picta</i> Maheshw.	Mandar	Indian coral tree	Fabaceae	√	√	√		-		
55	<i>Eucalyptus globulus</i> Labill	Globu eucalyptus		Myrtaceae	√	√	√		-		
56	<i>Eupatorium antiquorum</i> L.	Tesramansa	Malayan spurge	Euphorbiaceae	√				-		
57	<i>Eyithrina suberosa</i> Roxb.	Madar		Fabaceae	√				-		
58	<i>Ficus hispida</i> L.f.	Dumur	opposite leave fig	Moraceae		√	√		-		
59	<i>Glycosmis pentaphylla</i> (Retz.) A.DC.	Ashsaora	Motar tree	Rutaceae	√				-		
60	<i>Gmelina arborea</i> Roxb.	Gamari	White teak	Verbenaceae		√			-		
61	<i>Heliotropicum indicum</i> L.	Hatishur	Indian heliotrope	Boraginaceae	√				-		
62	<i>Hibiscus rosa sinensis</i> L.	Joba	China rose	Malvaceae	√	√	√		-		
63	<i>Ipomoea aquatica</i> Forssk.	Kolmi	Swamp cabbage	Convolvulaceae	√				-		
64	<i>Ipomoea fistulosa</i> Mart.ex Choisy	Dol kolmi		Convolvulaceae	√	√	√		-		
65	<i>Jatropha curcas</i> L.	Bon verenda	Poison nut	Euphorbiaceae		√			-		

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
66	<i>Justicia gendarussa</i> Burm.f.	Jagatmadan	gendarussa	Acanthaceae	√				-		
67	<i>Lablab purpureus</i> subsp. <i>Bengalensis</i> (Jacq.) Verdc.	Bangla shim	Bean	Fabaceae	√				-		
68	<i>Lagernaria siceraria</i> (Molina) Standl.	Kadu	Club gourd	Cucurbitaceae	√				-		
69	<i>Lantana camara</i> L.	Lantana	Lantana	Verbenaceae	√				-		
70	<i>Lepisanthes rubiginosa</i> (Roxb.) Leenh.	Rubihorina	Rusty Sapindus	Sapindaceae	√				-	TH	
71	<i>Leucaena leucocephala</i> (Lam.) de Wit	Ipil –Ipil	wild tamarind	Mimosaceae	√				-		
72	<i>Leucana leucocephala</i> (Lam.) de Wit	Epil-epil	Horse tamarind	Mimosaceae	√				-		
73	<i>Ludwigia hyssopifolia</i> (G. Don) Exell.	Zaikura	Seedbox	Onagraceae	√	√	√		-		
74	<i>Malvaviscus arboreus</i> Dill. ex Cav.	Lanka joba	Tree malvaviscus	Malvaceae	√				-		
75	<i>Mangifera indica</i> L.	Aam	Mango	Anacardiaceae	√	√	√		-		
76	<i>Melastoma malabathricum</i> L.	Datranga	Indian rhoddodendron	Melastomataceae	√				-		
77	<i>Melia azederach</i> L.	Ghoranim	Bead tree	Meliaceae		√	√		-		
78	<i>Mikania micrantha</i> Kunth	Asamlata	heartleaf	Asteraceae		√			-		

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
79	<i>Mimosa pudica</i> L.	Lajjabati	Sensitive plant	Mimosaceae	√				-		
80	<i>Momordica charantia</i> L. var. <i>charantia</i>	Tita corolla	Bitter melon	Cucurbitaceae		√	√		-		
81	<i>Moringa olifera</i> Lam.	Sajna	Horse radish tree	Moringaceae	√	√	√		-		
82	<i>Musa itinerans</i> Cheesman	Atikola	Banana	Musaceae	√				-		
83	<i>Musa paradisiaca</i> L.	Kacha kola	banana	Musaceae	√	√	√		-		
84	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajur	Date sugar palm	Arecaceae	√		√		-		
85	<i>Phyllanthus acidus</i> (L.) Skeels	Horboroi	Country gooseberry	Euphorbiaceae			√		-		
86	<i>Phyllanthus emblica</i> L.	Amloki	Indian gooseberry	Euphorbiaceae	√				-		
87	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Khoibabla	Madras thron	Mimosaceae	√				-		
88	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Debdaru	Cemetry tree	Annonaceae	√				-		
89	<i>Pongamia pinnata</i> (L.) Pierre	Koronja	indian beach	Fabaceae		√	√		-		
90	<i>Porteresia coarctata</i> (Roxb.) Roberty	Dhani ghas		Poaceae	√				-		
91	<i>Psidium guajava</i> L.	Peyara	Guava	Myrtaceae	√	√			-		
92	<i>Psophocarpus tetragonolobus</i> (L.)	Kamranga shim	Goa bean	Fabaceae	√				-		

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
	DC.										
93	<i>Raphanus sativus L.</i>	Mula	Radish	Brassicaceae		√			-		
94	<i>Ricinus communis L.</i>	Verenda	Castor	Euphorbiaceae	√				-		
95	<i>Scoparia dulcis L.</i>	Bondhoney	Sweet broom	Scrophulariaceae	√				-		
96	<i>Sesbania sesban (L.) Merr</i>	Dhaincha	Common sesban	Fabaceae	√				-		
97	<i>Solanum americanum Mill.</i>	Tit begun		Solanaceae			√		-		
98	<i>Solanum lycopersicum L.</i>	Tomato	Tomato	Solanaceae		√			-		
99	<i>Solanum melongena L.</i>	Begun	Brinjal	Solanaceae		√	√		-		
100	<i>Spondius pinnata(L.f.) kurz</i>	Amra	Hog-plum	Anacardiaceae	√				-		
101	<i>Sterculia foetida L.</i>	Udal	Wild almond	Sterculiaceae	√				-		
102	<i>Streblus asper lour.</i>	Shaora	toothbrush tree	Moraceae	√				-		
103	<i>Swietenia mahagoni (L.) Jacq.</i>	Mahogany	Spanish mahogany	Meliaceae		√	√		-		
104	<i>Tamarindus indica L.</i>	Tetul	Tamarind tree	Tamaricaceae	√		√		-		
105	<i>Tephrosia purpurea (L.) Pers.</i>	Bon-nil	Wild Indigo	Fabaceae	√				-		
106	<i>Terminalia arjuna (Roxb.ex Dc.) Wight& Arn.</i>	Arjun	Arjun	Combretaceae	√				-		
107	<i>Trichosanthes cordata Roxb.</i>	Data chichinga	Snake guard	Cucurbitaceae	√				-	TH	
108	<i>Urena lobata L.</i>	Batapuran	Aramina fibre	Malvaceae	√				-		

Table-1(2) Terrestrial flora (Power plant site; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)				Conservation Status		Remark
					Power plant area	Kutubdia Island	Mouth of Matarbari Channel	Sonadia Island	IUCN	Local	
109	<i>Vernonia elliptica</i> DC.	Patavernon	Curtain creeper	Asteraceae	√				-		
110	<i>Vigna unguiculata</i> (L.) Walp.	Borboti	Yard long bean	Fabaceae	√				-		
111	<i>Vitex negundo</i> L.	Nishinda	Chaste tree	Verbenaceae		√			-		
112	<i>Zea mays</i> L.	Bhutta	Maize	Poaceae		√			-		
113	<i>Ziziphus mauritiana</i> Lam.	Kul	Plum	Rhamnaceae	√		√		-		
114	<i>Zoysia matrella</i> (L.) Merr.	Baissa ghas	Manilla Grass	Poaceae	√				-		

(Source: JICA Study Team)

Table-2.1(1) Terrestrial Fauna (Insect) (Power plant site; Rainy season)

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Rainy Season)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local Status	
1	<i>Agriocnemis femina</i> (Brauer)	Narrow-winged Damselfly (Foring)	Bush bean (Near the pond)		√			-		Predator and Bioindicator
2	<i>Agriocnemis pygmaea</i> (Rambur)	Damselfly (Foring)	Common bean (Near the pond)	√	√	√		-		Predator and Bioindicator
3	<i>Ceriagrion cerinorubellum</i> (Brauer)	Damselfly (Foring)	Woods of vegetation	√	√	√		-		Predator and Bioindicator
4	<i>Tholymis</i> sp.	Evening Skimmer (Foring)	Woods of vegetation				√	-		Predator and Bioindicator
5	<i>Gryllus</i> spp.	Cricket (Urchunga)	Rice field	√	√	√	√	-		Agricultural pest
6	<i>Oxya chinensis</i> (Thunberg)	Small Rice Grasshopper (Ghas Foring)	Rice field	√	√	√	√	-		Agricultural pest
7	<i>Periplaneta Americana</i> Linn.	American Cockroach (Telapoka)	Restaurant	√	√	√	√	-		Household pest
8	<i>Agromyza</i> spp.	Miner flies	Bush bean	√	√	√	√	-		Leaf miner pest of vegetables
9	<i>Bactrocera cucurbitae</i> (Coquillett)	Melon fly	Bottle gourd	√		√		-		Pest of vegetables
10	<i>Eristalinus</i>	Hoverfly	Cucumber		√			-		Pollinator in

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Rainy Season)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local Status	
	<i>quinclineatus</i> (Fabricius)		field							most cases
11	<i>Episyrphus spp.</i>	Hover fly	Cucumber field		√			-		Predator and pollinator in most cases
12	<i>Musca domestica</i> Linn.	House fly	Restaurant	√	√	√		-		Pathogen carrier and pollinator in few cases
13	<i>Chrysomya megacephala</i> (Fabricius)	Oriental latrine fly	Dry fish	√	√	√		-		Pest of dry fish and pollinator in few cases
14	<i>Eurema hecabe contubernalis</i> Moore	Common Grass Yellow (Holud)	Common been	√	√	√		-		Pollinator in adult aged
15	<i>Delias descombesi descombesi</i> (Boisduval)	Red spot jezebel (Kanka)	Secondary forest	√		√		-		Pollinator in adult aged
16	<i>Junonia atlites</i> (Linn.)	Chandnori	Agricultural field	√	√	√		-		Pollinator in adult aged
17	<i>Melanitis phedima bela</i> Moore	Dark Evening Brown	Agricultural field	√	√	√		-		Pollinator in adult aged
18	<i>Parnara guttatus mangala</i> Moore	Straight Swift (Nillbijuri)	Snake gourd		√			-		Pollinator
19	<i>Oriens goloides</i> Moore	Smaller Darlet	Agricultural field		√			-		Pollinator
20	<i>Aulacophora foveicollis</i> Lucas	Red pumpkin beetle	Pumpkin field	√	√	√		-		Agricultural pest
21	<i>Aulacophora</i>	Pumpkin beetle	Pumpkin field	√	√	√		-		Agricultural

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Rainy Season)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local Status	
	<i>frontalis</i> Baly									pest
22	<i>Nephotettix cincticeps</i> Matsumura	Spotted jassid	Ficefield	√		√		-		Pest of rice
23	<i>Leptocorisa acuta</i> Thunb.	Rice bug	Rice field	√		√		-		Pest of rice
24	<i>Rhopalosiphum sp.</i>	Aphis	Common bean	√				-		Agricultural pest
25	<i>Amegilla</i> spp.		Brinjal	√		√		-		Pollinator
26	<i>Lasioglossum</i> sp.	Solitary Bee	Cucumber field	√	√	√		-		Pollinator And bioindicator
27	<i>Trigona</i> sp.	Sweat bee	Cucumber field	√				-		Pollinator
28	<i>Apis mellifera</i> Linn.	Western Honey bee (Momachhi)	Cucumber field	√		√	√	-		Pollinator and Bioindicator
29	<i>Micraspis crocea</i> (Mulsant)	Lady beetle	Rice	√	√	√		-		Rice pest

(Source: JICA Study Team)

Table-2.1(2) Terrestrial Fauna (Amphibians and Reptiles) (Power plant site; Rainy season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy Season)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
(Amphibians)										
1	<i>Duttaphrynus (Bufo) melanostictus</i>	Southeast Asian toad	Kono bang	√	√	√	√	LC		Very common throughout the county
2	<i>Euphlyctis cyanophlyctis</i>	Green Forq	Kotkoti bang	√	√	√		LC		Very common
3	<i>Fejervarya limnocharis</i>	Cricket frog		√	√	√		LC		Common
4	<i>Fejervarya sp</i>	Cricket frog			√	√				
5	<i>Hoplobatrachus tigerinus</i>	Bull frog	Kola bang, Sona bang, Bhawa beng	√	√	√	√	LC		Wide spread
6	<i>Sylvirana leptoglossa</i>	Cope's Assam Frog	Koper Ashami Bang		√	√		LC		
7	<i>Rana temporalis</i>	Bronzed Frog	Gaso Bang		√			LC		
(Reptiles)										
1	<i>Calotes versicolor</i>	garden lizard	Roktochusha	√	√	√			TH	
2	<i>Mabuya mabuya</i>	skink	Achil	√	√	√			TH	
3	<i>Gekko gekko</i>	Tokay Gecko	Tokkhak/ Tokhha	√	√	√	√		TH	
4	<i>Hemidactylus brooki</i>	house lizard	Tiktiki	√	√	√	√	NO		
5	<i>Hemidactylus frenatus</i> Schlegel in Duméril & Bibron, 1836	house lizard	Tiktiki	√	√	√	√			
6	<i>Melanochelys trijuga</i> (Schweigger, 1812)	Indian Black Turtle	Kalo Kossop	√	√	√	√			
7	<i>Geoclemys hamiltonii</i> (Gray, 1830)	Spotted Pond Turtle	Kalo Kasim	√	√	√		EN	TH	
8	<i>Pangshura tentoria</i>	Median Roofed	Majhari Kaitta	√	√	√			TH	

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy Season)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
	(Gray, 1834)	Turtle								
9	<i>Ahaetulla prasina</i> (Boie, 1827)	Common Vine snake	Laodoga Shap/sutanoli Shap		√					
10	<i>Xenocrophis piscator</i>	Checkered keel back	Dhora sap	√	√	√	√			
11	<i>Naja kaouthia</i> Lesson, 1831	Monocled Cobra	Jati Sap	√	√	√	√			
12	<i>Naja naja</i>	Bicled Cobra	Gokhra Shap	√	√	√	√		TH	
13	<i>Cerberus rynchops</i> (Schneider, 1799)	Dog faced water snake	Andha sap	√			√			
14	<i>Enhydris sieboldii</i> (Schlegel, 1837)	Siebold's Smooth Water Snake	Sibolder Joloj Shap	√	√	√	√			

(Source: JICA Study Team)

Table-2.1(3) Terrestrial Fauna (Birds) (Power plant site; Rainy season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
1	<i>Passer domesticus</i>	House Sparrow	Pati Chorui	√	√	√		-		
2	<i>Dicrurus macrocercus</i>	Black Drongo	Kala Fingey	√	√	√	√	-		
3	<i>Sturnus contra</i>	Pied Myna	Pakra Shalik/Gubra Shalik/Gu Shalik	√	√	√	√	-		
4	<i>Sturnus malabaricus</i>	Chestnut-tailed Starling	Khoiralej Kathshalik/Deshi Pawei	√	√	√	√	-		
5	<i>Acridotheres cinereus</i>	Pale-bellied Myna	Dholatola Shalik	√	√	√	√	-		
6	<i>Acridotheres tristis</i>	Common Myna	Bhat Shalik	√	√	√	√	-		
7	<i>Acridotheres fuscus</i>	Jungle Myna	Jhuti Sahlik	√	√	√	√	-		
8	<i>Gracula religiosa</i>	Common Hill Myna			√		√	-		
9	<i>Copsychus saularis</i>	Oriental Magpie-Robin	Doel/Udoi Doel	√	√	√	√	-		
10	<i>Orthotomus sutorius</i>	Common Tailorbird	Pati Tuntuni	√	√	√	√	-		
11	<i>Columba livia</i>	Common Pigeon	Gola Paira/Jalali Kabutor	√	√	√	√	-		
12	<i>Treron bicinctus</i>	Orange-breasted Green Pigeon	Komlabook Horial/Horikol	√	√	√	√	-		
13	<i>Streptopelia decaocto</i>	Eurasian Collared Dove	Eurashio Konthighughu/Raj Ghughu	√	√	√	√	-		
14	<i>Streptopelia chinensis</i>	Spotted Dove	Tila Ghughu		√		√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
15	<i>Treron phoenicopterus</i>	Yellow-footed Green Pigeon	Holdepa Horial/Botkol	√	√	√	√	-		
16	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Bangla Bulbul/Bulbuli	√	√	√	√	-		
17	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Shipahi Bulbul/Bulbuli	√		√	√	-		
18	<i>Corvus splendens</i>	House Crow	Pati Kak	√	√	√	√	-		
19	<i>Corvus macrorhynchos</i>	Jungle Crow	Dar Kak/Danr Kak	√	√	√	√	-		
20	<i>Oriolus xanthornus</i>	Black-hooded Oriole	Kalamatha Benebou/Holdey Pakhi	√	√	√	√	-		
21	<i>Artamus fuscus</i>	Ashy Woodswallow	Metey Bonababil/Latora	√	√	√	√	-		
22	<i>Dendrocitta vagabunda</i>	Rufous Treepie	Khoira Harichacha/ Hari Chacha	√	√	√	√	-		
23	<i>Dicaeum cruentatum</i>	Scarlet-backet Flowerpecker	Lalpith Fuljhuri	√	√	√	√	-		
24	<i>Dicaeum erythrorhynchos</i>	Pale-billed Flowerpecker	Metethot Fuljhuri	√	√	√	√	-		
25	<i>Dicaeum trigonostigma</i>	Orenge-bellied Flowerpecker	Komlapet Fuljhuri	√	√	√	√	-		
26	<i>Chalcoparia singalensis</i>	Ruby-cheeked Sunbird	Chunimukhi Moutushi	√	√	√	√	-		
27	<i>Leptocoma zeylonica</i>	Purple-rumped Sunbird	Begunikomor Moutushi	√	√	√	√	-		
28	<i>Cinnyris asiaticus</i>	Purple Sunbird	Beguni Moutushi	√	√	√	√	-		
29	<i>Aethopyga siparaja</i>	Crimson Sunbird	Shidure Moutushi	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
30	<i>Arachnothera magna</i>	Streaked Spiderhunter		√	√	√	√	-		
31	<i>Ploceus philippinus</i>	Baya Weaver	Deshi Babui/Baoi	√	√	√	√	-		
32	<i>Lonchura malabarica</i>	Indian Silverbill	Deshi Chandithot				√	-		
33	<i>Lonchura malacca</i>	Black-headed Munia	Kalamatha Munia	√	√	√	√	-		
34	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Tila Munia	√	√	√	√	-		
35	<i>Lonchura striata</i>	White-rumped Munia	Dholakomor Munia	√	√	√	√	-		
36	<i>Anthus rufulus</i>	Paddyfield Pipit	Dhani Tulika	√	√	√	√	-		
37	<i>Pellorneum ruficeps</i>	Puff-throated Bbler	Golafola Satarey	√	√	√	√	-		
38	<i>Zosterops palpebrosus</i>	Oriental White-eye	Udoi Dholachokh/Shet Ankhi	√	√	√	√	-		
39	<i>Prinia inornata</i>	Plain Prinia	Nirol Prina	√	√	√	√	-		
40	<i>Ficedula albicilla</i>	Taiga Flycatcher	Taiga Chutki/Lalbook Chotok	√	√	√	√	-		
41	<i>Aegithina tiphia</i>	Common Iora	Fatik Jal	√		√	√	-		
42	<i>Hypothymis azurea</i>	Black-naped Monarch	Kalaghar Rajon	√	√	√	√	-		
43	<i>Disrurus paradiseus</i>	Greater Racket-tailed Drongo	Boro Racket-Fingey/Bhimraj	√	√	√		-		
44	<i>Disrurus aeneus</i>	Bronzed Drongo	Fingey	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
45	<i>Rhipidura albicollis</i>	White-throated Fantail	Dholagola Chatighurani/Lej Nachuni	√	√	√	√	-		
46	<i>Alcedo atthis</i>	Common Kingfisher	Pati Machranga	√	√	√	√	-		
47	<i>Alcedo meninting</i>	Blue-eared Kingfisher	Neelkan Machranga	√	√	√	√	-		
48	<i>Halcyon smyrnensis</i>	White-throated kingfisher	Dholagoloa Machranga	√	√	√	√	-		
49	<i>Ceryle rudis</i>	Pied Kingfisher	Pakra Machranga	√	√	√		-		
50	<i>Upupa epops</i>	Eurasian Hoopoe	Pati Hoodhood	√	√	√		-		
51	<i>Dinopium bengalensis</i>	Lesser goldenback	Bangla kaththokra				√	-		
52	<i>Merops leschenaulti</i>	Chestnut-headed Bee-eater	Khoiramatha Shuichora	√	√	√	√	-		
53	<i>Merops philippinus</i>	Blue-tailed Bee-eater	Neel-lej Shuichora	√	√	√	√	-		
54	<i>Psittacula alexandri</i>	Red-breasted Parakeet	Modna Tia	√	√	√	√	-		
55	<i>Psittacula krameri</i>	Rose-ringed Parakeet	Shobuj Tia	√	√	√	√	-		
56	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	Asio Talbatashi/Nakka ti	√	√	√	√	-		
57	<i>Ketupa zeylonensis</i>	Brown Fish Owl	Khoira mechupacha/Bhotoom Pecha	√	√	√	√	-		
58	<i>Athene brama</i>	Spotted Owlet	Khuruley Pencha/Konthi Kutipecha		√		√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
59	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Lenja Ratchora	√		√		-		
60	<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish Eagle	Metemetha Kura Eagle					-		
61	<i>Spilornis Cheela</i>	Crested Serpent Eagle	Tila Nag-eegol/Shapkeheko Baj		√		√	-		
62	<i>Phalacrocorax niger</i>	Little Cormorant	Choto Pankouri	√	√	√	√	-		
63	<i>Phalacrocorax fuscicollis</i>	Indian Cormorant	Deshi Pankouri		√		√	-		
64	<i>Egretta garzetta</i>	Little Egret	Choto Boga	√	√	√	√	-		
65	<i>Egretta intermedia</i>	Yellow-billed Egret	Majhla Boga/Korche Bok		√			-		
66	<i>Casmerudias albus</i>	Great Egret	Boro Boga	√		√		-		
67	<i>Bubulcus ibis</i>	Cattle Egret	Go Boga	√	√	√	√	-		
68	<i>Ardeola bucchus</i>	Chinese Pond Heron	China Kanibok	√	√	√	√	-		
69	<i>Ardeola grayii</i>	Indian Pond Heron	Deshi Kanibok	√	√	√	√	-		
70	<i>Sterna aurantia</i>	River Tern	Nodia Panchil	√		√	√	-		
71	<i>Glareola lactea</i>	Small Pratincole	Choto Babubatan			√	√	-		
72	<i>Ardea cinerea</i>	Grey Heron	Dhupni Bok	√	√	√	√	-		
73	<i>Sterna albifrons</i>	Little Tern	Choto Panchil	√	√	√	√	-		
74	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Kalamatha Nishibok	√	√	√	√	-		
75	Migratory/Winter visitors							-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
76	<i>Pandion haliaetus</i>	Osprey	Machmural/Mech ubaj	√	√	√	√			
77	<i>Tadorna ferruginea</i>	Ruddy Shelduck	Khoira Chokachoki		√			-		
78	<i>Anas clypeata</i>	Northern Shoveler	Utturey Khuntehash/Panta mukhi				√	-		
79	<i>Jynx torquilla</i>	Eurasian Wryneck	Eureshio Gharbetha			√		-		
80	<i>Halcyon pileata</i>	Black-capped Kingfisher	Kalatupi Machranga		√			-		
81	<i>Todiramphus chloris</i>	Collared Kingfisher	Dholaghar Machranga	√	√	√		-		
82	<i>Porzana pusilla</i>	bailon's Crake	Bailoner Gurguri					--		
83	<i>Gallinago gallinago</i>	Common Snipe	Pati Chega				√	-		
84	<i>Gallinago stenura</i>	Pin-tailed Snipe	Lenja Chega		√		√	-		
85	<i>Limosa lapponica</i>	Bar-tailed Godwit	Dagilej Jurali			√	√	-		
86	<i>Limosa limosa</i>	Black-tailed Godwit	Kalalej jurali				√	-		
87	<i>Numenius arquata</i>	Eurasian Curlew	Eureshio Gulinda	√	√	√	√	-		
88	<i>Numenius phaeopus</i>	Whimbrel	Choto Gulinda			√		-		
89	<i>Tringa glareola</i>	Wood Sandpiper	Bon Batan/Balu Batan	√	√	√	√	-		
90	<i>Actitis hypoleucos</i>	Common Sandpiper	Pati Batan/Chapakhi	√	√	√	√	-		
91	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Bali Batan				√	-		
92	<i>Tringa guttifer</i>	Nordmann's Greenshank	Nordman Shabujpa				√	EN	TH	
93	<i>Tringa nebularia</i>	Common Greenshank	Pati Shabujpa			√	√	-		
94	<i>Tringa totanus</i>	Common Redshank	Pati Lalpa			√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
95	<i>Xenus cinereus</i>	Terek Sandpiper	Terek Batan				√	-		
96	<i>Arenaria interpres</i>	Ruddy Turnstone	Lal Nuribatan		√		√	-		
97	<i>Limnodromus semipalmatus</i>	Asian Dowitcher	Eshio Daucher				√	-		
98	<i>Calidris alba</i>	Sanderlin	Sanderlin		√		√	-		
99	<i>Calidris ferruginea</i>	Curlew Sandpiper	Gulinda Batan				√	-		
100	<i>Calidris minuta</i>	Little Stint	Choto Chaha				√	-		
101	<i>Calidris ruficollis</i>	Red-necked Stint	Lalghar Chaha				√	-		
102	<i>Calidris temminckii</i>	Timminck's Stint	Timinker Chaha		√	√	√	-		
103	<i>Calidris tenuirostris</i>	Graet Knot	Boro Noth				√	-		
104	<i>Himantopus himantopus</i>	Black-winged Stilt	Kalapakh Thengi/Lal pa Dhenga				√	-		
105	<i>Pluvialis fulva</i>	Pacific Golden Plover	Proshanto Shonajiria	√	√		√	-		
106	<i>Charadrius alexandrinus</i>	Kentish Plover	Kentish Jiria	√	√	√	√	-		
107	<i>Charadrius dubius</i>	Little Ring Plover	Choto Nothjiria	√		√		-		
108	<i>Charadrius leschenaultii</i>	Greater Sand Plover	Boro Dhuljiria	√	√	√	√	-		
109	<i>Charadrius mongolus</i>	Little Sand Plover	Choto Dhuljiria	√	√	√	√	-		
110	<i>Eurynorhynchus pygmeus</i>	Spoon-billed Sandpiper	Chamuchthuto Batan				√	CR	TH	
111	<i>Larus brunnicephalus</i>	Brown-headed Gull	Khoiramatha Gangchil	√	√	√	√	-		
112	<i>Larus ichthyaetus</i>	Great Black-headed Gull	Palasi Gangchil/Bara Jal	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
			Kabutor							
113	<i>Larus heuglini</i>	Heuglin's Gull	Heugliner Gangchil				√	-		
114	<i>Larus ridibundus</i>	Common Black-headed Gull	Kalamatha Gangchil				√	-		
115	<i>Sterna sumatrana</i>	Black-naped Tern	Kalaghar Panchil	√	√	√	√	-		
116	<i>Threskiornis melanocephalus</i>	Black-headed Ibis	Kalamatha Kastechora		√		√	-		

(Source: JICA Study Team)

Table-2.1(4) Terrestrial Fauna (Mammals) (Power plant site; Rainy season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy Season)				Conservation Status		Remarks
				Power Plant Area	Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
1	<i>Canis aureus</i> Linnaeus, 1758	Jackal	Shial	√	√	√	√	-		
2	<i>Felis chaus</i> Schreber 1777	Wild cat	Bon biral	√	√	√	√	-		
3	<i>Lutra lutra</i> (Linnaeus, 1758)	Common otter	Ud biral	√	√	√	√	-		
4	<i>Viverra zibetha</i> Linnaeus 1758	Large Indian Civet	Baghdas		√		√	-		
5	<i>Suncus murinus</i> Linnaeus, 1766	House shrew	Chika	√	√	√	√	-		
6	<i>Bandicota indica</i> (Bechstein, 1800)	Indian Mole rat	Indur	√	√	√	√	-		
7	<i>Rattus rattus</i> (Linnaeus, 1758)	House rat	Indur	√	√	√		-		
8	<i>Callosciurus pygerythrus</i> (I. Geoffroy Saint Hilaire, 1832)	Hoary-bellied Himalayan Squirrel	Kathbirali		√			-		
9	<i>Pteropus giganteus</i> (Brunnich 1782)	Indian Flying Fox	Baro badur	√	√	√		-		
10	<i>Rousettus leschenaulti</i> (Desmarest, 1820)	Leschenault's Rousette	Kola Badur		√			-		
11	<i>Pipistrellus coromandra</i> (Gray, 1838)	Indian Pipistrelle	Chamchika		√	√		-		

(Source: JICA Study Team)

Table-2.2(1) Terrestrial Fauna (Insects) (Power plant site; Dry season)

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season)				Conservation Status			Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	CITES	Local Law	
Order: Odonata											
Family: Coenagriidae											
1	<i>Agriocnemis pygmaea</i> (Rambur)	Damsel fly (Foring)	Cultivated field	√	√	√	√	NO			Predator and Bioindicator
2	<i>Ceriagrion cerinorubellum</i> (Brauer)	Damsel fly (Foring)	Cultivated field	√	√	√	√				Predator and Bioindicator
Family: Libellulidae											
3	<i>Tholymis</i> sp.	Evening Skimmer (Foring)	Roadside vegetation	√	√	√	√				Predator and Bioindicator
Order: Arthropoda											
Family: Gryllidae											
4	<i>Gryllus</i> spp.	Cricket (Urchunga)	Paddy field	√	√	√	√	NO			Agricultural pest
Family: Acrididae											
5	<i>Oxya chinensis</i> (Thunberg)	Small Rice Grasshopper (Ghas Foring)	Paddy field	√	√	√	√	NO			Agricultural pest
Order: Dictyoptera											
Family: Blattaria											
6	<i>Periplaneta Americana</i> Linn.	American Cockroach (Telapoka)	Restaurant	√	√	√	√	NO			Household pest
Order: Diptera											
Family: Agromyzidae											

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season)				Conservation Status			Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	CITES	Local Law	
7	<i>Agromyza spp.</i>	Miner flies	Bush bean	√	√	√	√	NO			Leaf miner pest of vegetables
8	<i>Liriomyza</i>	Leaf miners	Tomato	√	√	√					*
Family: Calliphoridae											
9	<i>Lucilia</i>	Bluebottles	Crude fiesh		√						*
Family Phoridae											
10	<i>Megaselia sp.</i>		Crude fiesh		√						*
Family: Tephridae											
11	<i>Bactrocera cucurbitae</i> (Coquillett)	Melon fly	Bottle gourd	√		√		NO			Pest of vegetables
Family: Syrphidae											
12	<i>Eristalinus quinquelineatus</i> (Fabricius)	Hover fly	Paddy field		√						Pollinator in most cases
13	<i>Episyrphus spp.</i>	Hover fly	Paddy field	√	√	√	√	NO			Predator and pollinator in most cases
Family: Muscidae											
14	<i>Musca domestica</i> Linn.	House fly	Restaurant	√	√	√	√	NO			Pathogen carrier and pollinaotr in few cases
Family: Calliphoridae											
15	<i>Chrysomya megacephala</i> (Fabricius)	Oriental latrine fly	Dry fish	√	√	√	√	NO			Pest of dry fish and pollinaotr in few cases
Order: Lepidoptera											

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season)				Conservation Status			Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	CITES	Local Law	
Family: Pieridae											
16	<i>Eurema hecabe contubernalis</i> Moore	Common Grass Yellow (Holud)	Common been	√	√	√		NO			Pollinator in adult aged
Family: Nymphalidae											
17	<i>Junonia atlites</i> (Linn.)	Chandnori	Roadside Flower	√	√	√		NO			Pollinator in adult aged
Family: Satyridae											
18	<i>Melanitis phedima bela</i> Moore	Dark Evening Brown	Roadside Flower	√	√	√	√	NO			Pollinator in adult aged
Family: Hesperidae											
19	<i>Parnara guttatus mangala</i> Moore	Straight Swift (Nillbijuri)	Snake gourd		√	√		NO			Pollinator
20	<i>Oriens goloides</i> Moore	Smaller Darlet	Agricultural field		√	√		NO			Pollinator
Order: Coleoptera											
Family: Chrysomelidae											
21	<i>Aulacophora foveicollis</i> Lucas	Red pumpkin beetle	Agricultural field	√		√	√	NO			Agricultural pest
22	<i>Aulacophora frontalis</i> Baly	Pumpkin beetle	Agricultural field	√		√	√	NO			Agricultural pest
Order: Homoptera											
Family: Deltocephalidae											
23	<i>Nephotettix cincticeps</i> Matsumura	Spotted jassid	Paddy field	√		√		NO			Pest of rice
Order: Hemiptera											
Family: Coreidae											
24	<i>Leptocoris acuta</i>	Rice bug	Paddy field	√		√		NO			*

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season)				Conservation Status			Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	CITES	Local Law	
	Thunb.										Pest of rice
Order: Hymenoptera											
Family: Aphidae											
25	<i>Rhopalosiphum sp.</i>	Aphis	Common bean	√	√	√	√	NO			Agricultural pest
Family: Halictidae											
26	<i>Lasioglossum sp.</i>	Solitary Bee	Cucumber field	√	√	√	√	NO			
Family:Anthophoridae											
27	<i>Amegilla spp.</i>		Tomato								*
Family:Apidae											
28	<i>Apis mellifera</i> Linn.	Western Honey bee(Momachhi)	Cucumber field	√		√	√	NO			Pollinator and Bioindicator
Order: Coleoptera											
Family: Coccinellidae											
29	<i>Micraspis crocea</i> (Mulsant)	Lady beetle	Paddy field	√	√	√	√	NO			Rice pest
Order: Dictyoptera											
Family: Blattellidae											
30	<i>Blattella germanica</i>	German Cockroach	Vegetable field		√		√	NO			* Rice pest
Order: Hemiptera											
Family: Coreidae											
31	<i>Leptocoris acuta</i>	Rice bug	Paddy field	√		√		NO			* Rice pest
Order: Thysanoptera											
Family: Thripidae											

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season)				Conservation Status			Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	CITES	Local Law	
32	<i>Scirtothrips dorsalis</i> Hood.		Peper		√			NO			* Rice pest

Notes: 1. The survey in dry season was conducted twice. The first survey was carried out from December, 2012 to January, 2013, the second one was carried out in March, 2013

2. * =species newly identified only during 2nd dry season survey carried out March. Other species were identified both of 1st and 2nd dry season survey)

(Source: JICA Study Team)

Table-2.2(2) Terrestrial Fauna (Amphibians and Reptiles) (Power plant site; Dry season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites				Conservation Status		Remarks
				Dry Season				IUCN	Local	
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands			
(Amphibians)										
1	<i>Duttaphrynus melanostictus</i> (Bufo)	Southeast Asian toad	Kono bang	√	√	√	√	-		Very common throughout the county
2	<i>Euphlyctis cyanophlyctis</i>	Skipper Frog	Kotkoti bang	√	√	√		-		Very common
3	<i>Fejervarya limnocharis</i>	Cricket frog		√	√	√		-		Common
4	<i>Fejervarya nepalensis</i>	Nepal Cricket Frog		√	√	√		-		
5	<i>Hoplobatrachus tigerinus</i>	Bull frog	Kola bang, Sona bang, Bhawa beng	√	√	√		-		Wide spread
(Reptiles)										
1	<i>Calotes versicolor</i> (Daudin, 1802)	Garden lizard	Roktochusha		√		√	-	TH	
2	<i>Mabuya mabuya</i>	Skink	Achil	√	√	√		-	TH	
3	<i>Hemidactylus brooki</i> Gray, 1845	House lizard	Tiktiki	√	√	√	√	-		
4	<i>Hemidactylus frenatus</i> Schlegel in Duméril & Bibron,	house lizard	Tiktiki	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites				Conservation Status		Remarks
				Dry Season				IUCN	Local	
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands			
	1836									
5	<i>Xenocrophis piscator</i>	Checkered keel back	Dhora sap	√	√	√	√	-		
6	<i>Cerberus rynchops</i> (Schneider, 1799)	Dog faced water snake	Andha sap	√			√	-		
7	<i>Lepidochelys olivacea</i> Eschscholtz, 1758	Olive Ridley Turtle	Samudrik Kachim	√	√	√	√	VU-	TH	* It is protected by the Bangladesh Wildlife Preservation Act
8	<i>Eritmochelys imbricata</i> (Linnaeus, 1766)	Hawksbill Sea Turtle	Bajthuti Samudrik Kachim	√	√		√	CR	TH	* Do
9	<i>Chelonia mydas</i> (Linnaeus, 1758)	Green Turtle	Sabuj Samudrik Kachim	√			√	EN	TH	* Do
10	<i>Caretta caretta</i> (Linnaeus 1756)	Loggerhead Turtle	Mugur matha Kachha p	√	√		√	EN	TH	* Do

Notes: 1. The survey in dry season was conducted twice. The first survey was carried out from December, 2012 to January, 2013. The second one was carried out in March, 2013.

2. * =species newly identified only during 2nd dry season survey carried out March. Other species were identified both of 1st and 2nd dry season survey

(Source: JICA Study Team)

Table-2.2(3) Terrestrial Fauna (Birds) (Power plant site; Dry season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
1	<i>Passer domesticus</i>	House Sparrow	Pati Chorui	√	√	√	√			
2	<i>Orthotomus sutorius</i>	Common Tailorbird	Pati Tuntuni	√	√	√	√			
3	<i>Sturnus contra</i>	Pied Myna	Pakra Shalik/Gubra Shalik/Gu Shalik	√	√	√	√			
4	<i>Sturnus malabaricus</i>	Chestnut-tailed Starling	Khoiralej Kathshalik/Des hi Pawei	√	√	√	√			
5	<i>Acridotheres tristis</i>	Common Myna	Bhat Shalik	√	√	√	√			
6	<i>Acridotheres fuscus</i>	Jungle Myna	Jhuti Sahlak	√	√	√	√			
7	<i>Copsychus saularis</i>	Oriental Magpie-Robin	Doel/Udoi Doel	√	√	√	√			
8	<i>Orthotomus sutorius</i>	Common Tailorbird	Pati Tuntuni	√	√	√	√			
9	<i>Columba livia</i>	Common Pigeon	Gola Paira/Jalali Kabutor	√	√	√				
10	<i>Treron bicinctus</i>	Orenge-breasted Green Pigeon	Komlabook Horial/Horikol	√						
11	<i>Streptopelia decaocto</i>	Eurasian Collared Dove	Eurashio Konthighughu/Raj Ghughu	√	√	√	√			
12	<i>Streptopelia chinensis</i>	Spotted Dove	Tila Ghughu	√	√	√	√			
13	<i>Treron phoenicopterus</i>	Yellow-footed Green Pigeon	Holdepa Horial/Botkol	√						
14	<i>Pycnonotus cafer</i>	Red-vented	Bangla	√	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
		Bulbul	Bulbul/Bulbuli							
15	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Shipahi Bulbul/Bulbuli	√			√			
16	<i>Corvus splendens</i>	House Crow	Pati Kak	√	√	√	√			
17	<i>Corvus macrorhynchos</i>	Jungle Crow	Dar Kak/Danr Kak	√	√	√	√			
18	<i>Oriolus xanthornus</i>	Black-hooded Oriole	Kalamatha Benebou/Holde y Pakhi	√	√	√	√			
19	<i>Artamus fuscus</i>	Ashy Woodswallow	Metey Bonababil/Lato ra	√	√	√	√			
20	<i>Dendrocitta vagabunda</i>	Rufous Treepie	Khoira Harichacha/Hari Chacha	√	√	√	√			
21	<i>Dicaeum cruentatum</i>	Scarlet-backet Flowerpecker	Lalpith Fuljhuri	√	√					
22	<i>Dicaeum erythrorhynchos</i>	Pale-billed Flowerpecker	Metethot Fuljhuri	√						
23	<i>Leptocoma zeylonica</i>	Purple-rumped Sunbird	Begunikomor Moutushi	√	√	√	√			
24	<i>Cinnyris asiaticus</i>	Purple Sunbird	Beguni Moutushi	√	√	√	√			
25	<i>Aethopyga siparaja</i>	Crimson Sunbird	Shidure Moutushi	√						
26	<i>Arachnothera siparaja</i>	Little Spiderhunter	Choto Makormar	√	√		√			
27	<i>Ploceus philippinus</i>	Baya Weaver	Deshi Babui/Baoi	√	√	√	√			
28	<i>Lonchura malacca</i>	Black-headed	Kalamatha	√		√				

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
		Munia	Munia							
29	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Tila Munia	√	√	√	√			
30	<i>Lonchura straiata</i>	White-rumped Munia	Dholakomor Munia	√						
31	<i>Anthus rufulus</i>	Paddyfield Pipit	Dhani Tulika	√	√		√			
32	<i>Pellorneum ruficeps</i>	Puff-throated Babbler	Golafola Satarey	√	√	√				
33	<i>Turdoides earlei</i>	Straited Babbler	Dagi Satari	√						
34	<i>Zosterops palpebrosus</i>	Oriental White-eye	Udoi Dholachokh/Sh et Ankhi	√	√					
35	<i>Prinia inornata</i>	Plain Prinia	Nirol Prina	√	√	√	√			
36	<i>Ficedula albicilla</i>	Taiga Flycatcher	Taiga Chutki/Lalbook Chotok	√	√	√	√			
37	<i>Aegithina tiphia</i>	Common Iora	Fatik Jal	√	√					
38	<i>Hypothymis azurea</i>	Black-naped Monarch	Kalaghar Rajon	√	√	√	√			
39	<i>Dicrurus macrocercus</i>	Black Drongo	Kala Fingey	√	√	√	√			
40	<i>Disrurus paradiseus</i>	Greater Racket-tailed Drongo	Boro Recket-Fingey/Bhimraj	√						
41	<i>Disrurus aeneus</i>	Bronzed Drongo	Fingey	√		√	√			
42	<i>Rhipidura albicollis</i>	White-throated Fantail	Dholagola Chatighurani/Lej Nachuni	√	√	√	√			
43	<i>Alcedo atthis</i>	Common Kingfisher	Pati Machranga	√	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
44	<i>Alcedo meninting</i>	Blue-eared Kingfisher	Neelkan Machranga				√			
45	<i>Halcyon smyrnensis</i>	White-throated kingfisher	Dholagoloa Machranga	√	√	√	√			
46	<i>Ceryle rudis</i>	Pied Kingfisher	Pakra Machranga	√	√	√	√			
47	<i>Upupa epops</i>	Eurasian Hoopoe	Pati Hoodhood	√		√	√			
48	<i>Dendrocopos canicapillus</i>	Grey-capped Pigmy Woodpecker	Metetooopi Batkurali				√			
49	<i>Dendrocopos macei</i>	Fulvous-breasted Woodpecker	Batabi Katkurali	√						
50	<i>Dinopium bengalensis</i>	Lesser goldenback	Bangla kaththokra	√						
51	<i>Merops leschenaulti</i>	Chestnut-headed Bee-eater	Khoiramatha Shuichora	√	√	√	√			
52	<i>Merops philippinus</i>	Blue-tailed Bee-eater	Neel-lej Shuichora	√	√	√	√			
53	<i>Merops orientalis</i>	Green Bee-eater	Shabuj Shuichora	√		√	√			
54	<i>Psittacula alexandri</i>	Red-breasted Parakeet	Modna Tia	√	√	√				
55	<i>Psittacula krameri</i>	Rose-ringed Parakeet	Shobuj Tia	√	√	√	√			
56	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	Asio Talbatashi/Nak kati	√	√	√	√			
57	<i>Apus affinis</i>	Little Swift	Ghor Batashi	√	√	√	√			
58	<i>Ketupa zeylonensis</i>	Brown Fish	Khoira	√		√				

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
		Owl	mechupacha/B hootoom Pecha							
59	<i>Otus bakkamoena</i>	Collard Scops Owl	Konti Nimpesha	√		√				
60	<i>Tyto alba</i>	Barn Owl	Lokkhi Pecha	√	√					
61	<i>Athene brama</i>	Spotted Owlet	Khuruley Pencha/Konthi Kutipecha	√	√	√				
62	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Lenja Ratchora	√						
63	<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish Eagle	Metemetha Kura Eagle	√			√			
64	<i>Spilornis Cheela</i>	Crested Serpent Eagle	Tila Nag-eegol/Shapkhoko Baj			√	√			
65	<i>Haliaeetus leucoryphus</i>	Pallas's Fish Eagle	Kura/Kural				√	VU	TH	
66	<i>Phalacrocorax niger</i>	Little Cormorant	Choto Pankouri	√	√	√	√			
67	<i>Phalacrocorax fuscicollis</i>	Indian Cormorant	Deshi Pankouri				√			
68	<i>Egretta garzetta</i>	Little Egret	Choto Boga	√	√	√	√			
69	<i>Egretta intermedia</i>	Yellow-billed Egret	Majhla Boga/Korche Bok	√	√	√	√			
70	<i>Casmerudias albus</i>	Great Egret	Boro Boga	√		√				
71	<i>Bubulcus ibis</i>	Cattle Egret	Go Boga	√	√	√	√			
72	<i>Ardea cinerea</i>	Grey Heron	Dhupni Bok	√	√	√	√			
73	<i>Ardeola grayii</i>	Indian Pond Heron	Deshi Kanibok	√	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
74	<i>Sterna aurantia</i>	River Tern	Nodia Panchil			√	√			
75	<i>Sterna acuticauda</i>	Black-bellied Tern	Gangchil				√	EN	TH	
76	<i>Amauornis phoenicurus</i>	White-breasted Waterhen	Dholabook Dahuk	√	√	√	√			
77	<i>Porzana fusca</i>	Ruddy-breasted Crake	Lalbook Gurguri	√			√			
78	<i>Gallirallus striatus</i>	Slaty-breasted Rail	Metebook Jhilli				√			
79	<i>Vanellus duvaucelii</i>	River Lapwing	Hot-titi	√						
80	<i>Sterna albifrons</i>	Little Tern	Choto Panchil	√	√	√	√			
81	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Kalamatha Nishibok				√			
82	<i>Hirundo rustica</i>	Barn Swallow	Metho Ababil	√	√	√	√			
83	<i>Pandion haliaetus</i>	Osprey	Machmural/Me chubaj	√			√			
84	<i>Phyllocopus affinis</i>	Tickell's Leaf Warbler	Tikeler Patafutki				√			
85	<i>Phylloscopus collybita</i>	Common Chiffchaff	Pati Chifchaf	√						
86	<i>Phylloscopus fuscatus</i>	Dusky Warbler	Kalchey Futki	√	√		√			
87	<i>Phylloscopus trochiloides</i>	Greenish Warbler	Saoboje Futki				√			
88	<i>Anas clypeata</i>	Northern Shoveler	Utturey Khuntehash/Pantamukhi	√	√	√	√			
89	<i>Tadorna ferruginea</i>	Ruddy Shelduck	Khoira Chokachoki		√					
90	<i>Arser indicus</i>	Bar-headed Goose	Rajhans				√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
91	<i>Jynx torquilla</i>	Eurasian Wryneck	Eureshio Gharbetha	√		√				
92	<i>Halcyon pileata</i>	Black-capped Kingfisher	Kalatupi Machranga	√	√	√	√			
93	<i>Todiramphus chloris</i>	Collared Kingfisher	Dholaghar Machranga	√	√	√	√			
94	<i>Porzana pusilla</i>	Bailon's Crake	Bailoner Gurguri				√			
95	<i>Rallus aquaticus</i>	Water Rail	Panti Jhilli				√			
96	<i>Gallinago gallinago</i>	Common Snipe	Pati Chega		√	√	√			
97	<i>Gallinago stenura</i>	Pin-tailed Snipe	Lenja Chega	√			√			
98	<i>Limosa lapponica</i>	Bar-tailed Godwit	Dagilej Jorali				√			
99	<i>Limosa limosa</i>	Black-tailed Godwit	Kalalej jorali				√			
100	<i>Numenius arquata</i>	Eurasian Curlew	Eureshio Gulinda	√	√	√	√			
101	<i>Numenius phaeopus</i>	Whimbrel	Choto Gulinda	√	√		√			
102	<i>Tringa glareola</i>	Wood Sandpiper	Bon Batan/Balu Batan	√	√	√	√			
103	<i>Xenus cinereus</i>	Terek Sandpiper	Terek Batan		√	√	√			
104	<i>Eurynorhynchus pygmeus</i>	Spoon-billed Sandpiper	Chamuchthuto Batan	√ ¹			√ ²	CR	TH	*
105	<i>Limicola falcinellus</i>	Broad-billed Sandpiper	Motathuto Batan				√		TH	
106	<i>Philomachus pugnax</i>	Ruff	Geoala Batan	√						
107	<i>Recurvirostra avosetta</i>	Pied Avocet	Pakra Ultothuti				√		TH	
108	<i>Actitis hypoleucos</i>	Common	Pati Batan/	√	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
		Sandpiper	Chapakhi							
109	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Bali Batan			√	√		TH	
110	<i>Calidris ferruginea</i>	Curlew Sandpiper	Gulinda Batan	√		√	√			
111	<i>Tringa guttifer</i>	Nordmann's Greenshank	Nordman Shabujpa				√	EN	TH	
112	<i>Tringa nebularia</i>	Common Greenshank	Pati Shabujpa		√		√	C	Do	
113	<i>Tringa tetanus</i>	Common Redshank	Pati Lalpa	√	√	√	√	C	Do	
114	<i>Arenaria interpres</i>	Ruddy Turnstone	Lal Nuribatan				√	UC	TH	
115	<i>Limnodromus semipalmatu</i>	Asian Dowitcher	Eshio Daucher	√						
116	<i>Calidris alba</i>	Sanderling	Sanderling			√	√			
117	<i>Calidris minuta</i>	Little Stint	Choto Chaha	√	√		√			
118	<i>Calidris ruficollis</i>	Red-necked Stint	Lalghar Chaha				√			
119	<i>Calidris temminckii</i>	Timminck's Stint	Timinker Chaha	√			√			
120	<i>Calidris tenuirostris</i>	Graet Knot	Boro Noth				√			
121	<i>Himantopus himantopus</i>	Black-winged Stilt	Kalapakh Thengi/Lal pa Dhenga				√			
122	<i>Pluvialis fulva</i>	Pacific Golden Plover	Proshanto Shonajiria	√	√	√	√			
123	<i>Charadrius alexandrinus</i>	Kentish Plover	Kentish Jiria		√		√			
124	<i>Charadrius dubius</i>	Little Ring Plover	Choto Nothjiria	√			√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
125	<i>Charadrius hiaticula</i>	Common Ring Plover	Pati Nothjiria				√			
126	<i>Charadrius leschenaultia</i>	Greater Sand Plover	Boro Dhuljiria	√		√	√			
127	<i>Charadrius mongolus</i>	Lesser Sand Plover	Choto Dhuljiria	√	√	√	√			
128	<i>Larus brunnicephalus</i>	Brown-headed Gull	Khoiramatha Gangchil	√	√	√	√			
129	<i>Larus ichthyaetus</i>	Great Black-headed Gull	Palasi Gangchil/Bara Jal Kabutor		√		√			
130	<i>Larus heuglini</i>	Heuglin's Gull	Heugliner Gangchil		√		√			
131	<i>Larus ridibundus</i>	Common Black-headed Gull	Kalamatha Gangchil	√	√	√	√			
132	<i>Sterna sumatrana</i>	Black-naped Tern	Kalaghar Panchil	√	√	√	√			
133	<i>Threskiornis melanocephalus</i>	Black-headed Ibis	Kalamatha Kastechora				√			
134	<i>Motacilla alba</i>	White Wagtail	Dhola Khonjon	√	√	√	√			
135	<i>Motacilla cinerea</i>	Grey Wagtail	Metey Khonjon	√				UC	TH	
136	<i>Motacilla citreola</i>	Citrine Wagtail	Sitrin Khonjon	√			√			
137	<i>Motacilla flava</i>	Western Yellow Wagtail	Poschima Holdey Khonjon		√	√	√			
138	<i>Lanius schach</i>	Long-tail Shrike	Lombaleji Koshai	√	√	√				
139	<i>Lanius cristatus</i>	Brown Shrike	Koshai	√	√		√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry season)				Conservation Status		Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	Local status	
140	<i>Streptopelia</i>	Red Collared Dove	Lal Kontighugu	√						*
141	<i>Ninox scutulata</i>	Brown Hawk Owl				√				*
142	<i>Megalaima lineata</i>	Lineated Barbet	Bosonto Bawri	√	√	√				*
143	<i>Megalaima haemacepala</i>	Copersmith Barbet	Coparer Bosonto Bawri	√						*
144	<i>Parus major</i>	Great Tit	Baro Tit	√	√	√				*
145	<i>Falco chiquera</i>	Red-naked Falcon	Lal gola Baj	√						*
146	<i>Oriolus chinensis</i>	Black-naped Oriol		√						*
147	<i>Ciconia episcopus</i>	Wooly-naked Stork					√			*

Notes: 1. The survey in dry season was conducted twice. The first survey was carried out from December, 2012 to January, 2013. The second one was carried out in March, 2013.

2. *=species newly identified during 2nd dry season survey carried out March. Other species were identified both of 1st and 2nd dry season survey except Spoon-billed Sandpiper identified only 2nd dry season survey.

=√¹-only identified at 2nd dry season , √²-identified at both 1st and 2nd dry season

(Source: JICA Study Team)

Table-2.2(4) Terrestrial Fauna (Mammals) (Power plant site; Dry season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status			Remarks
				Power Plant Area	Dholghat and Kutubdia Islands	Mouth of Matarbari Channel	Sonadia Islands	IUCN	CITES	Local Law	
Order: Carnivora											
Family: Cadidae											
1	<i>Canis aureus</i> Linnaeus, 1758	Jackal	Shial	√	√	√	√	LC			
Family: Felidae											
2	<i>Felis chaus</i> Schreber 1777	Wild cat	Bon biral	√	√	√	√	LC			
Family: Mustelidae											
3	<i>Lutra lutra</i> (Linnaeus, 1758)	Common otter	Ud biral	√	√	√	√	NO			
Family: Viverridae											
4	<i>Viverra zibetha</i> Linnaeus 1758	Large Indian Civet	Baghdas		√		√	NO			
Order: Eulipotyphla											
Family: Soricidae											
5	<i>Suncus murinus</i> Linnaeus, 1766	House shrew	Chika	√	√	√	√	LC			
Order: Rodentia											
Family: Muridae											
6	<i>Bandicota indica</i> (Bechstein, 1800)	Indian Mole rat	Indur	√	√	√	√	LC			
7	<i>Rattus rattus</i> (Linnaeus, 1758)	House rat	Indur	√	√	√		LC			
Family: Sciuridae											
8	<i>Callosciurus</i>	Hoary-bellied	Kathbirali		√			LC			

	<i>pygerythrus</i> (I. Geoffroy Saint Hilaire, 1832)	Himalayan Squirrel									
Order: Chiroptera Family: Pteropidae											
9	<i>Pteropus giganteus</i> (Brunnich 1782)	Indian Flying Fox	Baro badur	√	√	√		LC			
10	<i>Rousettus leschenaulti</i> (Desmarest, 1820)	Leschenault's Rousette	Kola Badur					LC			
11	<i>Pipistrellus coromandra</i> (Gray, 1838)	Indian Pipistrelle	Chamchika			√		LC			
Order: Cetacea Family: Delphinidae											
12	<i>Tursiops aduncus</i> (Ehrenberg, 1833)	Indo-Pacific Bottlenose Dolphin	Dolphin		√		√	DD			

Notes: 1. The survey in dry season was conducted twice. The first survey was carried out from December, 2012 to January, 2013. The second one was carried out in March, 2013.

2. All of 12 species above were identified both of 1st and 2nd dry season survey

(Source: JICA Study Team)

Appendix-C15.5-4

Results of the survey on natural environment

(List of terrestrial wildlife along transmission line)

Table-1(1) Terrestrial flora (Transmission Line; Rainy season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)			Conservation Sites		Remarks
					PL2 (Pekua, Cox's Bazar)	PL3 & PL4 (Banshkhali, Chittagong)	PL5 (Anowara, Chittagong)	IUCN	Local status ¹	
1	<i>Acanthes ilicifolius</i> L.	Hargoza	Holy-leaved acanthus	Acanthaceae	√					
2	<i>Achyranthes aspera</i> L.	Apang	Red chaff tree	Amaranthaceae	√		√			
3	<i>Alstonia macrophylla</i> Wall. Ex G.Don	Baro Chhatim	Devil's tree	Apocynaceae	√		√			
4	<i>Ananus comosus</i> (L.) Merr.	Anaros	Pineapple	Bromeliaceae	√					
5	<i>Artocarpus heterophyllus</i> Lam.	Kathal	Jack fruit	Moraceae	√	√	√			
6	<i>Averrhoa carambola</i> L.	Kamranga shim	Carambola apple	Fabaceae	√					
7	<i>Avicennia alba</i> Blume	Barabaen		Verbenaceae	√					
8	<i>Bambusa tulda</i> Roxb.	Mitinga	Indian bamboo	Poaceae	√		√			
9	<i>Barringtonia acutangula</i> (L.) Gaertn.	Hijol	Indian oak	Lecythidaceae	√					TH
10	<i>Benincasa hispida</i> (Thumb.) Cogn.	Chalkumra	White gourd	Cucurbitaceae		√				
11	<i>Bombax ceiba</i> L.	Simul	Red silk cotton tree	Bombacaceae		√				
12	<i>Borassus flabellifer</i> L.	Tal	Barb tree	Arecaceae	√	√	√			
13	<i>Bougainvillea glabra</i> Choisy	Baganbilas	Bougainvillea	Nyctaginaceae	√					
14	<i>Carica papaya</i> L.	Pepe	Papaya	Caricaceae	√	√	√			
15	<i>Cocos nucifera</i> L.	Nairkel	coconut palm	Arecaceae		√	√			
16	<i>Colocasia esculenta</i> (L.) Schott	Kachu	Cocoyam	Araceae	√		√			

¹ Local status as judged by surveyors

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)			Conservation Sites		Remarks
					PL2 (Pekua, Cox's Bazar)	PL3 & PL4 (Banshkhali, Chittagong)	PL5 (Anowara, Chittagong)	IUCN	Local status ¹	
17	<i>Cynodon dactylon</i> (L.) Pers.	Durba grass	Star grass, Couch grass	Poaceae		√				
18	<i>Erythrina variegata</i> var. <i>picta</i> Maheshw.	Mandar	Indian coral tree	Fabaceae	√	√	√			
19	<i>Eucalyptus globulus</i> Labill	Globu eucalyptus		Myrtaceae		√				
20	<i>Eupatorium antiquorum</i> L.	Tesramansa	Malayan spurge	Euphorbiaceae		√	√			
21	<i>Ficus hispida</i> L.f.	Dumur	opposite leave fig	Moraceae		√				
22	<i>Gmelina arborea</i> Roxb.	Gamari	White teak	Verbenaceae		√	√			
23	<i>Heliotropium indicum</i> L.	Hatishur	Indian heliotrope	Boraginaceae		√				
24	<i>Hibiscus rosa sinensis</i> L.	Joba	China rose	Malvaceae		√				
25	<i>Ipomoea fistulosa</i> Mart.ex Choisy	Dol kolmi		Convolvulaceae	√					
26	<i>Ludwigia hyssopifolia</i> (G. Don) Exell.	Zaikura	Seedbox	Onagraceae	√	√	√			
27	<i>Mangifera indica</i> L.	Aam	Mango	Anacardiaceae	√	√	√			
28	<i>Marsilea minuta</i> L.	Susni shak	Marshy fern	Marsileaceae			√			
29	<i>Melia azederach</i> L.	Ghoranim	Bead tree	Meliaceae	√	√	√			
30	<i>Mikania micrantha</i> Kunth	Asamlata	heartleaf	Asteraceae	√	√	√			
31	<i>Mimosa pudica</i> L.	Lajjabati	Sensitive plant	Mimosaceae	√	√	√			
32	<i>Momordica charantia</i> L. var. <i>charantia</i>	Tita korolla	Bitter melon	Cucurbitaceae	√		√			
33	<i>Moringa olifera</i> Lam.	Sajna	Horse radish tree	Moringaceae	√					
34	<i>Musa paradisiaca</i> L.	Kacha kola	banana	Musaceae	√	√	√			
35	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajur	Date sugar palm	Arecaceae		√	√			
36	<i>Phyllanthus acidus</i> (L.) Skeels	Horboroi	Country gooseberry	Euphorbiaceae			√			

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Rainy season)			Conservation Sites		Remarks
					PL2 (Pekua, Cox's Bazar)	PL3 & PL4 (Banshkhali, Chittagong)	PL5 (Anowara, Chittagong)	IUCN	Local status ¹	
37	<i>Pongamia pinnata</i> (L.) Pierre	koronja	indian beach	Fabaceae	√					
38	<i>Psidium guajava</i> L.	Peyara	Guava	Myrtaceae	√	√	√			
39	<i>Raphanus sativus</i> L.	Mula	Radish	Brassicaceae		√				
40	<i>Solanum americanum</i> Mill.	Tit begun		Solanaceae	√	√	√			
41	<i>Solanum melongena</i> L.	begun	Brinjal	Solanaceae	√	√	√			
42	<i>Swietenia mahagoni</i> (L.) Jacq.	mahogany	Spanish mahogany	Meliaceae		√				
43	<i>Tamarindus indica</i> L.	Tetul	Tamarind tree	Tamaricaceae		√				
44	<i>Vitex negundo</i> L.	Nishinda	Chaste tree	Verbenaceae		√				
45	<i>Ziziphus mauritiana</i> Lam.	Kul	Plum	Rhamnaceae	√		√			

(Source: JICA Study Team)

Table-1(2) Terrestrial flora (Transmission Line; Dry season)

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)			Conservation Sites		Remarks
					PL2 (Pekua, Cox's Bazar)	PL3 & PL4 (Banskhali, Chittagong)	PL5 (Anowara, Chittagong)	IUCN	Local	
1	<i>Acanthes ilicifolius</i> L.	Hargoza	Holy-leaved acanthus	Acanthaceae	√			-		
2	<i>Achyranthes aspera</i> L.	Apang	Red chaff tree	Amaranthaceae	√			-		
3	<i>Alstonia macrophylla</i> Wall. Ex G.Don	Baro Chhatim	Devil's tree	Apocynaceae	√		√	-		
5	<i>Artocarpus heterophyllus</i> Lam.	Kathal	Jack fruit	Moraceae	√	√	√	-		
6	<i>Averrhoa carambola</i> L.	Kamranga shim	Carambola apple	Fabaceae	√			-		
7	<i>Avicennia alba</i> Blume	Barabaen		Verbenaceae	√			-		
8	<i>Bambusa tulda</i> Roxb.	Mitinga	Indian bamboo	Poaceae	√		√	-		
9	<i>Barringtonia acutangula</i> (L.) Gaertn.	Hijol	Indian oak	Lecythidaceae	√			-	TH	
10	<i>Benincasa hispida</i> (Thumb.) Cogn.	Chalkumra	White gourd	Cucurbitaceae	√			-		
11	<i>Bombax ceiba</i> L.	Simul	Red silk cotton tree	Bombacaceae	√	√		-		
12	<i>Borassus flabellifer</i> L.	Tal	Barb tree	Arecaceae	√	√	√	-		
13	<i>Bougainvillea glabra</i> Choisy	Baganbilas	Bougainvillea	Nyctaginaceae	√			-		
14	<i>Carica papaya</i> L.	Pepe	Papaya	Caricaceae	√	√	√	-		
15	<i>Cocos nucifera</i> L.	Nairkel	Coconut palm	Arecaceae		√	√	-		
16	<i>Colocasia esculenta</i> (L.) Schott	Kachu	Cocoyam	Araceae	√		√	-		
17	<i>Cynodon dactylon</i> (L.) Pers.	Durba grass	Star grass, Couch grass	Poaceae		√		-		
18	<i>Erythrina variegata</i> var. <i>picta</i> Maheshw.	Mandar	Indian coral tree	Fabaceae	√	√	√	-		
19	<i>Eucalyptus globulus</i> Labill	Globu		Myrtaceae		√		-		

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)			Conservation Sites		Remarks
					PL2 (Pekua, Cox's Bazar)	PL3 & PL4 (Banskhali, Chittagong)	PL5 (Anowara, Chittagong)	IUCN	Local	
		eucalyptus								
20	<i>Eupatorium antiquorum</i> L.	Tesramansa	Malayan spurge	Euphorbiaceae		√	√	-		
21	<i>Ficus hispida</i> L.f.	Dumur	opposite leave fig	Moraceae		√		-		
22	<i>Gmelina arborea</i> Roxb.	Gamari	White teak	Verbenaceae		√	√	-		
24	<i>Hibiscus rosa sinensis</i> L.	Joba	China rose	Malvaceae		√		-		
25	<i>Ipomoea fistulosa</i> Mart.ex Choisy	Dol kolmi		Convolvulaceae	√			-		
26	<i>Ludwigia hyssopifolia</i> (G. Don) Exell.	Zaikura	Seedbox	Onagraceae		√	√	-		
27	<i>Mangifera indica</i> L.	Aam	Mango	Anacardiaceae	√	√	√	-		
28	<i>Marsilea minuta</i> L.	Susni shak	Marshy fern	Marsileaceae			√	-		
29	<i>Melia azederach</i> L.	Ghoranim	Bead tree	Meliaceae	√	√	√	-		
30	<i>Mikania micrantha</i> kunth	Asamlata	heartleaf	Asteraceae	√	√	√	-		
31	<i>Mimosa pudica</i> L.	Lajjabati	Sensitive plant	Mimosaceae	√	√	√	-		
32	<i>Moringa olifera</i> Lam.	Sajna	Horse radish tree	Moringaceae	√			-		
33	<i>Musa paradisiaca</i> L.	Kacha kola	banana	Musaceae	√	√	√	-		
34	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajur	Date sugar palm	Arecaceae		√	√	-		
35	<i>Phyllanthus acidus</i> (L.) Skeels	Horboroi	Country gooseberry	Euphorbiaceae			√	-		
36	<i>Pongamia pinnata</i> (L.) Pierre	koronja	indian beach	Fabaceae	√			-		
37	<i>Psidium guajava</i> L.	Peyara	Guava	Myrtaceae	√	√	√	-		
38	<i>Raphanus sativus</i> L.	Mula	Radish	Brassicaceae		√		-		
39	<i>Solanum americanum</i> Mill.	Tit begun		Solanaceae	√	√	√	-		
40	<i>Solanum melongena</i> L.	begun	Brinjal	Solanaceae	√	√	√	-		

Sl. No.	Scientific name	Local name	English name	Family	Survey sites (Dry season)			Conservation Sites		Remarks
					PL2 (Pekua, Cox's Bazar)	PL3 & PL4 (Banshkhali, Chittagong)	PL5 (Anowara, Chittagong)	IUCN	Local	
41	<i>Swietenia mahagoni</i> (L.) Jacq.	mahogany	Spanish mahogany	Meliaceae		√		-		
42	<i>Tamarindus indica</i> L.	Tetul	Tamarind tree	Tamaricaceae		√		-		
43	<i>Vitex negundo</i> L.	Nishinda	Chaste tree	Verbenaceae		√		-		
44	<i>Ziziphus mauritiana</i> Lam.	Kul	Plum	Rhamnaceae	√		√	-		

(Source: JICA Study Team)

Table-2.1(1) Terrestrial Fauna (Insect) (Transmission line; Rainy season)

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Rainy Season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banshkhali Chittagong	PL4 Banshkhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local status	
1	<i>Orthetrum Sabina</i> (Drury)	Slender Dkimmer (Foring)	Common been		√	√	√			Prdator and Bioindicator
2	<i>Periplaneta Americana</i> Linn.	American Cockroach (Telapoka)	Restaurant	√	√	√	√			Household pest
3	<i>Blattella germanica</i> Linn.	German Cockroach (Telapoka)	Agricultural field		√	√	√			Pollinator in some cases
4	<i>Agromyza spp.</i>	Miner flies	Bush bean	√	√	√	√			Leaf miner pest of vegetables
5	<i>Episyrphus spp.</i>	Hover fly	Cucumber field		√	√	√			Predator and pollinator in most cases
6	<i>Musca domestica</i> Linn.	House fly	Restaurant	√	√	√	√			Pathogen carrier and pollinaotr in few cases
7	<i>Scirpophaga sp.</i>	Rice white stem borer	Rice				√			Pest of rice mainly
8	<i>Eurema hecabe contubernalis</i> Moore	Common Grass Yellow (Holud)	Common been	√	√	√	√			Pollinator in adult aged
9	<i>Junonia atlites</i> (Linn.)	Chandnori	Agricultural field	√	√	√	√			Pollinator in adult aged
10	<i>Melanitis phedima bela</i> Moore	Dark Evening Brown	Agricultural field	√	√	√				Pollinator in adult aged
11	<i>Parnara guttatus mangala</i> Moore	Straight Swift (Nillbijuri)	Snake gourd	√	√	√	√			Pollinator

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Rainy Season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local status	
12	<i>Aulacophora foveicollis</i> Lucas	Red pumpkin beetle	Pumpkin field	√	√	√	√			Agricultural pest
13	<i>Aulacophora frontalis</i> Baly	Pumpkin beetle	Pumpkin field	√	√	√	√			Agricultural pest
14	<i>Nephotettix cincticeps</i> Matsumura	Spotted jassid	Ficefield	√	√	√	√			Pest of rice
15	<i>Leptocorisa acuta</i> Thunb.	Rice bug	Rice field	√	√	√	√			Pest of rice
16	<i>Rhopalosiphum</i> sp.	Aphis	Common bean	√						Agricultural pest
17	<i>Lasioglossum</i> sp.	Solitary Bee	Cucumber field	√	√	√	√			Pollinator And bioindicator
18	<i>Micraspis crocea</i> (Mulsant)	Lady beetle	Rice	√	√	√	√			Rice pest

(Source: JICA Study Team)

Table-2.1(2) Terrestrial Fauna (Amphibians and Reptiles) (Transmission line; Rainy season)

Sl. No	Species Name	English Name	Local Name	Survey Sites (Rainy Season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banshkhali Chittagong	PL4 Banshkhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local status	
(Amphibians)										
1	<i>Duttaphrynus (Bufo) melanostictus</i>	Southeast Asian toad	Kono bang	√	√	√	√		TH	Very common throughout the county
2	<i>Euphlyctis cyanophlyctis</i>	Skipper frog	Kotkoti bang	√	√	√				Very common
3	<i>Fejervarya limnocharis</i>	Cricket frog		√	√	√				Common
4	<i>Fejervarya frithi</i>	Cricket frog		√	√	√				
5	<i>Hoplobatrachus tigerinus</i>	Bull frog	Kola bang, Sona bang, Bhawa beng	√	√	√	√			Wide spread
6	<i>Kaloula pulchra</i> Gray 1831	Banded bullfrog	Vepu bang	√	√	√	√			
7	<i>Microhyla ornate</i> (Dumeril and Bibron 1841)	Ornate narrow mouthed frog	China bang	√	√	√	√			
8	<i>Microhyla rubra</i> (Jerdon 1854)	Red narrow mouthed frog	Lal China bang	√	√	√	√			
9	<i>Hylarana tyleri</i> Theobald, 1868	Yellow stripped frog	Lufuno bang		√	√	√			
10	<i>Polypedates leucomystax</i> (Gravenhorst, 1838)	Stripped tree frog	Gecho bang		√	√	√			
(Reptiles)										
1	<i>Calotes versicolor</i>	garden lizard	Roktochusha	√	√	√				

Sl. No	Species Name	English Name	Local Name	Survey Sites (Rainy Season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banshkhali Chittagong	PL4 Banshkhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local status	
2	<i>Mabuya mabuya</i>	skink	Achil	√	√	√			TH	
3	<i>Gekko gecko</i>	Tokay Gecko	Tokkhak/ Tokhha	√	√	√	√			
4	<i>Hemidactylus brooki</i>	house lizard	Tiktiki	√	√	√	√			
5	<i>Hemidactylus frenatus</i> Schlegel in Duméril & Bibron, 1836	house lizard	Tiktiki	√	√	√	√			
6	<i>Varanus bengalensis bengalensis</i> (Daudin, 1802)	Bengal monitor	Gooishup	√	√	√	√			
7	<i>Typlops diardii</i> Schlegel, 1839	Diard's worm snake	Kecho shup		√	√	√			
8	<i>Ahaetulla prasina</i> (Boie, 1827)	Common Vine snake	Laodoga Shap/sutanoli Shap	√	√	√	√			
9	<i>Amphiesma stotatum</i> (Linnaeus, 1758)	Buff-stripped keelback	Hee shup	√	√	√	√			
10	<i>Xenocrophis piscator</i>	Checkered keel back	Dhora sap	√	√	√	√			
11	<i>Naja kaouthia</i> Lesson, 1831	Monocled Cobra	Jati Sap	√	√	√	√			
12	<i>Naja naja</i>	Bicled Cobra	Gokhra Shap	√	√	√	√			
13	<i>Bungarus fasciatus</i> (Schneider, 1801)	Banded krait	Shonkini shup	√	√	√	√			
14	<i>Bungarus niger</i> Wall, 1908	Greater black krait	Kal shup				√			

(Source: JICA Study Team)

Table-2.1(3) Terrestrial Fauna (Birds) (Transmission line; Rainy season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local Status	
1	<i>Acridotheres tristis</i>	Common Myna	Bhat Shalik	√	√	√	√	-		
2	<i>Acridotheres fuscus</i>	Jungle Myna	Jhuti Sahlik	√	√	√	√	-		
3	<i>Gracula religiosa</i>	Common Hill Myna		√	√	√	√	-		
4	<i>Copsychus saularis</i>	Oriental Magpie-Robin	Doel/Udoi Doel	√	√	√	√	-		
5	<i>Orthotomus sutorius</i>	Common Tailorbird	Pati Tuntuni	√	√	√	√	-		
6	<i>Columba livia</i>	Common Pigeon	Gola Paira/Jalali Kabutor	√	√	√	√	-		
7	<i>Treron bicinctus</i>	Oreng-breasted Green Pigeon	Komlabook Horial/Horikol		√		√	-		
8	<i>Ploceus philippinus</i>	Baya Weaver	Deshi Babui/Baoi	√	√	√	√	-		
9	<i>Lonchura malabarica</i>	Indian Silverbill	Deshi Chandithot	√	√	√	√	-		
10	<i>Streptopelia decaocto</i>	Eurasian Collared Dove	Eurashio Konthighughu/Raj Ghughu	√	√	√	√	-		
11	<i>Streptopelia chinensis</i>	Spotted Dove	Tila Ghughu	√	√	√	√	-		
12	<i>Treron phoenicopterus</i>	Yellow-footed Green Pigeon	Holdepa Horial/Botkol	√	√	√	√	-		
13	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Bangla Bulbul/Bulbuli		√		√	-		
14	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Shipahi Bulbul/Bulbuli	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local Status	
15	<i>Corvus splendens</i>	House Crow	Pati Kak	√	√	√	√	-		
16	<i>Corvus macrorhynchos</i>	Jungle Crow	Dar Kak/Danr Kak	√		√	√	-		
17	<i>Oriolus xanthornus</i>	Black-hooded Oriole	Kalamatha Benebou/Holdey Pakhi	√	√	√	√	-		
18	<i>Artamus fuscus</i>	Ashy Woodswallow	Metey Bonababil/Latora	√	√	√	√	-		
19	<i>Dicaeum cruentatum</i>	Scarlet-backet Flowerpecker	Lalpith Fuljhuri	√	√	√	√	-		
20	<i>Dicaeum erythrorhynchos</i>	Pale-billed Flowerpecker	Metethot Fuljhuri	√	√	√	√	-		
21	<i>Dicaeum trigonostigma</i>	Orenge-bellied Flowerpecker	Komlapet Fuljhuri	√	√	√	√	-		
22	<i>Chalcoparia singalensis</i>	Ruby-cheeked Sunbird	Chunimukhi Moutushi	√	√	√	√	-		
23	<i>Leptocoma zeylonica</i>	Purple-rumped Sunbird	Begunikomor Moutushi	√	√	√	√	-		
24	<i>Cinnyris asiaticus</i>	Purple Sunbird	Beguni Moutushi	√	√	√	√	-		
25	<i>Aethopyga siparaja</i>	Crimson Sunbird	Shidure Moutushi	√	√	√	√	-		
26	<i>Passer domesticus</i>	House Sparrow	Pati Chorui	√	√	√	√	-		
27	<i>Rhipidura albicollis</i>	White-throated Fantail	Dholagola Chatighurani/Lej Nachuni	√	√	√	√	-		
28	<i>Lonchura malacca</i>	Blkack-headed Munia	Kalamatha Munia	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local Status	
29	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Tila Munia	√	√	√	√	-		
30	<i>Anthus rufulus</i>	Paddyfield Pipit	Dhani Tulika	√	√	√	√	-		
31	<i>Zosterops palpebrosus</i>	Oriental White-eye	Udoi Dholachokh/Shet Ankhi				√	-		
32	<i>Prinia inornata</i>	Plain Prinia	Nirol Prina	√	√	√	√	-		
33	<i>Ficedula albicilla</i>	Taiga Flycatcher	Taiga Chutki/Lalbook Chotok	√	√	√	√	-		
34	<i>Aegithina tiphia</i>	Common Iora	Fatik Jal	√	√	√	√	-		
35	<i>Hypothymis azurea</i>	Black-naped Monarch	Kalaghar Rajon	√	√	√	√	-		
36	<i>Pellorneum ruficeps</i>	Puff-throated Babbler	Golafola Satarey	√	√	√	√	-		
37	<i>Rhipidura albicollis</i>	White-throated Fantail	Dholagola Chatighurani/Lej Nachuni	√	√	√	√	-		
38	<i>Sturnus contra</i>	Pied Myna	Pakra Shalik/Gubra Shalik/Gu Shalik	√	√	√	√	-		
39	<i>Sturnus malabaricus</i>	Chestnut-tailed Starling	Khoiralej Kathshalik/Deshi Pawei	√	√	√	√	-		
40	<i>Dicrurus macrocercus</i>	Black Drongo	Kala Fingey	√		√	√	-		
41	<i>Disrurus paradiseus</i>	Greater Racket-tailed Drongo	Boro Recket-Fingey/Bhi mraj	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local Status	
42	<i>Disrurus aeneus</i>	Bronzed Drongo	Fingey	√	√	√		-		
43	<i>Alcedo atthis</i>	Common Kingfisher	Pati Machranga	√	√	√	√	-		
44	<i>Halcyon smyrnensis</i>	White-throated kingfisher	Dholagoloa Machranga	√	√	√	√	-		
45	<i>Ceryle rudis</i>	Pied Kingfisher	Pakra Machranga	√	√	√	√	-		
46	<i>Pelargopsis capensis</i>	Stork-billed Kingfisher	Megh-hou Machranga	√	√	√	√	-		
47	<i>Upupa epops</i>	Eurasian Hoopoe	Pati Hoodhood	√	√	√	√	-		
48	<i>Dinopium bengalensis</i>	Lesser goldenback	Bangla kaththokra	√	√	√		-		
49	<i>Dendrocopos canicapillus</i>	Grey-capped Pygmy Woodpecker	Metetupi Batkurali	√	√	√		-		
50	<i>Dendrocopos macei</i>	Fulvous-breasted Woodpecker	Batabi Kathkurali				√	-		
51	<i>Picus canus</i>	Grey-headed Woodpecker	Metematha Kathkurali		√	√	√	-		
52	<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker	Boro Metekutali		√	√		-		
53	<i>Megalaima haemacephala</i>	Coppersmith Barbet	Shekra Bosonto	√	√	√	√	-		
54	<i>Megalaima lineata</i>	Lineated Barbet	Dagi Bosonto	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local Status	
55	<i>Merops leschenaulti</i>	Chestnut-headed Bee-eater	Khoiramatha Shuichora	√	√	√	√	-		
56	<i>Merops philippinus</i>	Blue-tailed Bee-eater	Neel-lej Shuichora	√	√	√	√	-		
57	<i>Psittacula alexandri</i>	Red-breasted Parakeet	Modna Tia		√		√	-		
58	<i>Psittacula krameri</i>	Rose-ringed Parakeet	Shobuj Tia	√		√		-		
59	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	Asio Talbatashi/Nakkati	√	√	√	√	-		
60	<i>Athene brama</i>	Spotted Owlet	Khuruley Pencha/Konthi Kutipecha		√		√	-		
61	<i>Ketupa zeylonensis</i>	Brown Fish Owl	Khoira mechupacha/Bhoo toom Pecha	√	√	√	√	-	TH	
62	<i>Ninox scutulata</i>	Brown Hawk-Owl	Khoira Shikrepecha		√		√	-		
63	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Lenja Ratchora	√	√	√	√	-		
64	<i>Spilornis Cheela</i>	Crested Serpent Eagle	Tila Nag-eegol/Shapkh eko Baj		√			-		
65	<i>Milvus migrans</i>	Black kite	Bhubon Chil	√				-		
66	<i>Haliastur indus</i>	Brahminy Kite	Shonkho Chil		√	√		-		
67	<i>Phalacrocorax niger</i>	Little Cormorant	Choto Pankouri	√	√	√	√	-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banshkhali Chittagong	PL4 Banshkhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local Status	
68	<i>Egretta garzetta</i>	Little Egret	Choto Boga	√	√	√	√	-		
69	<i>Egretta intermedia</i>	Yellow-billed Egret	Majhla Boga/Korche Bok	√		√	√	-		
70	<i>Casmerodius albus</i>	Great Egret	Boro Boga	√	√	√	√	-		
71	<i>Bubulcus ibis</i>	Cattle Egret	Go Boga	√	√	√	√	-		
72	<i>Ardeola grayii</i>	Indian Pond Heron	Deshi Kanibok	√	√	√	√	-		
73	<i>Ardea cinerea</i>	Grey Heron	Dhupni Bok	√			√	-		
74	<i>Gallinago gallinago</i>	Common Snipe	Pati Chega	√	√	√	√	-		
75	<i>Tringa glareola</i>	Wood Sandpiper	Bon Batan/Balu Batan		√			-		
76	<i>Actitis hypoleucos</i>	Common Sandpiper	Pati Batan/Chapakhi	√	√	√	√	-		
77	<i>Charadrius dubius</i>	Little Ring Plover	Choto Nothjiria	√				-		
78	<i>Dendrocitta vagabunda</i>	Rufous Treepie			√			-		

(Source: JICA Study Team)

Table-2.1(4) Terrestrial Fauna (Mammals) (Transmission line; Rainy season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy Season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local status	
1	<i>Canis aureus</i> Linnaeus, 1758	Jackal	Shial	√	√	√	√	-		
2	<i>Felis chaus</i> Schreber 1777	Wild cat	Bon biral	√	√	√	√	-		
3	<i>Herpestes urva</i> (Hodgson 1836)	Crab-eating Mongoose	Kankra-vuk-benji		√	√	√	-		
4	<i>Herpestes edwardsi</i> (E.Geoffroy-Saint-Hillaire 1818)	Common Mongoose	Baro benji		√	√	√	-		
5	<i>Lutra lutra</i> (Linnaeus, 1758)	common otter	Ud biral	√	√	√	√	-		
6	<i>Viverra zibetha</i> Linnaeus 1758	Large Indian Civet	Baghdas		√		√	-		
7	<i>Suncus murinus</i> Linnaeus, 1766	House shrew	Chika	√	√	√	√	-		
8	<i>Bandicota indica</i> (Bechstein, 1800)	Indian Mole rat	Indur	√	√	√	√	-		
9	<i>Bandicota bengalensis</i> (Gray and Hardwicke, 1833)	Lesser bandicoot rat	Indur	√	√	√	√	-		
10	<i>Rattus rattus</i> (Linnaeus, 1758)	House rat	Indur	√	√	√		-		
11	<i>Mus musculus</i> Linnaeus, 1758	House mouse	Nengti indur	√	√	√	√	-		
12	<i>Callosciurus pygerythrus</i> (I. Geoffroy Saint Hilaire,	Hoary-bellied Himalayan Squirrel	Kathbirali		√			-		

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Rainy Season)				Conservation Status		Remarks
				PL2 Pekua Cox's Bazar	PL3 Banskhali Chittagong	PL4 Banskhali Chittagong	PL5 Anowara, Chittagong	IUCN	Local status	
	1832)									
13	<i>Pteropus giganteus</i> (Brunnich 1782)	Indian Flying Fox	Baro badur	√	√	√		-		
14	<i>Cynopterus sphinx</i> (Vahl, 1791)	Common short-nosed fruit bat	Badur		√	√	√	-		
15	<i>Pipistrellus coromandra</i> (Gray, 1838)	Indian Pipistrelle	Chamchika		√	√	-	-		

(Source: JICA Study Team)

Table-2.2(1) Terrestrial Fauna (Insect) (Transmission line; Dry season)

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season) 22 nd Dec' 12, 13 th & 16 th Jan' 13					Conservation Status			Remarks
				PL1	PL2	PL3	PL4	PL5	IUCN	CITES	Local status	
Order: Odonata												
Family: Coenagriidae												
1	<i>Agriocnemis pygmaea</i> (Rambur)	Damsel fly (Foring)	Common bean	√	√	√	√	√	NO			Predator and Bioindicator
2	<i>Ceriagrion cerinorubellum</i> (Brauer)	Damsel fly (Foring)	Common bean	√	√	√	√	√	-			Predator and Bioindicator
Family: Libellulidae												
3	<i>Orthetrum Sabina</i> (Drury)	Slender Dkimmer (Foring)	Common been	√	√	√	√	√				Prdator and Bioindicator
Order: Dictyoptera												
Family: Blattaria												
4	<i>Periplaneta Americana</i> Linn.	American Cockroach (Telapoka)	Restaurant	√	√	√	√	√	NO			Household pest
Order: Dictyoptera												
Family: Blattellidae												
5	<i>Blattella germanica</i> Linn.	German Cockroach (Telapoka)	Agricultural field	√	√	√	√	√	NO			Pollinator in some cases
Order: Diptera												
Family: Agromyzidae												
6	<i>Agromyza spp.</i>	Miner flies	Bush bean		√	√	√	√	NO			Leaf miner pest of vegetables
7	<i>Episyrphus spp.</i>	Hover fly	Cucumber			√	√	√	NO			Predator and

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season) 22 nd Dec' 12, 13 th & 16 th Jan' 13					Conservation Status			Remarks
				PL1	PL2	PL3	PL4	PL5	IUCN	CITES	Local status	
			field									pollinator in most cases
Family: Muscidae												
8	<i>Musca domestica</i> Linn.	House fly	Varieties of habitat	√	√	√	√	√	NO			Pathogen carrier and pollinaotr in few cases
Order: Lepidoptera Family: Pyralidae												
9	<i>Scirpophaga sp.</i>	Rice white stem borer	Rice	√	√			√	NO			Pest of rice mainly
Family: Pieridae												
10	<i>Eurema hecabe contubernalis</i> Moore	Common Grass Yellow (Holud)	Common been		√	√	√	√	NO			Pollinator in adult aged
Family: Nymphalidae												
11	<i>Junonia atlites</i> (Linn.)	Chandnori	Agricultural field		√	√	√	√	NO			Pollinator in adult aged
Family: Satyridae												
12	<i>Melanitis phedima bela</i> Moore	Dark Evening Brown	Agricultural field		√	√	√	√	NO			Pollinator in adult aged
Family: Hesperidae												
13	<i>Parnara guttatus mangala</i> Moore	Straight Swift (Nillbijuri)	Snake gourd		√	√	√	√	NO			Pollinator
Order: Coleoptera Family: Chrysomelidae												
14	<i>Aulacophora foveicollis</i> Lucas	Red pumpkin beetle	Pumpkin field		√	√	√	√	NO			Agricultural pest
15	<i>Aulacophora frontalis</i> Baly	Pumpkin beetle	Pumpkin field		√	√	√	√	NO			Agricultural pest
Order: Homoptera												

Sl. No.	Species Name	English Name (Local Name)	Habitat	Survey Sites (Dry Season) 22 nd Dec' 12, 13 th & 16 th Jan' 13					Conservation Status			Remarks
				PL1	PL2	PL3	PL4	PL5	IUCN	CITES	Local status	
Family: Deltocephalidae												
16	<i>Nephotettix cincticeps</i> Matsumura	Spotted jassid	Ficefield	√	√	√	√	√	NO			Pest of rice
Order: Hemiptera Family: Coreidae												
17	<i>Leptocorisa acuta</i> Thunb.	Rice bug	Rice field		√	√		√	NO			Pest of rice
Order: Hymenoptera Family: Aphidae												
18	<i>Apis mellifera</i> Linn.	Western Honey bee (Momachhi)	Cucumber field	√	√	√	√	√	NO			Pollinator and Bioindicator
19	<i>Rhopalosiphum sp.</i>	Aphis	Common bean		√	√	√	√	NO			Agricultural pest
Family: Halictidae												
20	<i>Lasioglossum sp.</i>	Solitary Bee	Cucumber field	√	√	√	√	√	NO			Pollinator And bioindicator
Order: Coleoptera Family: Coccinellidae												
21	<i>Micraspis crocea</i> (Mulsant)	Lady beetle	Rice	√	√	√	√	√	NO			Rice pest

(Source: JICA Study Team)

Table-2.2(2) Terrestrial Fauna (Amphibians and Reptiles) (Transmission line; Dry season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)					Conservation Status		Remarks
				PL1	PL2	PL3	PL4	PL5	IUCN	Local status	
(Amphibians)											
1	<i>Duttaphrynus (Bufo) melanostictus</i>	Southeast Asian toad	Kono bang		√	√	√	√	-		Very common throughout the county
2	<i>Euphlyctis cyanophlyctis</i>	Skipper frog	Kotkoti bang		√	√	√		-		Very common
3	<i>Fejervarya limnocharis</i>	Cricket frog			√	√	√		-		Common
4	<i>Hoplobatrachus tigerinus</i>	Bull frog	Kola bang, Sona bang, Bhawa beng		√	√	√	√	-		Wide spread
6	<i>Microhyla ornate</i> (Dumeril and Bibron 1841)	Ornate narrow mouthed frog	China bang		√	√	√	√	-		
7	<i>Microhyla rubra</i> (Jerdon 1854)	Red narrow mouthed frog	Lal China bang		√	√	√	√	-		
(Reptiles)											
1	<i>Calotes versicolor</i> (Daudin, 1802)	Garden lizard	Roktochusha		√	√	√		-	TH	
2	<i>Mabuya mabuya</i>	Skink	Achil	√	√	√	√		-	TH	
3	<i>Gekko gekko</i>	Tokay Gecko	Tokkhak/ Tokhha		√	√	√	√	-	TH	
4	<i>Hemidactylus brooki</i>	House lizard	Tiktiki	√	√	√	√	√	-		
5	<i>Hemidactylus frenatus</i> Schlegel in Duméril & Bibron, 1836	House lizard	Tiktiki	√	√	√	√	√	-		
6	<i>Ahaetulla prasina</i> (Boie, 1827)	Common Vine snake	Laodoga Shap/sutanoli Shap	√	√	√	√	√	-		
7	<i>Amphiesma stolatum</i> (Linnaeus, 1758)	Buff-stripped keelback	Hee shup	√	√	√	√		-		
8	<i>Xenocrophis piscator</i>	Checkered keel back	Dhora sap		√	√	√	√	-		

(Source: JICA Study Team)

Table-2.2(3) Terrestrial Fauna (Birds) (Transmission line; Dry season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
1	<i>Passer domesticus</i>	House Sparrow	Pati Chorui	√	√	√	√			
2	<i>Orthotomus sutorius</i>	Common Tailorbird	Pati Tuntuni	√	√	√	√			
3	<i>Sturnus contra</i>	Pied Myna	Pakra Shalik/Gubra Shalik/Gu Shalik	√	√	√	√			
4	<i>Sturnus malabaricus</i>	Chestnut-tailed Starling	Khoiralej Kathshalik/Des hi Pawei	√	√	√	√			
5	<i>Acridotheres tristis</i>	Common Myna	Bhat Shalik	√	√	√	√			
6	<i>Acridotheres fuscus</i>	Jungle Myna	Jhuti Sahlik	√	√	√	√			
7	<i>Copsychus saularis</i>	Oriental Magpie-Robin	Doel/Udoi Doel	√	√	√	√			
8	<i>Orthotomus sutorius</i>	Common Tailorbird	Pati Tuntuni	√	√	√	√			
9	<i>Columba livia</i>	Common Pigeon	Gola Paira/Jalali Kabutor	√	√	√				
10	<i>Treron bicinctus</i>	Orange-breasted Green Pigeon	Komlabook Horial/Horikol	√						
11	<i>Streptopelia decaocto</i>	Eurasian Collared Dove	Lal Rajghughu		√	√				
12	<i>Streptopelia tranquebarica</i>	Red Turtle Dove	Eurashio Konthighughu/Raj Ghughu			√				
13	<i>Streptopelia chinensis</i>	Spotted Dove	Tila Ghughu	√	√	√	√			
14	<i>Treron phoenicopterus</i>	Yellow-footed Green Pigeon	Holdepa Horial/Botkol			√				

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
15	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Bangla Bulbul/Bulbuli	√	√	√	√			
16	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Shipahi Bulbul/Bulbuli	√	√	√	√			
17	<i>Corvus splendens</i>	House Crow	Pati Kak	√	√	√	√			
18	<i>Corvus macrorhynchos</i>	Jungle Crow	Dar Kak/Danr Kak	√	√	√	√			
19	<i>Oriolus xanthornus</i>	Black-hooded Oriole	Kalamatha Benebou/Holdey Pakhi	√	√	√	√			
20	<i>Artamus fuscus</i>	Ashy Woodswallow	Metey Bonababil/Latorra	√	√	√	√			
21	<i>Dendrocitta vagabunda</i>	Rufous Treepie	Khoira Harichacha/Hari Chacha	√	√	√	√			
22	<i>Dicaeum cruentatum</i>	Scarlet-backet Flowerpecker	Lalpith Fuljhuri	√	√	√				
23	<i>Leptocoma zeylonica</i>	Purple-rumped Sunbird	Begunikomor Moutushi	√	√	√	√			
24	<i>Cinnyris asiaticus</i>	Purple Sunbird	Beguni Moutushi	√	√	√	√			
25	<i>Aethopyga siparaja</i>	Crimson Sunbird	Shidure Moutushi				√			
26	<i>Pericrocotus cinnamomeus</i>	Small Minivet	Choto Saheli	√	√		√			
27	<i>Pericrocotus flammeus</i>	Scarlet Minivet	Shidurey Saheli				√			
28	<i>Arachnothera siparaja</i>	Little Spiderhunter	Choto Makormar	√	√	√	√			
29	<i>Ploceus philippinus</i>	Baya Weaver	Deshi	√	√	√				

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
			Babui/Baoi							
30	<i>Garrulax galbanus</i>	Yellow-throated Laughingthrush	Holdeygola Penga			√			TH	
31	<i>Garrulax ruficollis</i>	Rufous-necked Laughingthrush	Lalghar Penga	√		√	√			
32	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Tila Munia		√	√	√			
33	<i>Lonchura striata</i>	White-rumped Munia	Dholakomor Munia			√				
34	<i>Anthus rufulus</i>	Paddyfield Pipit	Dhani Tulika	√	√		√			
35	<i>Turdoides striatus</i>	Jungle Babber	Bon Satari	√		√				
36	<i>Pellorneum ruficeps</i>	Puff-throated Babber	Golafola Satarey	√		√				
37	<i>Turdoides earlei</i>	Straited Babber	Dagi Satari	√	√	√				
38	<i>Zosterops palpebrosus</i>	Oriental White-eye	Udoi Dholachokh/Sh et Ankhi	√	√	√	√			
39	<i>Prinia inornata</i>	Plain Prinia	Nirol Prina	√		√				
40	<i>Ficedula albicilla</i>	Taiga Flycatcher	Taiga Chutki/Lalbook Chotok	√	√	√	√			
41	<i>Aegithina tiphia</i>	Common Iora	Fatik Jal	√	√	√	√			
42	<i>Hypothymis azurea</i>	Black-naped Monarch	Kalaghar Rajon	√		√	√			
43	<i>Dicrurus macrocercus</i>	Black Drongo	Kala Fingey	√	√	√	√			
44	<i>Disrurus paradiseus</i>	Greater Racket-tailed Drongo	Boro Racket-Fingey/Bhimraj			√				
45	<i>Disrurus aeneus</i>	Bronzed Drongo	Fingey			√	√			
46	<i>Rhipidura albicollis</i>	White-throated	Dholagola	√	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
		Fantail	Chatighurani/Lej Nachuni							
47	<i>Alcedo atthis</i>	Common Kingfisher	Pati Machranga	√	√	√	√			
48	<i>Halcyon smyrnensis</i>	White-throated kingfisher	Dholagoloa Machranga	√	√	√	√			
49	<i>Ceryle rudis</i>	Pied Kingfisher	Pakra Machranga	√	√	√	√			
50	<i>Upupa epops</i>	Eurasian Hoopoe	Pati Hoodhood	√		√	√			
51	<i>Picus canus</i>	Grey-headed Woodpecker	Meteymatha Kathkurali	√		√				
52	<i>Dendrocopos macei</i>	Fulvous-breasted Woodpecker	Batabi Katkurali	√			√			
53	<i>Picus chlorolophus</i>	Lesser Yellownape	Choto Holdeykurali		√					
54	<i>Dinopium bengalensis</i>	Lesser goldenback	Bangla kaththokra	√		√				
55	<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker	Boro Metekutali				√			
56	<i>Merops leschenaultia</i>	Chestnut-headed Bee-eater	Khoiramatha Shuichora	√	√	√	√			
57	<i>Merops philippinus</i>	Blue-tailed Bee-eater	Neel-lej Shuichora	√	√	√	√			
58	<i>Merops orientalis</i>	Green Bee-eater	Shabuj Shuichora	√	√	√	√			
59	<i>Psittacula alexandri</i>	Red-breasted Parakeet	Modna Tia	√		√	√			
60	<i>Psittacula krameri</i>	Rose-ringed Parakeet	Shobuj Tia		√	√	√			
61	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	Asio Talbatashi/Nak	√	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
			kati							
62	<i>Apus affinis</i>	Little Swift	Ghor Batashi	√	√	√	√			
63	<i>Ketupa zeylonensis</i>	Brown Fish Owl	Khoira mechupacha/B hootoom Pecha			√			TH	
64	<i>Otus bakkamoena</i>	Collard Scops Owl	Konti Nimpesha		√	√	√			
65	<i>Otus spilocephalus</i>	Mountain Scops Owl	Pahari Ninpecha			√				
66	<i>Tyto alba</i>	Barn Owl	Lokkhi Pecha	√		√				
67	<i>Athene brama</i>	Spotted Owlet	Khuruley Pencha/Konthi Kutipecha	√	√	√	√			
68	<i>Glaucidium cuculoides</i>	Asian Barred Owlet	Eshio Dagipecha		√					
69	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Lenja Ratchora	√		√				
70	<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish Eagle	Metemetha Kura Eagle			√				
71	<i>Spilornis Cheela</i>	Crested Serpent Eagle	Tila Nag-eegol/Shapkeko Baj		√	√	√			
72	<i>Culicicapa ceylonensis</i>	Grey-headed Canary-flycatcher	Futki		√	√	√			
73	<i>Phalacrocorax niger</i>	Little Cormorant	Choto Pankouri	√	√	√	√			
74	<i>Phalacrocorax carbo</i>	Great Cormorant	Boro Pankouri			√				

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
75	<i>Egretta garzetta</i>	Little Egret	Choto Boga	√	√	√	√			
76	<i>Egretta intermedia</i>	Yellow-billed Egret	Majhla Boga/Korche Bok	√	√	√	√			
77	<i>Casmerudias albus</i>	Great Egret	Boro Boga	√		√				
78	<i>Bubulcus ibis</i>	Cattle Egret	Go Boga	√	√	√	√			
79	<i>Ardea cinerea</i>	Grey Heron	Dhupni Bok	√	√	√	√			
80	<i>Ardeola grayii</i>	Indian Pond Heron	Deshi Kanibok	√	√	√	√			
81	<i>Sterna aurantia</i>	River Tern	Nodia Panchil			√	√			
82	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	Dholabook Dahuk	√	√	√	√			
83	<i>Porzana fusca</i>	Ruddy-breasted Crake	Lalbook Gurguri	√			√			
84	<i>Vanellus indicus</i>	Red-wattled Lapwing	Lal-litika Hot-ti-ti	√	√	√	√			
85	<i>Parus major</i>	Great Tit	Boro Tit	√	√	√	√			
(Migratory/Winter visitors)										
86	<i>Hirundo rustica</i>	Barn Swallow	Metho Ababil	√	√	√	√			
87	<i>Oriolus chinensis</i>	Black-naped Oriole	Kalaghar Benebou			√				
88	<i>Dendrocygna bicolor</i>	Fulvous Whistling Duck	Raj Shorali		√	√				
89	<i>Dendrocygna javanica</i>	Lesser Whistling Duck	Pati Shorali	√	√	√	√			
90	<i>Anus acuta</i>	Northern Pintail	Utturey Lenjash			√				
91	<i>Jynx torquilla</i>	Eurasian Wryneck	Eureshio Gharbetha			√				
92	<i>Halcyon pileata</i>	Black-capped Kingfisher	Kalatupi Machranga	√		√				

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
93	<i>Todiramphus chloris</i>	Collared Kingfisher	Dholaghar Machranga			√				
94	<i>Porzana pusilla</i>	Bailon's Crake	Bailoner Gurguri			√				
95	<i>Rallus aquaticus</i>	Water Rail	Panti Jhilli	√		√				
96	<i>Gallinago gallinago</i>	Common Snipe	Pati Chega		√	√	√			
97	<i>Gallinago stenura</i>	Pin-tailed Snipe	Lenja Chega	√			√			
98	<i>Vanellus cinereus</i>	Grey-headed Lapwing	Dhushor Ti-ti			√				
99	<i>Numenius arquata</i>	Eurasian Curlew	Eureshio Gulinda	√			√			
100	<i>Numenius phaeopus</i>	Whimbrel	Choto Gulinda		√					
101	<i>Tringa glareola</i>	Wood Sandpiper	Bon Batan/Balu Batan	√	√	√	√			
102	<i>Actitis hypoleucos</i>	Common Sandpiper	Pati Batan/Chapakhi	√	√	√	√			
103	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Bali Batan			√				
104	<i>Tringa nebularia</i>	Common Greenshank	Pati Shabujpa		√		√			
105	<i>Tringa totanus</i>	Common Redshank	Pati Lalpa	√	√	√				
106	<i>Pluvialis fuva</i>	Pacific Golden Plover	Proshanto Shonajiria	√	√					
107	<i>Charadrius alexandrines</i>	Kentish Plover	Kentish Jiria		√	√				
108	<i>Charadrius dubius</i>	Little Ring Plover	Choto Nothjiria	√		√	√			
109	<i>Charadrius hiaticula</i>	Common Ring Plover	Pati Nothjiria	√						
110	<i>Charadrius leschenaultia</i>	Greater Sand Plover	Boro Dhuljiria	√	√					

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Dry Season)				Conservation Status		Remarks
				PL1	PL2	PL3 + PL4	PL5	IUCN	Local status	
111	<i>Charadrius mongolus</i>	Lesser Sand Plover	Choto Dhuljiria	√	√	√	√			
112	<i>Larus brunnicephalus</i>	Brown-headed Gull	Khoiramatha Gangchil	√			√			
113	<i>Larus ridibundus</i>	Common Black-headed Gull	Kalamatha Gangchil	√	√		√			
114	<i>Motacilla alba</i>	White Wagtail	Dhola Khonjon	√	√	√	√			
115	<i>Motacilla cinerea</i>	Grey Wagtail	Metey Khonjon		√					
116	<i>Motacilla citreola</i>	Citrine Wagtail	Sitrin Khonjon	√						
117	<i>Motacilla flava</i>	Western Yellow Wagtail	Poschima Hodey Khonjon	√	√	√	√			
118	<i>Phylloscopus trochiloides</i>	Greenish Warbler	Saoboje Futki	√	√	√	√			
119	<i>Phylloscopus collybita</i>	Common Chiffchaff	Pati Chifchaf			√				
120	<i>Phylloscopus trochiloides</i>	Greenish Warbler	Saoboje Futki	√		√	√			
121	<i>Riparia riparia</i>	Sand Martin	Nakkati			√	√			
122	<i>Hirundo daurica</i>	Red-rumped Swallow	Lalkomor Ababil			√				
123	<i>Lanius cristatus</i>	Brown Shrike	Badami Koshai	√	√	√	√			
124	<i>Lanius schach</i>	Long-tail Shrike	Lombaleji Koshai	√	√	√	√			

(Source: JICA Study Team)

Table-2.2(4) Terrestrial Fauna (Mammals) (Transmission line; Dry season)

Sl. No.	Species Name	English Name	Local Name	Survey Sites					Conservation Status			Remarks
				Dry Season					IUCN	CITES	Local Law	
				22 nd Dec' 12, 13 th & 16 th Jan' 13								
PL1	PL2	PL3	PL4	PL5								
Order: Carnivora												
Family: Canidae												
1	<i>Canis aureus</i> Linnaeus, 1758	Jackal	Shial	√	√	√	√	√	LC		C	
Family: Felidae												
2	<i>Felis chaus</i> Schreber 1777	Wild cat	Bon biral	√	√	√	√	√	LC			
Family: Herpestidae												
3	<i>Herpestes edwardsi</i> (E.Geoffroy-Saint-H illare 1818)	Common Mongoose	Baro benji		√	√	√	√	LC			
Family: Mustelidae												
4	<i>Lutra lutra</i> (Linnaeus, 1758)	Common otter	Ud biral		√	√	√	√	NO			
Family: Viverridae												
5	<i>Viverra zibetha</i> Linnaeus 1758	Large Indian Civet	Baghdas		√		√	√	NO			
Order: Eulipotyphla												
Family: Soricidae												
6	<i>Suncus murinus</i> Linnaeus, 1766	House shrew	Chika	√	√	√	√	√	LC		VC	
Order: Rodentia												
Family: Muridae												
7	<i>Bandicota bengalensis</i> (Gray and Hardwicke, 1833)	Lesser bandico ot rat	Indur	√	√	√	√	√	LC		VC	

8	<i>Bandicota indica</i> (Bechstein, 1800)	Indian Mole rat	Indur	√	√	√	√	√	LC			
9	<i>Rattus rattus</i> (Linnaeus, 1758)	House rat	Indur	√	√	√		√	LC		C	
Family: Sciuridae												
10	<i>Callosciurus pygerythrus</i> (I. Geoffroy Saint Hilaire, 1832)	Hoary-bellied Himalayan Squirrel	Kathbirali		√			√	LC		C	
Order: Chiroptera Family: Pteropidae												
11	<i>Pteropus giganteus</i> (Brunnich 1782)	Indian Flying Fox	Baro badur	√	√	√	√	√	LC			
12	<i>Rousettus leschenaulti</i> (Desmarest, 1820)	Leschenault's Rousette	Kola Badur		√		√	√	LC			
13	<i>Pipistrellus coromandra</i> (Gray, 1838)	Indian Pipistrelle	Chamchika		√	√	√	√	LC			

(Source: JICA Study Team)

Appendix-C15.5-5

Environmental Baseline Survey Report (Access Road)

**FIELD SURVEY REPORT
ON NATURAL
ENVIRONMENT
(DRY & RAINY SEASON)**

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1) **Background**

The Government of Bangladesh (GOB) assigns top priority to the development of power sector realizing its importance in economy, industrial and social development of the country. GOB forecasts that the maximum electricity demand would be 13,000MW in 2017 and 34,000 MW in 2030, and to meet up this, GOB has formulated a Power System Master Plan (PSMP 2010). PSMP 2010 targets composition of power supply as of 2030 set at 50% for domestic and imported coal, 25% for domestic and imported (in the form of LNG) natural gas and 25% for other sources such oil, nuclear power and renewable energy. The coal based generation is the least cost option in consideration to present economy.

In this context, Bangladesh Power Development Board (BPDB) established Coal Power Generation Company Bangladesh LTD (CPGCBL), and plans installation of Matarbari Coal-Fired Power Plant (Matarbari CFPP; 2x600 MW) at Matarbari Island under Maheshkhali Upazill, Cox's Bazar District.

After the follow-up survey for PSMP 2010, JICA has implemented "The preparatory survey on the Chittagong area coal-fired power plant development project" including the preliminary design of access road.

The access road (Figure-1) will be utilized for the purposes of transporting needed equipment and materials, and for the movement of parties involved in the construction of the power plant.

2) Purpose of survey

The purpose of the environmental field survey is to understand the existing condition of the important environmental components of the project area.

Identification of the critical environmental parameters through the baseline survey will help to make decision on the project component finalization and the required adjustment of the project work.

The main purposes of the environmental baseline study are;

- i. to assess present environmental quality & the environmental impacts and
- ii. to identify environmentally significant factors that could preclude project development.

This report contains information on existing environmental scenario for the following parameters.

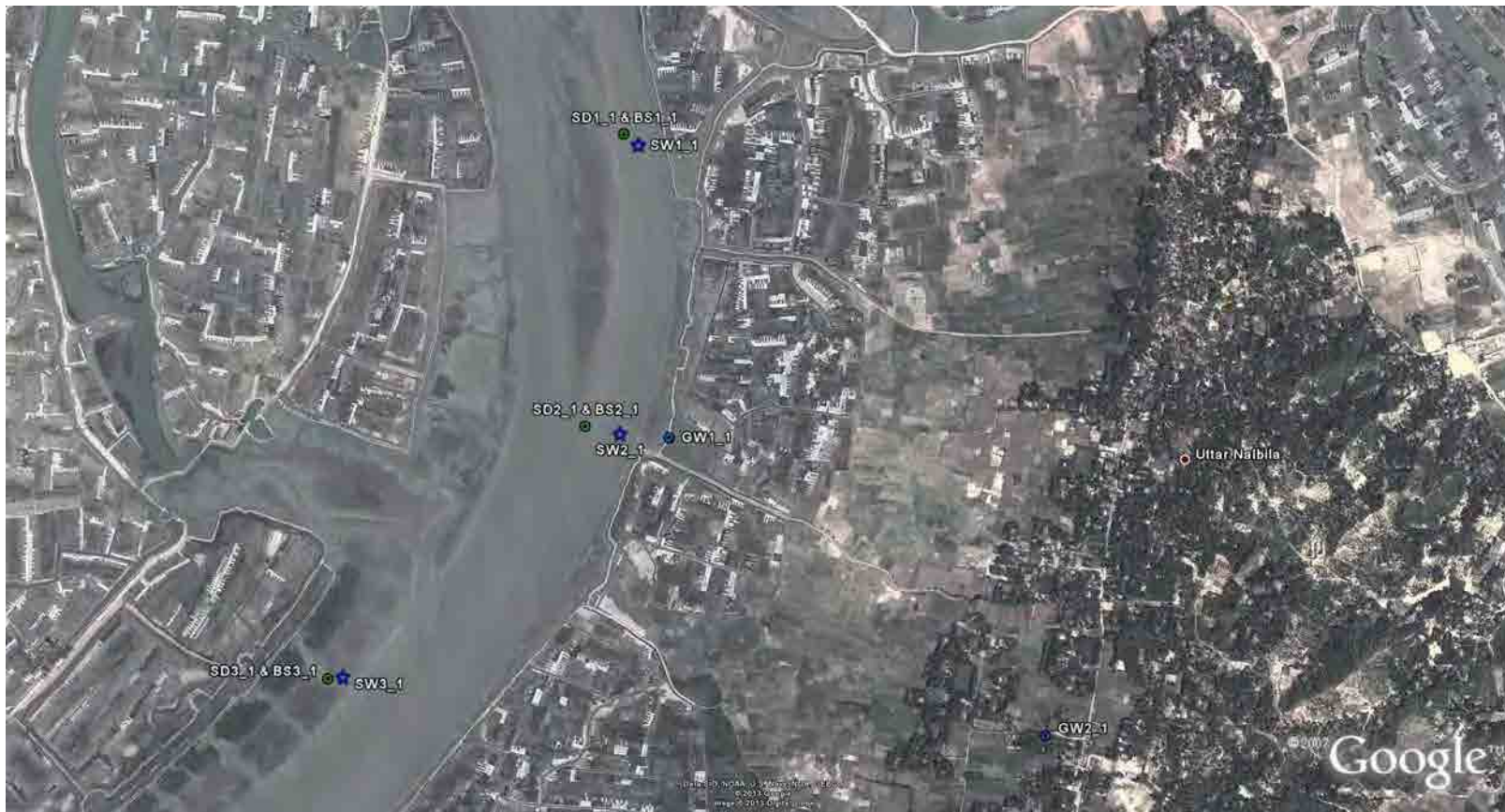
- Air Environment
- Noise and Vibration Environment
- Water Environment
- Soil/sediment Environment
- Biological Environment

To achieve these objectives, consultant team monitored the environmental parameters within the core zone and buffer zone from the route location accordance with the Guidelines for EIA. The discussions of this report contain the results of field studies/monitoring carried out during the dry and Rainy season-2013 (March to May and June-2013).

3) Location map showing survey points

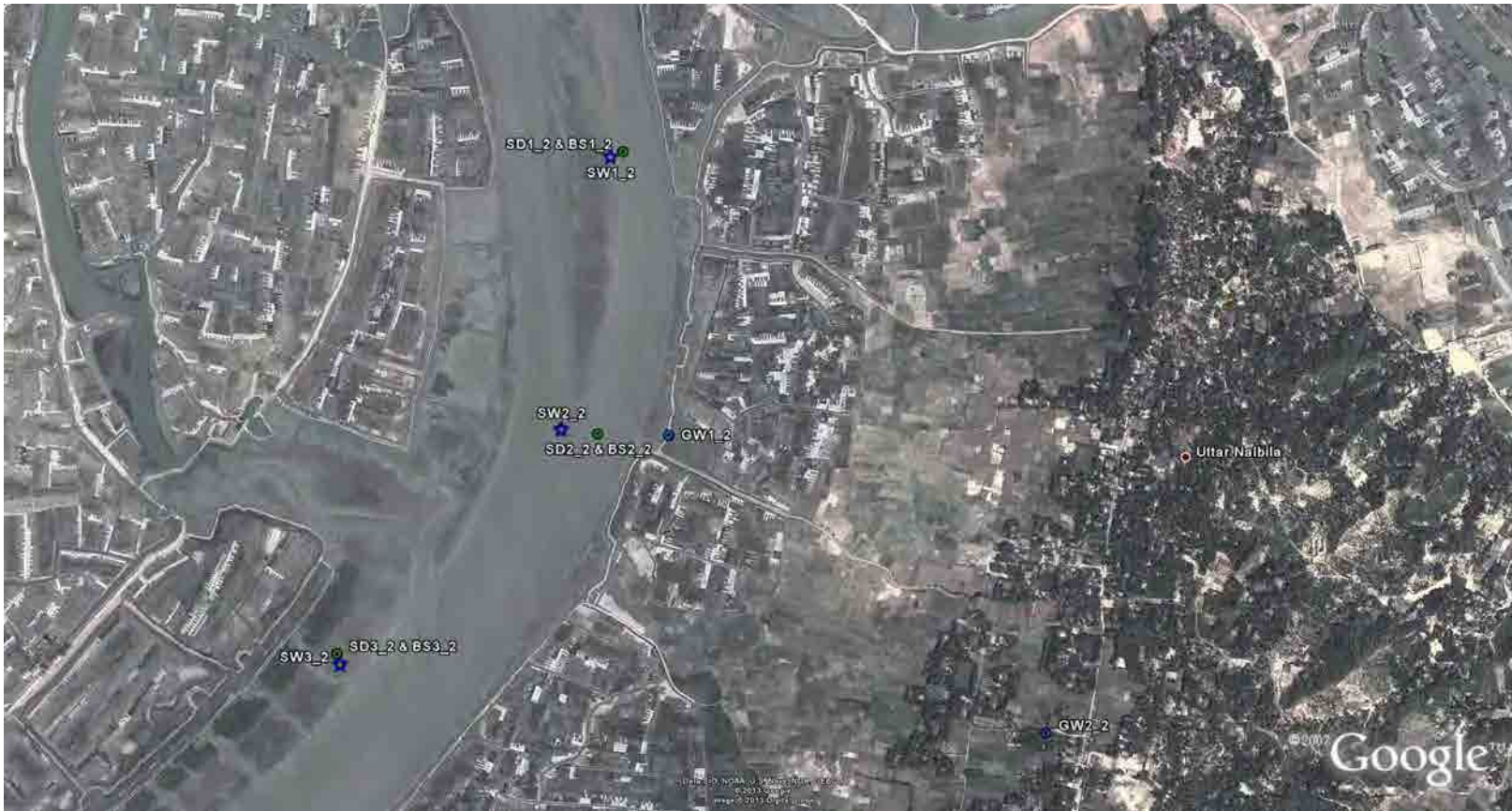
Table 1: Sampling Location

Sl. No.	Item	Frequency (season)	Locations
1	Air Quality (AQ)	Twice	A. Yunuskhali Bazar B. Ilisha Bazar (Between Eidmoni and Badarkhali) C. Ekata Bazar
2	Noise & Vibration (N&V)	Twice	A. Yunuskhali Bazar B. Ilisha Bazar (Between Eidmoni and Badarkhali) C. Ekata Bazar D. Janata Bazar E. Close to Baggasara (Between Pekua and Eidmoni)
3	Surface Water Quality (WQ)	Twice	A. Upstream of Proposed Bridge B. Downstream of Proposed Bridge C. Close to Mangrove Forest
4	Sediment Quality (SQ)	Twice	A. Upstream of Proposed Bridge B. Downstream of Proposed Bridge C. Close to Mangrove Forest
5	Ground Water Quality (GWQ)	Twice	A. Close to the proposed Bridge site B. Village Close to Yunuskhali Bazar
6	Aquatic Benthic Animals	Twice	A. Upstream of Proposed Bridge B. Downstream of Proposed Bridge C. Close to Mangrove Forest
7	*Vegetations	Twice	A. Plantation forest Area B. Matarbari Bank side (River Upstream to Downstream) C. Yunuskhali Bank side (River Upstream to Downstream)
8	Terrestrial Animals	Twice	A. Janata Bazar to Proposed Bridge Site B. Plantation forest Area C. Tidal Flat Area of Kuhelia River along the Mangrove forest
9	Avian	4 times	A. Janata Bazar to Proposed Bridge site B. Plantation forest Area C. Matarbari Bank Site (at low tide and high tide) D. Yunuskhali Bank Site (at low tide and high tide)



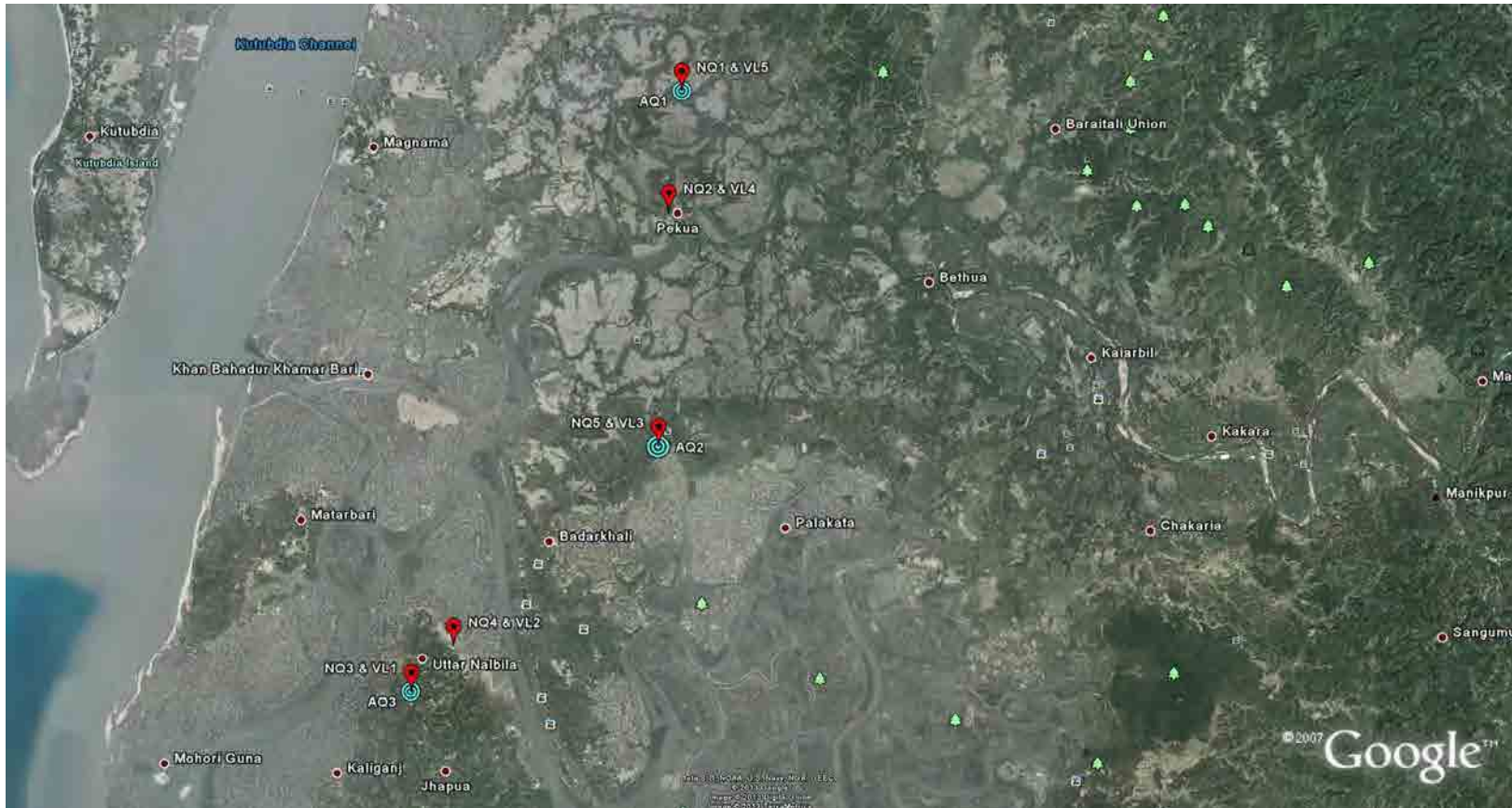
SW- Surface water Sampling Location; SD- Sediment Sampling Location ; GW - Ground water sampling location

Figure 2: Map showing sampling location of surface water, sediment quality and ground water in the project area at Dry Season.



SW- Surface water Sampling Location; SD- Sediment Sampling Location; GW - Ground water sampling location

Figure 3: Map showing sampling location of surface water, sediment quality and ground water in the project area at Rainy season.



AQ - Air Quality Sampling Location ;NQ- Noise Quality Sampling Location

Figure 4: Map showing sampling location of Air and Noise quality in the project area at Dry and Rainy season

4) Work Item with Quantity

Table 2: Sampling Frequency

SL#	Item	Frequency (Season)	No. of location	Parameters
1	Air Quality	2 times (Dry & Rainy)	3	NO _x , SO _x , CO, PM ₁₀ , O ₃
2	Noise & Vibration	2 times	5	Noise and Vibration level , 24 hrs
3	Surface Water quality	2 times	3	On-site observation: Clarity, Colour, Water temperature, Salinity (vertical), pH, Turbidity Laboratory analysis: Suspended Solid, Dissolved Oxygen, COD, BOD5, Ammonium Nitrogen (NH ₄ -N), Nitrate Nitrogen (NO ₃ -N), Total Nitrogen, Phosphate(PO ₄ -P), Total Phosphorus, Total Coliform, Oil, and Grease content, Mercury, Arsenic, Lead, Chromium, Cadmium, Copper, Nickel, Zinc
4	Sediment quality	2 times	3	Appearances, Odor, Colour, Grading Analysis, Density, Water content, Ignition loss, COD, Mercury, Arsenic, Lead, Chromium, Cadmium, Copper, Nickel, Zinc
5	Ground Water Quality	2 times	2	On-site observation: Clarity, Colour, Water temperature, Salinity, pH, Turbidity Laboratory analysis: Dissolved Oxygen, COD, BOD5, Ammonium Nitrogen (NH ₄ -N), Nitrate Nitrogen (NO ₃ -N), Total Nitrogen, Phosphate(PO ₄ -P), Total Phosphorus, Total Coliform, Mercury, Arsenic, Lead, Chromium, Cadmium, Copper, Nickel, Zinc
6	Aquatic Benthic Animals	2 times	3	Collected species name, Number of individuals and Weight by species in unit area
7	Ecology including terrestrial Vegetation, animal and Avian fauna	2 times	3 typical	Species and categories

5) Survey period

Survey was conducted in two Season.

Dry Season : 28th March to 9th May.

Rainy season : 4th June to 20th June.

6) Equipment used

Table 3: Sampling Equipment

SL#	Item	Equipment Used
1.	Air Quality	High Volume Sampler Model- LATA ENVIROTECH APM 250
2.	Noise & Vibration	3223 Data logger Sound level meter Digital vibration meter (model- C35 NVT) Clarity Sacci Disk Water temperature Digital Thermometer Salinity (vertical) Digital Salinity Meter pH Digital pH meter Turbidity Digital Turbidity Meter Suspended Solid Titration Method Dissolved Oxygen Digital DO meter COD Titration Method BOD ₅ Titration Method Ammonium Nitrogen Titration Method (NH ₄ -N) Nitrate Nitrogen Spectrophotometer (NO ₃ -N)
3.	Water quality	Total Nitrogen Spectrophotometer Phosphate (PO ₄ -P) Spectrophotometer Total Phosphorus Spectrophotometer Total Coliform Bacterial Count Oil and Grease content Atomic absorption spectrophotometer Mercury Atomic absorption spectrophotometer Arsenic Atomic absorption spectrophotometer Lead Atomic absorption spectrophotometer Chromium Atomic absorption spectrophotometer Cadmium Atomic absorption spectrophotometer Copper Atomic absorption spectrophotometer Nickel Atomic absorption spectrophotometer Zinc Atomic absorption spectrophotometer COD Titration method Mercury Atomic absorption spectrophotometer Arsenic Atomic absorption spectrophotometer Lead Atomic absorption spectrophotometer
4.	Sediment quality	Chromium Atomic absorption spectrophotometer Cadmium Atomic absorption spectrophotometer Copper Atomic absorption spectrophotometer Nickel Atomic absorption spectrophotometer Zinc Atomic absorption spectrophotometer
5.	Aquatic Animals	Benthic a) Ekman dredge b) Benthos sieve & c) Plate counter

7) Survey method

Table 4: Sampling, Measurement and Analysis Methodology

SL#	Item	Methods
1	Air Quality	High Volume Sampler (Model- LATA ENVIROTECH APM 250) was set up for 24 hrs for the analysis in each location.
2	Noise & Vibration	3223 Data logger Sound level meter The meter was set up in each location for 24 hrs to take the data. After the raw data, maximum, minimum and average data was extracted. Digital vibration meter (model- C35 NVT)
3	Water quality	Water Sampling by Bottle and some parameter was done on site with digital meter.
4	Sediment quality	Sediment sample collected by sampling pot and take to the laboratory for analysis.
5	Ground Water Quality	Water Sampling by Bottle and some parameter was done on site with digital meter.
6	Aquatic Benthic Animals	River bootom mud sample was collected through stainless steel EKMAN bottom grab sampler was submerged to the bottom to collect sample. The sample was emptied from the grabber into a tray and then water was added to the tray to decant the invertebrates from the sample to a wide mouth PET bottle to take to the laboratory. Benthic invertebrates were identified to their families using appropriate keys or well-known diagnostic characters (APHA 2004, Pennak 1987; Merrit and Cummins 2008, McCafferty 1998).
7	Ecology including terrestrial vegetation, animal and Avian fauna	<p>a) Flora Based on satellite imagery and field visit, an attempt was made to assess there are various vegetation types in hill side forest area and few vegetation cover in the mangrove cluster near the proposed bridge area. Once established, the main ecosystems areas will be visited and plantation forest species assessment made. In the most important ecosystems, standardized transects will be established in order to assess species composition and vegetation structure. To facilitate the identification of the maximum number of species, several visits were made.</p> <p>Quardrate survey was conducted in the hill side forest and mangrove forest area. The Quardrate study was conducted to determine the biodiversity indices of the surrounding of the project area. Cover vegetation can be measured by estimating visually the proportion of the Quardrate occupied by each species (i.e. the vertical projection of each plantation forest). It may be more sensible to use percentage classes, e.g. in 10% or 25%</p>

		<p>steps, or use those given in the Domin or Braun-Blanquet scales. It may find useful to divide the vegetation into layers, e.g. a bryophyte layer, an herb layer and a shrub layer, and make cover estimates separately for each layer.</p> <p>The Biodiversity indices estimate as follows:</p> <ul style="list-style-type: none"> - Shannon-Wiener Diversity Index - Species Richness (S) - Total Abundance - Simpson Diversity Index - Evenness <p>b) Fauna</p> <p>During the fauna survey of the project impact zone mainly covers -</p> <ol style="list-style-type: none"> I. Birds II. Amphibians and Reptiles III. Mammals <p>I. Birds</p> <p>The basic method that will be chosen is based on setting up a single line at each site called transect. Birds can be identified either visually, by their calls or digitally recorded. This method involves identifying all the birds seen or heard while standing at a series of points along transect (straight line through the site). Bird counts are conducted at the start of first light which is before sunrise. This is the time when birds vocalize most, and is known as the 'Dawn Chorus'. It is also a time of maximum bird movement as birds move through the bush to begin feeding. A systematic search in the project area (over a fixed area and/or for a fixed time) such as the method specified here has the added advantage of providing an index of the abundance of individuals and species. The reliability of the abundance index can be reduced by either overestimates or underestimates of bird numbers. To reduce overestimates, particularly when a member is observing, try to ensure that each individual bird is recorded only once. Hence, ensure that a least one member of the team is watching at all times. Interview survey with local people (including villagers, academicians help us to get information of the local species available in the project area.</p> <p>II. Amphibians and Reptiles</p> <p>A variety of methods were employed to sample the amphibians and reptilians. The total study sites were divided into few categories according to the habitat that required by these species. These were transecting line methods, opportunistic searching method,</p>
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		<p>sampling at breeding sites, nocturnal searches etc. The specimens were observed almost everywhere of the study site; such as cleared homestead forested areas, around human habitation, edges of village grooves, roadsides, drainage systems, under logs, human debris or refuse, holes on the ground, tree holes, burrows, leaf litters, under low lying vegetation, rain water puddles, temporary stagnant water etc.</p> <p>10.1 III. Mammals</p> <p>For inventory of this project area, “Observational methods” including imaging by digital camera, identification of dung, tracks and others signs, night walks was adopted. Sometimes indigenous knowledge (especially from hunters) is shared to prepare preliminary list of species and/or help with identification of signs. Interview survey with local people also consider during this inventory of the project area.</p>
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8) Survey Results

1. Ambient Air Quality – Annex A
2. Noise level Data – Annex B
3. Vibration Level data- Annex C
4. Surface Water Quality Data- Annex D
5. Ground Water Quality Data- Annex E
6. Sediment quality data- Annex F
7. Benthos quantity data- Annex G
8. Checklist of Plantation forest (dry Season) -ANNEX H
9. Checklist of Plantation forest (Rainy season) -ANNEX I
10. Species Checklist of Amphibians and Reptiles (Dry season) -ANNEX J
11. Species Checklist of Amphibians and Reptiles (Rainy season) -ANNEX K
12. Species Checklist of Mammals (Dry season)- ANNEX L
13. Species Checklist of Mammals (Rainy season) - ANNEX M
14. Species Checklist of Birds (Dry season) -ANNEX N
15. Species Checklist of Birds (Rainy season) -ANNEX O
16. Checklist of Butterflies - ANNEX P
17. Field Observation of the Floral Species of the Study Area ANNEX- Q
18. Field Observation of the Amphibian & Reptail Species of the Study Area- ANNEX R
19. Field Observation of the Mammals Species of the Study- ANNEX S
20. Field Observation of the Birds Species of the Study -ANNEX T
21. Field Observation of the Butterfly Species of the Study- ANNEX U

9) Evaluation of Survey Results

9.1 Air Quality

The existing ambient air quality of the study area was monitored at three (3) locations during the dry and rainy season monitoring period. The monitoring parameters included Particulate Matter (PM₁₀), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO) and Ozone (O₃).

Selection of sampling locations: The existing status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network. The ambient air quality monitoring locations were based on the following aspects covered in field survey plan developed prior to the field work:

- Meteorological conditions of the area based on information of BMD observatory at the site;
- Topography of the study area; and
- Location of sensitive receptors such as major settlements;

9.1.1 PM₁₀

During monitoring period of dry and rainy season, 24-hourly average PM₁₀ concentration in ambient air in the study area was recorded in the range of 31.43 – 64.72 µg/m³ and 24.51- 40.65 µg/m³. The maximum PM₁₀ concentration was reported from Illisha bazar as 64.72 µg/m³ and 40.65 µg/m³ respectively. 24-hourly National Ambient Air Quality Standard (NAAQS) for PM₁₀ in Bangladesh is 150 µg/m³.

9.1.2 SO₂

The 24-hourly SO₂ concentration was recorded in the range of 4.71 – 6.72 µg/m³ and 2.45 – 4.34 µg/m³ respectively during the dry and Rainy season monitoring period. During the monitoring period, the maximum SO₂ concentration is reported at Illisha bazar as 6.72 and 4.34 µg/m³. SO₂ concentrations at all the monitoring locations were reported below 365 µg/m³, which is a 24-hourly National Ambient Air Quality

Standard (NAAQS) for SO₂ in Bangladesh.

9.1.3 NO_x

During monitoring period of dry and rainy season the 24-hourly NO_x average concentration in ambient air in the study area was recorded in the range of 13.65 – 21.35 µg/m³ and 9.52- 15.46 µg/m³ respectively.

During the monitoring period, the maximum NO_x concentration is reported at Ilisha bazar as 21.35 and 15.46 µg/m³. There are no stipulated standards for 24-hourly NO_x concentration in Bangladesh. The annual Bangladesh standard guideline value for NO_x are 100 µg/m³ and present concentrations at all the locations are well below these values.

9.1.4 CO

The 8-hourly average CO concentration was recorded below 2 ppm. CO was reported low at all the monitoring locations while comparing with the Bangladesh Standards (9 ppm).

9.1.5 O₃

The 8-hourly O₃ concentration was recorded in the range of 22.4 – 35.7 µg/m³ and 16.86 – 27.97 µg/m³ respectively during the dry and rainy season monitoring period. During the monitoring period, the maximum O₃ concentration is reported at Ilisha bazar as 35.7 and 27.97 µg/m³. O₃ concentrations at all the monitoring locations were reported well below 157 µg/m³, which is a 8-hourly National Ambient Air Quality Standard (NAAQS) for O₃ in Bangladesh.

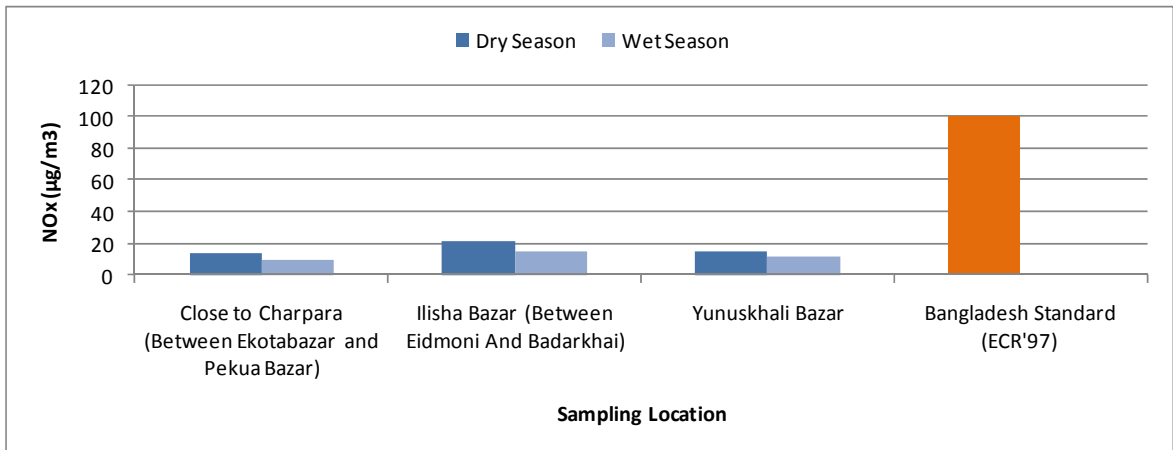


Figure 5: NO_x Level in the project area in dry and Rainy season

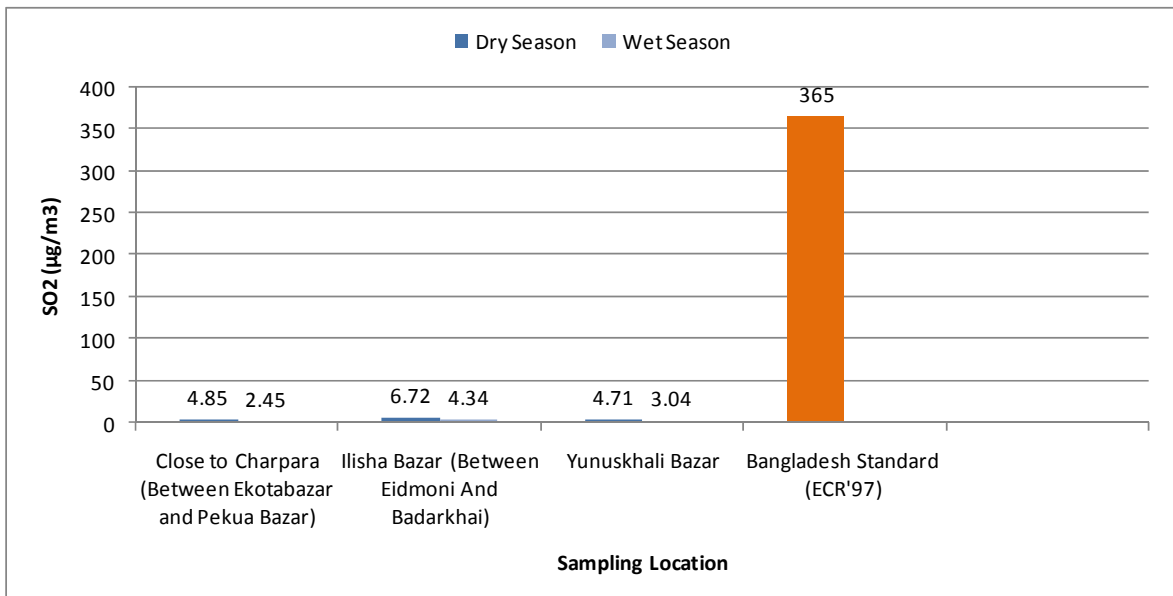


Figure 6: SO₂ Level in the project area in dry and rainy season

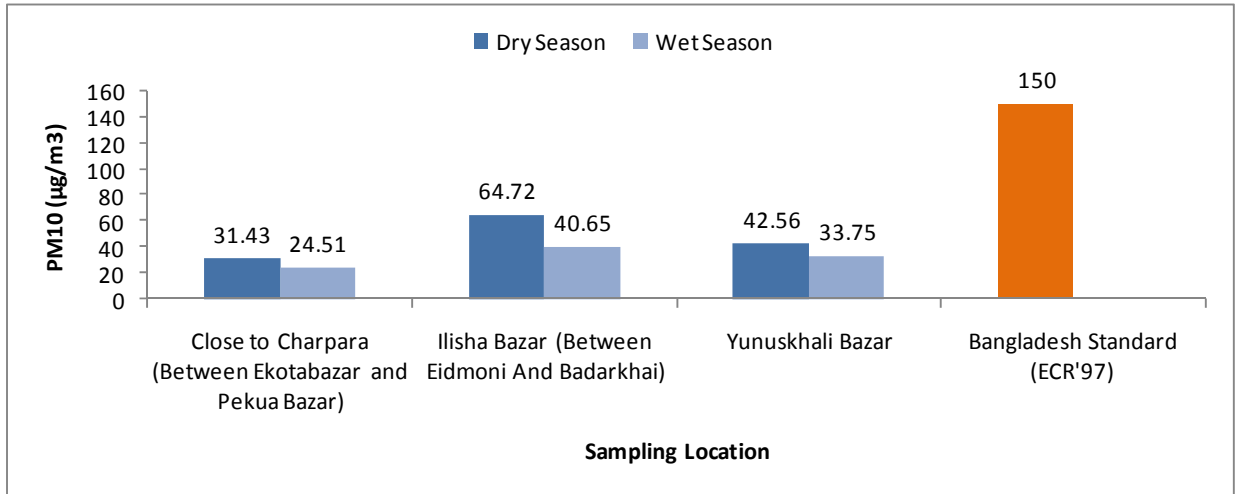


Figure 7: PM₁₀ Level in the project area in dry and rainy season

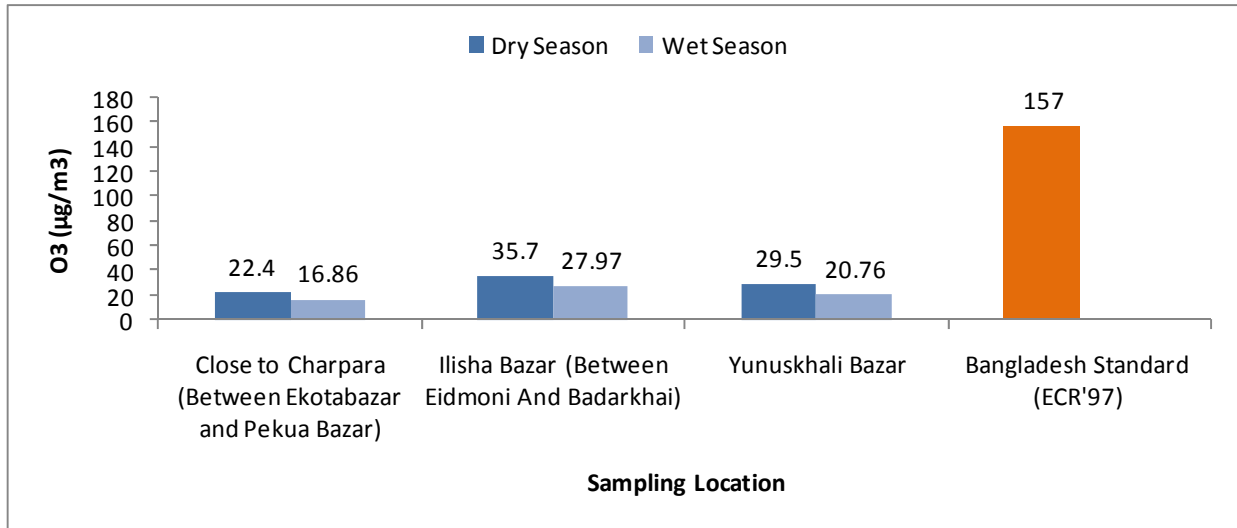


Figure 8: O₃ Level in the project area in dry and rainy season

9.2 Water Quality

Water sampling and analysis was undertaken to understand the overall baseline water quality characteristics of the surface and groundwater in the study area. Samples were taken from representative selected water bodies and groundwater sources representing different parts of the study area. The surface water sampling was based on the identification of major surface water bodies such as the river in the site. Groundwater sampling locations were selected to obtain a representative water sample from various zones within the study area. The samples were collected from existing tube wells (hand-pumps being used by the villagers).

A total of 5 samples, three (3) surface water and two (2) ground water samples were collected. Detail of the sampling location is provided in ANNEX - D and ANNEX -E.

The samples were analysed for parameters covering physical, chemical and bacteriological characteristics as mentioned in the scope of work which includes certain heavy metals, trace elements and toxic constituents.

Water samples were collected as grab water sample in a pre-washed 5-litre plastic jerry can and 250 ml sterilized clean PET bottle for complete physiochemical and bacteriological tests respectively.

The quality of surface water was compared with the standards for *Inland Surface Water*, Environment Conservation Rules (ECR), 1997-Schedule 3 whereas the groundwater was compared with the *Drinking Water Standard* E.C.R .-Schedule-3, 1997. The standards have been presented along with the monitoring results of surface and groundwater for comparison.

9.2.1 Surface Water Quality

The surface water quality was compared with the Bangladesh ECR standard for best practice based classification criteria. ANNEX-D shows the analysis results.

As per the best practice based classification standards of the Bangladesh ECR, the quality of most of the surface water samples from the river is of a level that can be utilized for fisheries, industrial process and for irrigation.

Some of the water analysis parameters are discussed below in detail:

pH

All results for pH in surface water fell within the permissible limits of 6.5 to 8.5.

Dissolved Oxygen (DO)

The DO of the river water ranges between 7.1 to 7.5 mg/l for dry season and 7.3 - 7.4 mg/l for rainy season, and thus meets the surface water classification for different usages.

BOD

The BOD of the river water ranges between 3.2 to 4.0 mg/l and 2.7 to 2.9 mg/l for

dry season and rainy season respectively; and thus is well below the permissible limits.

9.2.2 Groundwater Quality

The results of four groundwater samples collected from the borewells in Close to the proposed bridge and Younuskhali village are shown in ANNEX-E.

Groundwater quality analysis

The key parameters in groundwater are discussed below, compared with the Bangladesh ECR Standards for drinking water.

pH

The pH of the samples varies in the range of 6.5 to 6.8 and 6.5 to 6.6 for dry and Rainy season respectively which are well within the standard range of 6.5 to 8.5.

COD

The COD of both two ground water sample varies 5.2- 5.9 and 4.6 – 5.5 mg/l for dry and rainy season which are exceed the permissible standard of 4 mg/l.

BOD₅

The BOD₅ values in the samples varied in the range of 0.55 to 0.63 mg/l and exceed the permissible standards of 0.2 mg/l.

Arsenic

Arsenic content of both the samples are <0.005 mg/l which indicated the samples are free from arsenic.

9.3 Noise

Noise levels were recorded at six locations in the study area during the monitoring period. Noise levels were recorded in the form of sound pressure levels with the help of a digital sound level meter. The details of noise monitoring locations are given in ANNEX -B.

The purpose of ambient noise level measurement was to determine sound intensity at the monitoring locations. These locations are chosen in such a way that a

representative data could be recorded all over the Quardrate. The sound level is recorded in form of A-weighted equivalent continuous sound pressure level (Leq) values with the use of A-weighting filters in the noise measuring instrument.

Noise level monitoring was carried out for 24 hours (twice- dry and rainy season) during monitoring period with 1-min equivalent sound pressure levels. At all the locations, measurement was taken at 1-min intervals over a 24 hour period. Further to that the equivalent noise levels have been converted to hourly equivalent noise levels. Finally, the measurements were done by dividing the 24 hours into two parts, i.e. daytime, which is considered from 0600 to 2200 hours and night from 2200 to 0600 hours. At each location, day time Leq has been computed from the hourly sound pressure level values measured between 0600 to 2200 hours and night time Leq has been computed from the hourly sound pressure level values measured between 2200 to 0600 hours.

Ambient daytime noise level (Leq_{day}) was recorded in the range of 49.6 to 61.8 dB (A) and 48.5 to 60.1 dB (A) in dry and rainy season respectively. Whereas, ambient night time noise level (Leq_{night}) in the study area were 45.0 to 58.0 dB (A) and 45.2 dB (A) to 56.3 dB (A) in dry and rainy season respectively.

From the above it can be concluded that ambient noise levels in the study area are lower than the prescribed limits with respect to the standards defined for different landuse, which is 60 dB (A) for day time and 50 dB(A) for night time in Mixaed areas and 70 dB(A) for day time and 60 dB(A) for night time in commercial areas.

9.4 Sediment

The sediment quality of the proposed project area has been analysis. There are no standard of sediment quality in Bangladesh. In all cases the appearance of the sediment is grey, odor is earthy and color is grey-yellow. Particle size distribution of all 3 places is almost similar. And the sediment texture is loam to silt loam. The grading analysis of 3 samples varies from 2.3-4.9 mm. The density was the minimum in SD1 at dry season (1.97 gm/m^3) and maximum at SD3 at dry season (2.16 gm/m^3). Water content of the sediment varies from 24-31%. Heavy metal, like Mercury is very low and below detection limit.

9.5 Ecology

9.5.1 Introduction

Bangladesh is situated between 20°34' and 26°38' north latitude and between 88°01' and 92°41' east longitude and lies in the “Oriental Region”, between the Indo-Himalayas and Indo-Chinese sub regions of the Orient. The country has a total area of 147,570 km², of which about 80 percent comprises one of the largest deltaic plains in the world, formed by the confluence of the Brahmaputra (Jamuna), the Ganges and the Meghna rivers. The remaining 20 percent are comprised of the undulating, forested Hill Tracts. Bangladesh enjoys large number of diverse ecosystems and a rich association of flora and fauna. These diverse ecosystems are primarily formed due to the contribution of physiographic variations in the soil and hydrological conditions as well as climatic conditions such as temperature and rainfall.

9.5.1.1 State of biodiversity in Bangladesh

Biodiversity is the variation of taxonomic life forms within a given ecosystem, biome or for the entire Earth and is often used as a measure of the health of biological systems. Although traditionally biodiversity has been identified and described in three levels (e.g. genetic, species and ecosystem), but in this study only ecosystem and species level biodiversity of the study area were discussed.

Bangladesh is an important transition zone between Indo-China, the Himalayas and the rest of the Indian subcontinent. Bangladesh was once rich in wildlife species. The tropical moist forests were botanically amongst the richest in the Indian subcontinent, and they also supported the greatest diversity of mammals and a high diversity of birds. Although the species richness is relatively large for the small area of Bangladesh, endemism is low and the population size of most of the species has declined drastically. Eighteen (18) species of wildlife are now extinct from Bangladesh. Among them are several internationally threatened species such as the three species of Asian Rhinoceros (*Rhinoceros unicornis*), and also the Banteng (*Bos javanicus*), Nilgai (*Boselaphus tragocamelus*), Swamp Deer (*Rucervus duvaucelii*), pink headed Duck (*Rhodonessa caryophyllacea*), Bengal Florican (*Houbaropsis bengalensis*) and Mugger (*Crocodylus palustris*) crocodile.

9.5.1.2 Ecosystem diversity

Within a relatively small land mass Bangladesh enjoys large and diverse ecological differences. The differences of climatic conditions, physiographic variations in soil and hydrological conditions contributed the variety of ecosystems found in the country. Being low-lying deltaic country seasonal variations of water availability is the major factor which generates different ecological scenarios of Bangladesh.

Within a relatively small geographic boundary Bangladesh enjoys a diverse array of ecosystems. Temperature, rainfall, physiographic variations in soil and different hydrological conditions play vital roles in country's diverse ecosystems. In national level, twenty five bio-ecological zones described by Nishat, et al. (2002) can be recognized as the major ecosystems of the country (*Figure 10*).

9.5.1.3 Species diversity

Bangladesh possesses rich species diversity particularly for angiosperm and avi-fauna, out of total 3,454 species of angiosperm, about 2,466 species under 155 families belong to dicotyledons and about 988 species under 41 families to monocotyledons. As no systematic and complete study has been done recently, it is very likely that the number will change. Although endemism is relatively low for the country, the records suggest the existence of at least 16 endemic species of flowering plantation forest.

A. Flora

Existing status: Only 7 species of Gymnosperms have been reported yet till now from Bangladesh, of which only 5 species are found in the wild. A total of 195 species of Pteridophytes have been identified and described from the country. 248 species of bryophytes under 34 families area also identified from the country. People over the centuries have been cultivating, preserving, and using more than 1364 plantation forest species coming from both endemic and exotic origins, for about 85 diverse uses. There are about 175 species of medicinal herbs. (Bangladesh National Herbarium, 2001)

Threatened Status: According to IUCN Red List of Threatened Protected Area (IUCN, 1997), a total of 24 Protected Area species are faced with various degrees of

threats of extinction in Bangladesh. Among them, 1 is extinct/ endangered, 21 are vulnerable, 1 is rare and 1 is indeterminate. On the other hand, 106 vascular Protected Area species face risks of various degrees of extinction (Bangladesh National Herbarium, 2001).

B. Fauna

Existing status: A total of 708 fish species are recorded, of which 266 freshwater fishes belonging to 154 genera and 55 families and 442 – estuarine and marine fin fish including sharks and rays, a number of shellfishes including 36 species of shrimps. About 628 birds have been recorded over the years but a recent comprehensive nationwide survey is still lacking.

Bangladesh is home to roughly 53 species of amphibians and 139 reptile species. The mammalian species diversity in Bangladesh is not very rich and only 116 species of mammals are found in the country (Khan, M. Monirul H. 2008).

Threatened status: Bangladesh has identified 54 species of fish, 8 species of amphibians, 58 species of reptiles, 47 species of birds, and 53 species of mammals in the country which are threatened under different degree of risk of extinction. Altogether 323 species of vertebrates are currently categorized as data deficient. The status of threatened higher vertebrates is shown in the [Table 5](#).

Table 5: Status of Threatened Inland and resident vertebrates of Bangladesh (according to Bangladesh National Criteria)

Group	Threatened Data			Total	Deficiency (DD)
	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)		
Fishes (Fresh water & Brackish water)	12	28	14	54	66
Amphibians	0	3	5	8	7
Reptiles	12	24	22	58	39
Birds	19	18	4	41	158
Mammals	21	13	6	40	53
Total	64	86	51	201	323

The overall status of Fishes, Amphibian, Reptiles, Birds and Mammals of Bangladesh are shown in the *Table 6*.

Table 6: Status of higher vertebrates of Bangladesh

Group	of Tot. No. Living Species	Extinct (EX)	Threatened status				Total	Data Deficient (DD)	Not Threatened (NO)
			Critically Endangered (CR)	Endangered	Vulnerable				
Fishes	708	0	12	28	14	54	66	588	
Amphibians	22	0	0	3	5	8	7	7	
Reptiles	126	1	12	24	22	58	39	29	
Birds	628	2	19	18	8	47	168	413	
Mammals	113	10	21	15	7	53	53	7	
Total	1597	13	64	88	56	220	333	1044	

(Source: IUCN Bangladesh, 2000)

C. Ecologically Critical Area (ECA) & Protected Areas of Bangladesh

Protected Areas include Wildlife Sanctuary, National Park and Game Reserve. Their definitions in the Bangladesh Wildlife (Preservation) Order, 1973 (henceforth Wildlife Order) is as follows:

“Wildlife Sanctuary means an area closed to hunting, shooting or trapping of wild animals and declared as such under Article 23 by the government as undisturbed breeding ground primarily for the protection of wildlife inclusive of all natural resources such as vegetation soil and water” (paragraph) (p) of Article 2).

“National Park means comparatively large areas of outstanding scenic and natural beauty with the primary object of protection and preservation of scenery, flora and fauna in the natural state to which access for public recreation and education and research may be allowed” (paragraph) (p) of Article 2).

“Game Reserve means an area declared by the government as such for the protection of wildlife and increase in the population of important species wherein capturing of wild animals shall be unlawful (paragraph) (c) of Article 2”.

Article 23 of the Wildlife Order has provisions for declaration of Protected Areas and also has regulations prohibiting activities in the Protected Areas.

In the proposed project influence zone surrounding, there is no ECA area or even any Protected Area. (Figure 9& 10)

Notified Protected Areas of the Country are as follows (Table 7)

Table 7: Notified Protected Areas of Bangladesh

10.1.1 C.1 National Parks:

Sl. #	National Parks	Location	Area (ha.)	Established
	Bhawal National Park	Gazipur	5022.00	11-5-1982
	Modhupur National Park	Tangail/ Mymensingh	8436.00	24-2-1982
	Ramsagar National Park	Dinajpur	27.75	30-4-2001
	Himchari National Park	Cox's Bazar	1729.00	15-2-1980
	Lawachara National Park	Moulavibazar	1250.00	7-7-1996
	Kaptai National Park	Chittagong Hill Tracts	5464.00	9-9-1999
	Nijhum Dweep National Park	Noakhali	16352.23	8-4-2001
	Medha Kachhapia National Park	Cox's Bazar	395.92	8-8-2008
	Satchari National Park	Habigonj	242.91	15-10-2005
	Khadim Nagar National Park	Sylhet	678.80	13-04-2006
	Baraiyadhala National Park	Chittagong	2933.61	06-04-2010
	Kuakata National Park	Patuakhali	1613.00	24-10-2010
	Nababgonj National Park	Dinajpur	517.61	24-10-2010
	Shingra National Park	Dinajpur	305.69	24-10-2010
	Kadigarh National Park	Mymensingh	344.13	24-10-2010
	Altadighi National Park	Naogaon	264.12	24-12-2011
	Birgonj National Park	Dinajpur	168.56	24-12-2011
Sub-Total			45,745.33	

10.1.2 C.2 Wildlife Sanctuaries:

Sl. #	Wildlife Sanctuaries	Location	Area (ha.)	Established
	Rema-Kalenga Wildlife Sanctuary	Hobigonj	1795.54	7-7-1996
	Char Kukri-Mukri Wildlife Sanctuary	Bhola	40.00	19-12-1981
	Sundarban (East) Wildlife Sanctuary	Bagerhat	31226.94	6-4-1996
	Sundarban (West) Wildlife Sanctuary	Satkhira	71502.10	6-4-1996
	Sundarban (South) Wildlife Sanctuary	Khulna	36970.45	6-4-1996
	Pablakhali Wildlife Sanctuary	Chittagong Hill Tracts	42087.00	20-9-1983
	Chunati Wildlife Sanctuary	Chittagong	7763.97	18-3-1986
	Fashiakhali Wildlife Sanctuary	Cox's Bazar	1302.43	11-4-2007

Dudh Pukuria-Dhopachari Wildlife Sanctuary	Chittagong	4716.57	6-4-2010
Hazarikhil Wildlife Sanctuary	Chittagong	1177.53	6-4-2010
Sangu Wildlife Sanctuary	Bandarban	2331.98	6-4-2010
Teknaf Wildlife Sanctuary	Cox's Bazar	11615.00	24-03-2010
Tengragiri Wildlife Sanctuary	Barguna	4048.58	24-10-2010
Dudhmukhi Wildlife Sanctuary	Bagerhat	170.00	29-01-2012
Chadpai Wildlife Sanctuary	Bagerhat	560.00	29-01-2012
Dhangmari Wildlife Sanctuary	Bagerhat	340.00	29-01-2012
Sonarchar Wildlife Sanctuary	Patuakhali	2026.48	24-12-2011
	Sub-Total	2,24,833.55	
	Grand-Total	2,70,478.88	

****Protected Area Covers 10.72% of Total Forest Area**

10.1.3 C.3 Other Conservation Sites

SL#	Name	Location	Area (ha.)	Established
	National Botanical Garden	Dhaka	84.21	1961
	Baldha Garden	Dhaka	1.37	1909
	Madhabkunda Eco-Park	Moulavibazar	265.68	2001
	Sitakunda Botanical Garden and Eco-park	Chittagong	808	1998
	Dulahazara Safari Parks	Cox's Bazar	600	1999



Figure 9: Reserve Forest Area in Bangladesh

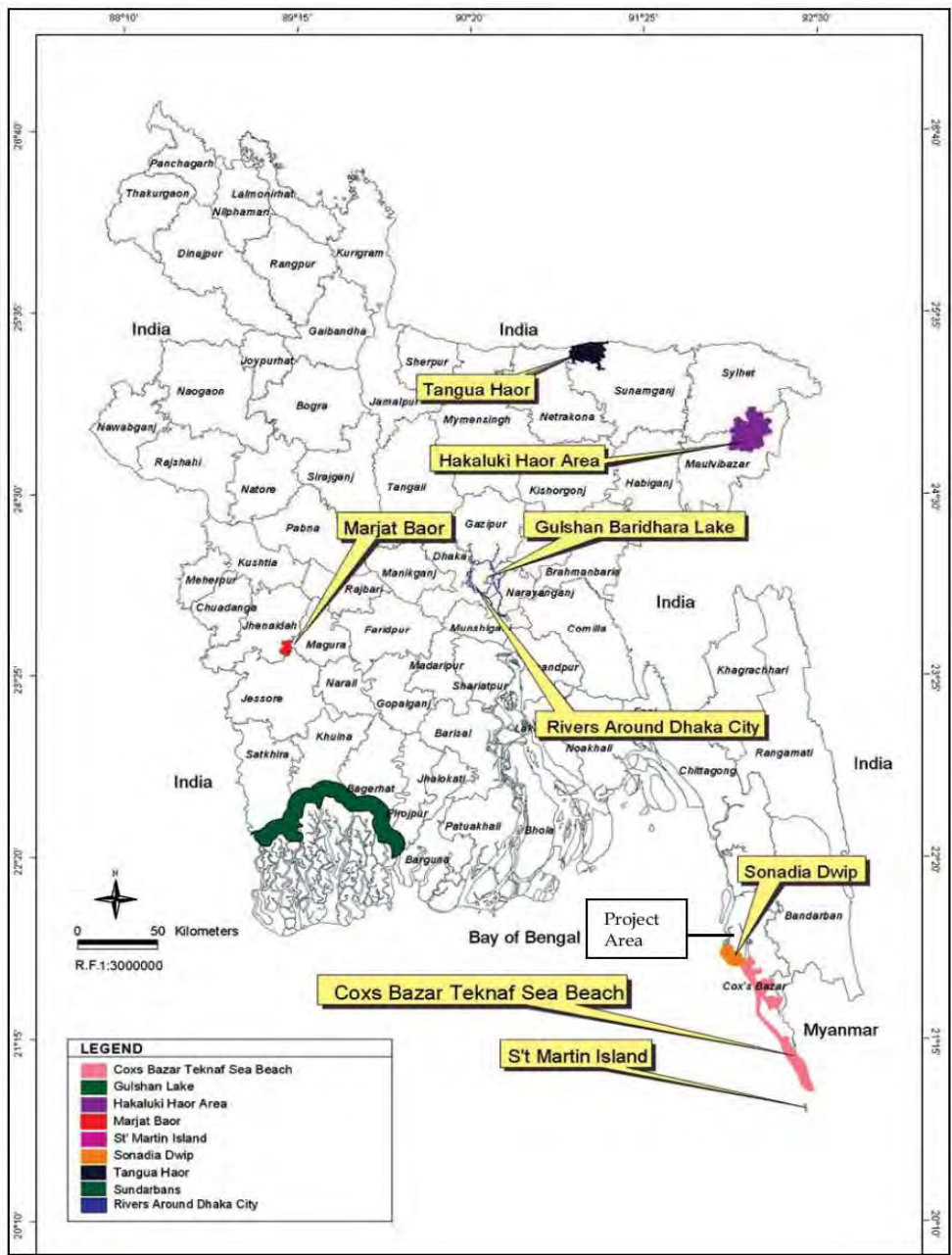


Figure 10: Government Gazetted ECA Area

9.1.2 Biodiversity of the Study Area

9.1.2.1 The Bio-ecological Zone

The proposed site fall in an important bio-ecological zone (Nishat, et al., 2002) of the country, namely “Offshore Island” (Figure 11)

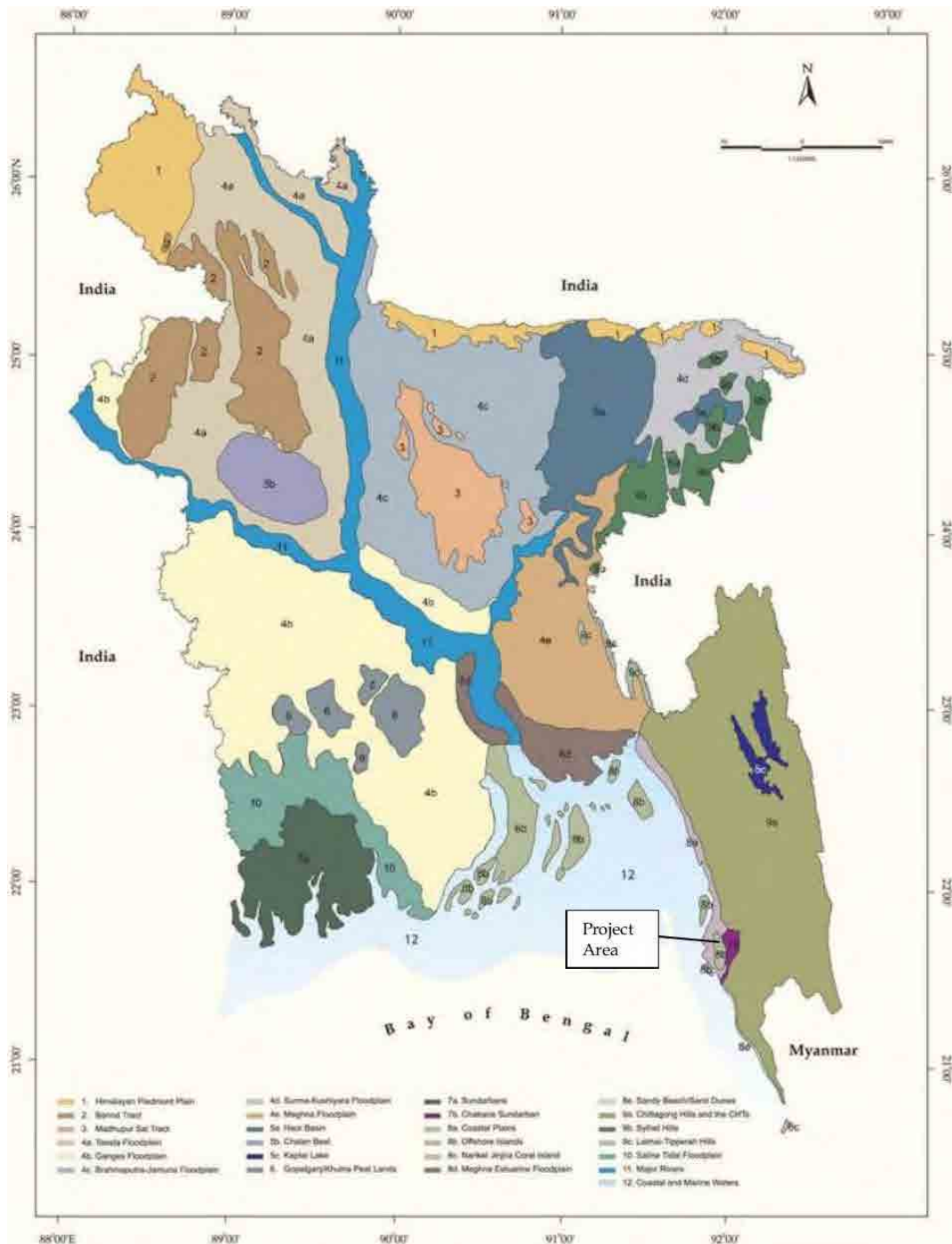
Zone 8b Offshore Island

This zone comprises Sonadia, Maheshkhali, Kutubdia, Sandwip, hatiya, Bhola, Manpura etc area. This area has wide variety of water fowl, particularly the migratory shorebirds. Rashid (1989) recorded over 108,000 waterfowl of 49 species, together 5,500 unidentified duck and 56,500 unidentified shorebirds. Besides, some of the common reptiles of the zone include: the Common garden lizard (*Calotes versicolor*), common shink (*Mabuy carinata*), Bengal monitor (*Varanus bengalensis*), Yellow monitor (*V. flavescens*), Checkered keelback (*Xenochrophis piscator*), Binocellate cobra (*Naja naja*), and Spotted flapshell turtle (*Lissemys punctata*). Likewise, common mammalian species of this zone include: the Ganges River Dolphin (*Platanista gangetica*), Jackel (*Canis aureus*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), large Indian civit (*Viverra zibetha*) and greater bandicoot rat (*Bandicota indica*).

The vegetation of the this area provides the habitats for a large number of wildlife (viz. mammals, birds, reptiles, molluscs, amphibians, fishes, and innumerable number of insects) including the feeding, nesting sites and breeding ground for various migratory birds and favors the occurrence and visits of numerous diaspore dispersal agents. Through different infrastructures have been established and various human interferences is continuous in this area since three decades, the original vegetation of this area has been mostly replaced by a mixed type of vegetation comprised of numerous species most of which are introduced from other areas of the country through various agents of dispersal. Because of the occurrence of rich plantation forest and animal diversity in these areas, it can be considered as a small biodiversity hotspot exposed to different anthropogenic activities.

In last few decades, a good number of checklists on the local flora of different areas in Bangladesh have been published by different workers (e.g., Khan et al., 1994; Rahman and Hassan, 1995; Rahman and Uddin, 1997; Uddin et al., 1998; Uddin and Rahman, 1999; Uddin and Hassan, 2004. A number of taxonomic studies have also been completed in

different districts (e.g., Ismail and Mia, 1973; Alam, 1995; Rahman and Hassan, 1995; Rashid et al., 1995 and Alam et al., 2006 etc). However, till now many areas of the country including that of Maheshkhali Upazilla have been either poorly investigated or remain totally unexplored. This upazilla is such an area to which no notable attention has so far been given by the small pool of taxonomists working in this country for conducting the taxonomic inventory on its flora, except the listing of a number of some vascular plantation forest species as a part of the ecological studies, though this area is floristically very rich. Therefore, the scope of a complete and comprehensive study on the flora of the areas and that of Maheshkhali Island as well is still remaining.



10.2 Figure 11: Bio-ecological Zones of Bangladesh

9.1.2.2 Biodiversity of Flora

A. Terrestrial Ecosystems:

The field study was conducted on following area for identifying terrestrial vegetation:

- A1. Hill side forest area
- A2. Crop vegetation
- A3. Road side forest (*Janata bazaar to proposed bridge site*)
- A4. River bank side vegetation (*Yunuskhali bank site and Matarbari bank site*)
- A5. Mangrove forest

Appendix 11: A.1 Hill side forest Area

The field study was conducted northern part of hill forest under saflapur forest beat. This forest area covers approximately 24,000 acres land and 2 Quadrates (15X15 meters) sampling in both seasons was conducted in different location of natural growing and plantation forest area in this forest. Most of the plantation forest of the study area is mixed type that is deciduous or semi deciduous or evergreen. Both the man made plantation forest and natural forests are present in different forest lands. Department of Forest has planted the trees by steep forest or bloc system like fruit plant, medicinal plant and timber yield in plantation forest.

Interesting observation is that a vast amount of naturally growing wild weeds like herb, shrub, climber, grasses and cedges were found. It seems that the propagules/ diospores like seeds of wild weeds may be contain with loose soil and some seeds of weed disseminated by flooded water and wind. It is also interesting that the wild weeds can grow and survive easily at low fertile soil. Also there are some homestead forests. People of that area are using these forests for social and economical benefit.

In plantation forest dominant tree species are Akasmoni (*Acacia auriculiformis*) and Eucaliptus (*Eucalyptus citriodora*)

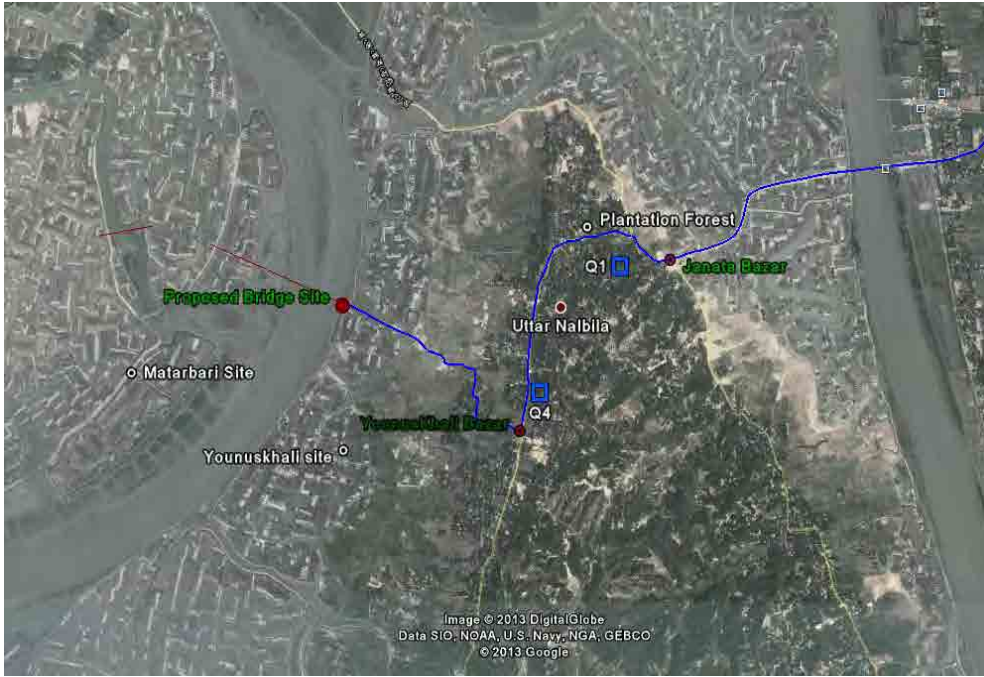


Figure13: Quarbrates in the study area at dry season

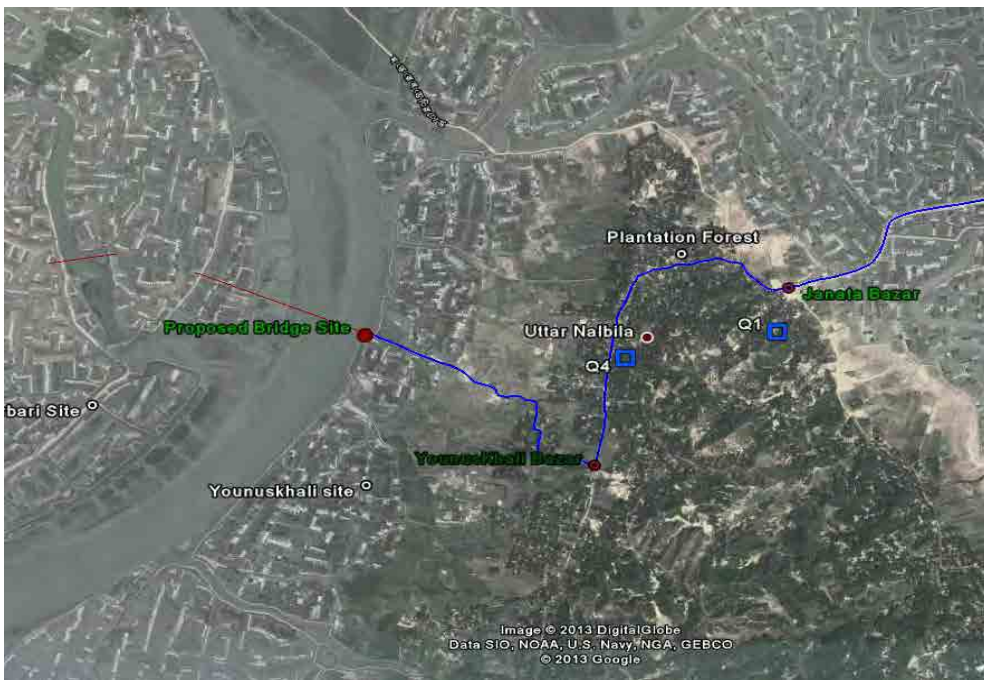


Figure14: Quarbrates in the study area at rainy season

Plantation forest species diversity:

In the dry season (winter season), 41 species, 18 species, 6 species and 3 species were found in the hill side forest area, road side forest, river bank area and mangrove forest.

In the rainy season, among the recorded 20 families are comprised of 30 species in quadrat 1&4.

Biodiversity indices

Two quadrat surveys were done to determine the biodiversity indices of the surrounding of the plantation forest area. During the survey, it covers vegetation which can be measured by estimating visually the proportion of the Quadrat occupied by each species (i.e. the vertical projection of each plantation forest; see above). Various measures can be used. We have estimate cover to the nearest per cent (or less), but this might give a spurious accuracy, given the problems of estimating cover (see below). It may be more sensible to use percentage classes, e.g. in 10% or 25% steps, or use those given in the Domin or Braun-Blanquet scales (*Figure 15*). Usually it be may find useful to divide the vegetation into layers, e.g. a bryophyte layer, a herb layer and a shrub layer, and make cover estimates separately for each layer.

Table 4.2. *The Domin and Braun-Blanquet scales for visual estimates of cover*

Value	Braun-Blanquet	Domin
+	<1% Cover	1 Individual, with no measurable cover
1	1%–5% Cover	<4% Cover with few individuals
2	6%–25% Cover	<4% Cover with several individuals
3	26%–50% Cover	<4% Cover with many individuals
4	51%–75% Cover	4%–10% Cover
5	76%–100% Cover	11%–25% Cover
6		26%–33% Cover
7		34%–50% Cover
8		51%–75% Cover
9		76%–90% Cover
10		91%–100% Cover

Figure 15: Domin or Braun-Blanquet scales

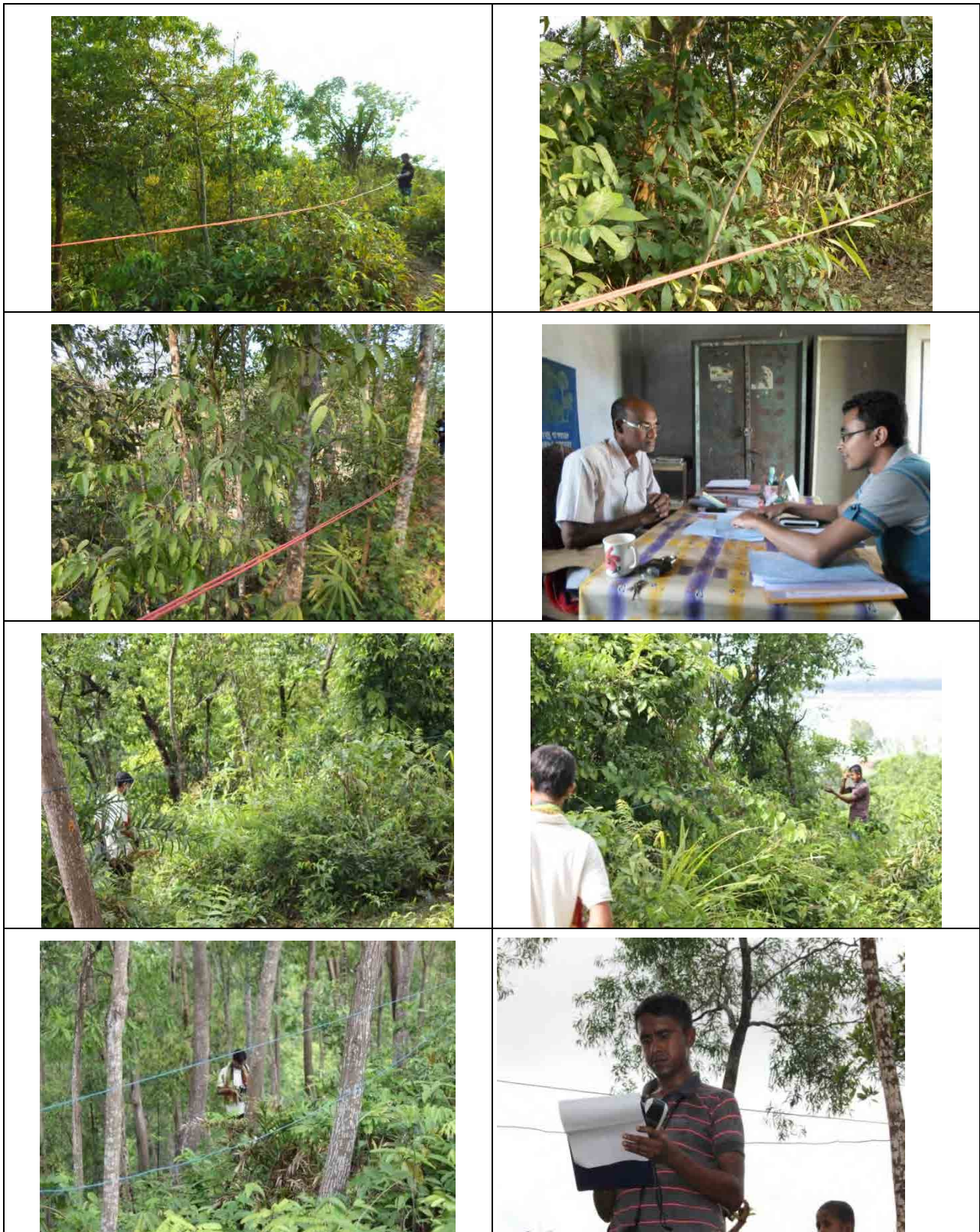


Figure 16: Biodiversity Indices Survey & consultation with forest officer

Dry season: The Biodiversity indices for dry season in the studied Quadrates are given in [Table 8](#).

Table 8: Biodiversity Indices of different Quardrates

Parameter	Quardrate 1	Quardrate 4
GPS	21°42'39.98"N 91°55'53.57"E	21°42'16.74"N 91°55'36.26"E
Shannon-Wiener Diversity Index	3.046	1.777
Species Richness (S)	31.0	17.0
Total Abundance	121	90
Simpson Diversity Index	D: 0.07069136 1-D: 0.9293086 1/D: 14.146	D: 0.28960324 1-D: 0.7103968 1/D: 3.453
Evenness	0.887	0.627

The above table shows that the plot surveyed in the north part i.e. Quardrate 1 of study area represents higher diversity than Quardrate 4.

Shannon Weiner Diversity: On the diversity scale, biologically realistic H' values range from 0 (only one species present with no uncertainty as to what species each individual will be) to about 4.5 (high uncertainty as species are relatively evenly distributed). In theory, the H' value can be much higher than 4.5, although most real world estimates of H' range from 1.5 to 3.5.

Simpson's Index (D): Simpson's Index (D) value of ranges between 0 and 1. With this index, 0 represents infinite diversity and 1, no diversity. That is, the bigger the value of D, the lower the diversity. The highest Simpson's diversity (0.0289) was recorded at Quardrate 4.

Simpson's Index of Diversity (1-D): The value of this index also ranges between 0 and 1, but now, the greater the value, the greater the sample diversity. In this case, the index represents the probability that two individuals randomly selected from a sample will belong to different species. The highest diversity (0.92) was recorded at Quardrate1.

Simpson's Reciprocal Index (1/D): The value of this index starts with 1 as the lowest possible figure. This figure would represent a community containing only one species. Higher value than 1 shall represent higher diversity on the similar scale. Accordingly, Quardrate 1 recorded higher diversity than 4 by 14.146.

Species Richness: Quardrate 1 recorded the highest number of species, i.e., 31, and thus showed higher species richness.

Total Abundance: Total abundance represents the highest number of individuals recorded per sample which was recorded highest in Quardrate 1 (121) in the study area.

Evenness (J'): Evenness is constrained between 0 and 1. The higher value of J' represents less variation in communities between the species. Accordingly, J' is recorded highest in

Quardrate 1 and indicated the dominance of similar species with less variation.

Rainy season: The Biodiversity indices for rainy season in the studied Quardrates are given in *Table 9*.

Table 9: Biodiversity Indices of different Quardrates

Parameter	Quardrate 1	Quardrate 4
GPS	21°42'33.40"N 91°56'2.48"E	21°42'28.70"N 91°55'37.12"E
Shannon-Wiener Diversity Index	2.548	2.787
Species Richness (S)	16.0	23.0
Total Abundance	181	236
Simpson Index	DiversityD: 0.0912325 1-D: 0.9087675 1/D: 10.961	D: 0.079358 1-D: 0.920642 1/D: 12.601
Evenness	0.919025	0.887323

The Shannon- Weiner Diversity Index is used to measure diversity in categorical data. It is simply the information entropy of the distribution treating species as symbols and their relative population sizes. The standard range of Shannon- Weiner Diversity Index is 1-4. The highest value of the index indicates highly diversified population or plantation forest community and lower value indicates less diversified vegetation. From the above analysis, Shannon Weiner Diversity Index, richness of species and evenness were found to be 2.548, 16 and 0.919025 for Quardrate 1 and 2.787, 23, 0.887323 for Quardrate 4 and 2.317, 14 and 0.878035 flora respectively. Therefore it is clear that the Quardrate 4 is highly diversified vegetation. Because the index value found in the analysis is near about the height level (4) of the standard range of Shannon- Weiner Diversity Index.

11.1 A2. Crop Vegetation

Given the dominance of crops in these areas, cultivated land is relatively low in species diversity with few if any native flora species occurring. Some of the most common weed species (other than plantation forest crops) within the study area both in 1st and rainy season are provided in *Table 10* below.

Table 10: Common flora species recorded within study area agricultural lands

Scientific Name	Family	Local Name
<i>Cynodon dactylon</i>	Gramineae	Durba
<i>Ageratum conyzoides</i>	Compositae	Fulkuri

<i>Dentella repens</i>	Rubiaceae	Hachuti
<i>Heliotropium indicum</i>	Boraginaceae	Hatisur
<i>Cotula hemispherica</i>	Compositae	Kancha ghash
<i>Cyperus cephalotes</i>	Cyperaceae	Niratraba
<i>Alternanthera sessilis</i>	Amaranthaceae	Sachishak

Note: Excludes crop species.

11.2 A3. Road Site Plantation forest (Janata bazaar to proposed bridge site)

Janata Bazar to proposed bridge site is approximately 5 km. There are plantation forest trees along the road side from Janata Bazar to Yununkhali Bazar. The abundant plantation forest species in this area are Akasmoni (*Acacia auriculiformis*) and Kalo Korai (*Albizia lebbek*). Some natural growing herb and shrub (*Hyptis suaveolens*, *Clerodendrum viscosum*) also present in this area. Road side trees planted by community will be affected by widen the road. Homestead like plantation forest is present along the road side of Yunuskhali bazar to proposed bridge site e.g. Akasmoni (*Acacia auriculiformis*), Am (*Mangifera indica*), Kathal (*Artocarpus heterophyllus*) etc. Approximately last 0.75 km road side has no trees and here some shrub and herb (*Clerodendrum viscosum*, *Leucas aspera*, *Rumex dentatus*) like species are present. A detail list of species is listed in [ANNEX-H& I](#) in 2 seasons correspondingly.

Dry season: A total 17 species of 14 families were listed. Out of 17 species 8 are tree, 5 are shrub, 3 are herb, 01 is woody grass and 01 is grass.

Rainy season: A total 33 species of 22 families were found of which 4 family are Palmae, 3 family are Caesalpinae, 2 family are Moraceae, Meliaceae, Gramineae, Labiatae and Boraginaceae; 1 family are Fabaceae, Leguminosae, Caricaceae, Anacardiaceae, Musaceae, Myrataceae, Vitaceae, Lamiaceae, Ranunculaceae, Asclepiadaceae, Mimosaceae, Amaranthaceae, Asteraceae and Dryopteridaceae. Out of 33 species 17 are tree, 6 are shrub, 9 are herb and 01 is grass.

11.3 A4. River bank side (Yunuskhali and matarbari bank)

River bank side of the proposed bridge area is almost free from tree species. There are large number of salt cultivation land/ salt pan are present both of the bank site. In the Matarbari bank side have totally 15-20 tree species of 5 family in both seasons e.g. Coconut (*Cocos nucifera*), Koroi (*Albizia procera*), Eucalyptus (*Eucalyptus citriodora*), Paniala (*Flacourtia jangomas*), Khejur (*Phoenix sylvestris*) etc. But Yunuskhali bank side has no forest species.

Detail plant list is given in [ANNEX H](#).

11.4 A5. Mangrove Forest

In the Matarbari bank side have a mangrove cluster and it approximately 0.60 km far from the proposed bridge site. The mangrove forest comprises only three (3) types of plantation forest species e.g. *Acanthus illicifolia*, *Ficus sp.* and *Sonneratia apetala*. Hargoja (*Acanthus illicifolia*) is the most abundant species in the mangrove forest. (ANNEX H)



Figure17: Mangrove Forest

9.1.2.3 Biodiversity of Fauna

During the fauna survey of the study area mainly covers –

- A. Birds
- B. Amphibians and Reptiles
- C. Mammals
- D. Crabs

A. Birds (Avifauna)

Habitat Condition of the study Area: The hill forest and mangrove have good condition for resident birds; local people told that some migratory birds come in this area at winter season. But during the field study it observed that hill forest area along or nearby the road has no densely bird species. A consultation meeting was conducted with Shaflapur forest beet officer and he was stated that the agricultural, betel leaf cultivation field use huge insecticide and this is the main reason for reduce bird species in this area. Both river bank sides have huge salt cultivation land. There is a mangrove cluster along the Matarbari bank side.

Important Bird Areas (IBAs) in Bangladesh: According to the Bird Life International the Important Bird Areas (IBAs) of Bangladesh are listed in *Table 11*.

Table 11: List of the Important Bird Areas (IBAs) of Bangladesh (Source- Bird Life international)

Country/Territory	International name	IBA Code	Criteria
Bangladesh	Aila Beel	BD003	A1, A4i, A4iii
Bangladesh	Ganges-Brahmaputra-Meghna delta	BD011	A1, A4i, A4iii
Bangladesh	Hail Haor	BD006	A1, A4i, A4iii
Bangladesh	Hakaluki Haor	BD004	A1, A4i, A4iii
Bangladesh	Hazarikhil Wildlife Sanctuary	BD013	A3
Bangladesh	Himchari National Park	BD018	A3
Bangladesh	Jamuna-Brahmaputra river	BD009	A1, A4i
Bangladesh	Lawachara / West Bhanugach Reserved Forest	BD005	A1, A3
Bangladesh	Madhupur National Park	BD001	A3
Bangladesh	Muhuri Dam	BD012	A4i
Bangladesh	Pablakhali Wildlife Sanctuary	BD014	A1, A3
Bangladesh	Patenga Beach	BD016	A1, A4i
Bangladesh	Rajkandi Reserved Forest	BD007	A3
Bangladesh	Rampahar-Sitapahar Wildlife Sanctuary	BD015	A3
Bangladesh	Rema-Kalenga Wildlife Sanctuary	BD008	A3
Bangladesh	Sangu Matamuhari	BD017	A3
Bangladesh	Sunderbans (East, South, West Wildlife Sanctuaries)	BD010	A1, A4iii
Bangladesh	Tanguar Haor and Panabeel	BD002	A1, A4i, A4iii
Bangladesh	Teknaf Game Reserve	BD019	A1, A3

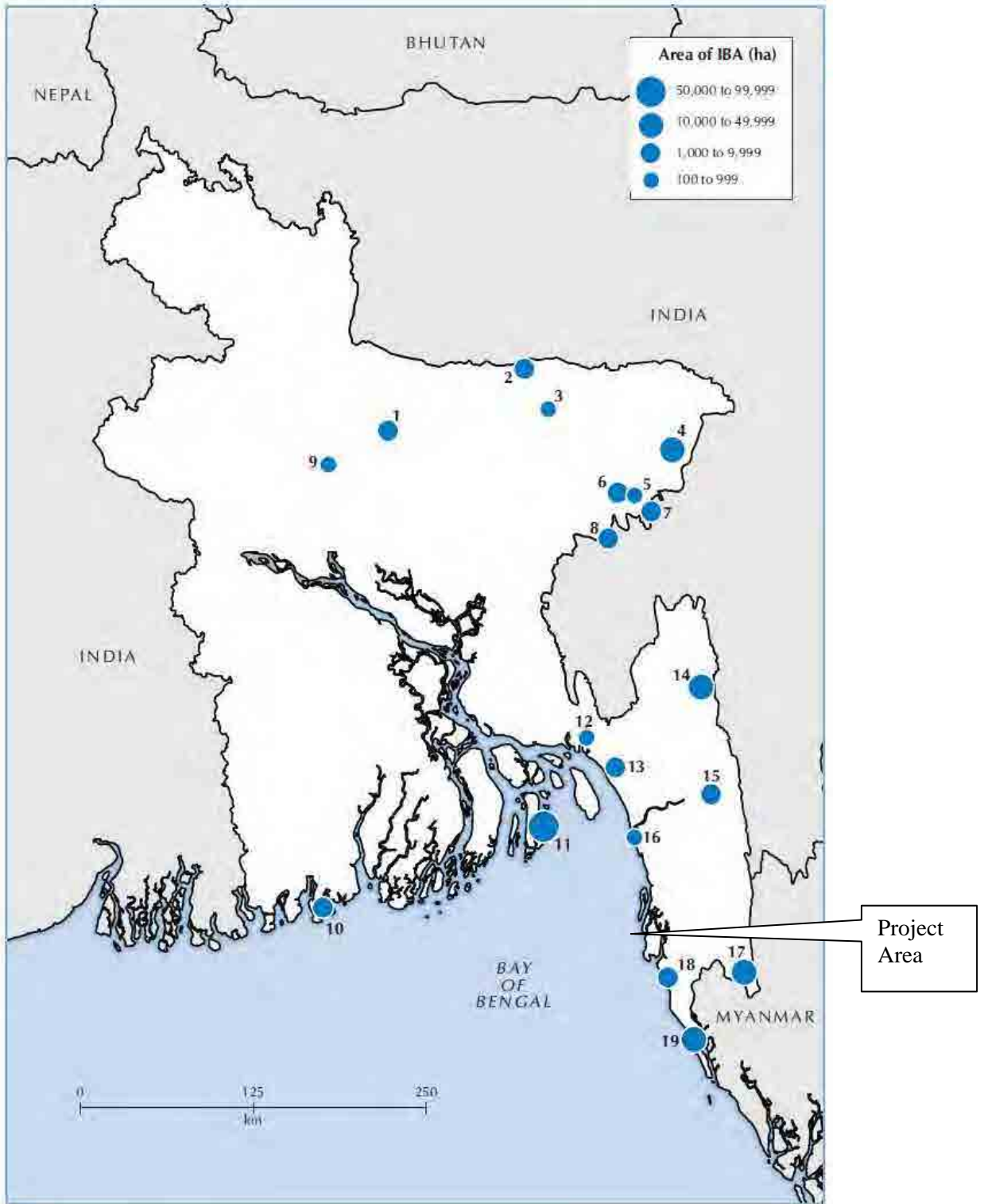


Figure 18: Map of the Important Bird Areas (IBAs) of Bangladesh
 (Source- Bird Life international)

Species Diversity:

Dry season: A total of about 13 bird species were observed within the hill side forest, along

the road and bank side. The field study shows that mangrove forest is the safe and densely habitat for bird species. *Phalacrocorax fuscicollis*, *Ardeola grayii*, *Ardeaalba modesta* are the most common species in the bank site of project area. At high tide most of the aquatic birds stay at mangrove forest. During the low tide they come from the forest to catch fish, insect or others.

In the hill side forest area and along the road sides there are some common bird species were seen. A detail about the terrestrial and aquatic birds' species checklist is available in [ANNEX-N](#).

Rainy season: A total of about 18 bird species of 15 families were observed within the hill side forest, along the road and bank side. The field study shows that mangrove forest is the safe and densely habitat for bird species. *Phalacrocorax fuscicollis*, *Ardeola grayii*, *Ardea alba modesta* are the most common species in the bank sides of project area. At high tide most of the aquatic birds stay at mangrove forest and low tide they come from the forest to catch fish, insect or others. During the monsoon season bird species were seen less number compare to dry season. Common sandpiper was not seen during this field survey.

In the hill side forest area and along the roar site there are some common bird species were seen. A detail about the terrestrial and aquatic birds' species checklist is available in [ANNEX-O](#).

B. Amphibians & Reptiles

The geographical location of Bangladesh is such that there is a high possibility of occurrence of animals and natural and pranted forest. It supports a wide range of floral and faunal community throughout the country. The study area supports many aquatic and terrestrial wildlife species. Like all over Bangladesh, this area also inhabits rich biota.

Dry season: During field investigation, a total 14 species of 10 families were found. Among those most of Colubridae species are natural and usually not seen in day light. Interview survey and secondary data confirmed their presence at the study area. These species IUCN status are LC. Other families Ranidae, Hacophoridae, Scincidae, Varanidae species also found during visit both land and aquatic area followed by their habitat. Among the 14 species, several species are taken place in CITES list. In the mangrove forest area *Enhydrina schistose*, *Bungarus caeruleus*, *Bungarus caeruleus*, *Atretium schistosum*, *Xenochrophis piscator* rwere present. Along the road side there were *Varanus bengalensis*, *Lampropholis guichenoti*, *Varanus flavescens*, *Duttaphrynus*

melanostictus. In the hill side forest area most of the amphibian and reptile were not seen but from secondary source and interview survey a list of them are developed. A detail species list is provided in [ANNEX-J](#).

Rainy season: During field investigation, a total 14 species of 10 families were found. A detail species list is provided in [ANNEX-K](#).

C. Mammals

Dry & Rainy season: Among the mammals, 11 species were recorded under 09 families. Almost all large mammals are facing habitat predicament due to human pressure. Common mammals that were found within the hill area are *Herpestes javanicus*, *Macaca mulatta*, *Vulpes bengalensis*, *Cynopterus sphinx* etc. During study there were no mammals seen along the mangrove forest area. At high tide the mangrove forest totally inundates at high tide and there are no safe locations for wild animal to move. Along the road side there were only seen *Herpestes javanicus* and local people stated that there are some *Vulpes bengalensis* species near the jungle of road. A detail species list of mammals is provided in [ANNEX-L& M](#).

D. Crabs

Dry & Rainy season: During the field visit at low tide there were large number of crabs along the upstream to downstream river bank of proposed bridge site area and these also seen in the high tide on tree of mangrove forest but in a little number. Mud crab (*Scylla serrata*) and Red-fiddler crab (*Uca crassipes*) are common in this area but red fiddler is the dominant species. There also were seen little amount of snail during low tide.

10) Conclusion and Recommendation

According to the analysis result of the project area, the environmental quality is within the Bangladesh EQS standard.

ANNEX A

AIR QUALITY ANALYSIS RESULT

Test Results of Ambient Air Quality Analysis

Description of Data: Ambient Air Quality

Data Collector: Collected by EQMS personnel

Sampling Date: Dry season: 3-9 May, 2013 & Rainy season: 7-10 June, 2013

Reporting Date: 16th May & 30th June, 2013

Description of Analysis:

Sl No.	Sampling Location	Ambient Air Pollutants Concentration									
		NOx ($\mu\text{g}/\text{m}^3$)		SO ₂ ($\mu\text{g}/\text{m}^3$)		PM10 ($\mu\text{g}/\text{m}^3$)		CO (ppm)		O ₃ ($\mu\text{g}/\text{m}^3$)	
		Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season
01	Ekata Bazar	13.65	9.52	4.85	2.45	31.43	24.51	<2.0	<2.0	22.4	16.86
02	Ilisha Bazar (Between Eidmoni And Badarkhali)	21.35	15.46	6.72	4.34	64.72	40.65	<2.0	<2.0	35.7	27.97
03	Yunuskhali Bazar	15.31	11.57	4.71	3.04	42.56	33.75	<2.0	<2.0	29.5	20.76
Bangladesh Standard (According to ECR'97 and subsequent amendment at 2005)		100 (annual)		365		150		9		157	
Duration (Hours)		24		24		24		8		8	
Method of Analysis		Jacob & Hochheiser		West Greake		Gravimetric		Digital CO meter		UV Photometry	

Note:

1. NOx - Oxides of Nitrogen
2. SO₂ - Sulphur Di-Oxide
3. PM10 - Respirable Dust Content
4. CO - Carbon Monoxide
5. O₃ - Ozone

Dry Season



Figure: Air quality sampling at Ekata Bazar



Figure: Air quality sampling at Close to Yunuskhali Bazar

Rainy season



Figure: Air quality sampling at Ekata Bazar



Figure: Air quality sampling at Close to Ilisha Bazar (Between Eidmoni And Badarkhali)



Figure: Air quality sampling at Close to Yunuskhali Bazar

ANNEX B

NOISE QUALITY ANALYSIS RESULT

Hourly Equivalent Noise Level Analysis Report

Description of Data: Hourly Noise level data

Data Collector: Collected by EQMS personnel

Sampling Date: Dry Season: 6-14 May &

Rainy season: 7-10 June, 2013

Reporting Date: 21th May & 30th June, 2013

Description of Analysis:

Hourly equivalent noise level (dB(A))

	Hour	Description of Analysis:										
		Hourly equivalent noise level (dB(A))										
		NQ1 Close to Baggasara (Between Pekua and Eidmoni)		NQ2 Ekata Bazar		NQ3 Yunuskhali Bazar		NQ4 Janata Bazar		NQ5 Ilisha Bazar (Between Eidmoni and Badarkhali)		
		Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	
Day time	6:00:00-6:59:00	52.3	54.2	52.3	49.6	51.4	50.3	57.0	52.5	56.8	54.3	
	7:00:00-7:59:00	55.2	51.7	57.2	53.6	55.6	53.5	59.1	57.8	59.6	57.4	
	8:00:00-8:59:00	54.6	50.6	56.8	52.6	55.4	56.4	59.9	57.3	59.3	56.6	
	9:00:00-9:59:00	57.3	54.7	56.7	53.8	58.0	55.3	60.0	59.6	60.5	58.3	
	10:00:00-10:59:00	55.8	52.6	56.2	55.8	58.4	56.6	59.6	57.5	61.3	57.6	
	11:00:00-11:59:00	54.5	56.8	53.8	57.3	60.1	58.4	60.3	58.3	61.1	58.5	
	12:00:00-12:59:00	57.5	53.5	52.8	54.3	60.5	59.3	59.8	58.7	60.8	60.2	
	13:00:00-13:59:00	57.8	54.7	55.8	51.8	59.8	57.3	60.3	56.7	60.5	57.9	
	14:00:00-14:59:00	58.7	53.5	57.0	55.8	59.7	58.4	60.2	58.6	60.2	57.8	
	15:00:00-15:59:00	57.5	58.3	57.7	53.7	58.8	59.3	59.4	57.3	60.5	59.6	
	16:00:00-16:59:00	55.1	57.2	56.5	54.5	59.7	57.3	59.0	58.4	60.4	56.7	
	17:00:00-17:59:00	55.0	53.9	57.9	53.8	59.6	57.5	57.9	59.2	61.8	56.3	
	18:00:00-18:59:00	57.0	54.7	57.7	55.8	57.7	55.8	57.6	56.6	61.5	60.1	
	19:00:00-19:59:00	53.8	55.3	55.9	53.8	59.6	58.3	56.4	54.7	60.6	58.3	
	20:00:00-20:59:00	49.6	48.5	50.4	52.5	55.3	57.2	52.9	53.6	60.0	56.7	
		Maximum	58.7	58.3	57.9	57.3	60.5	59.3	60.3	59.6	61.8	60.2
		Minimum	49.6	48.5	50.4	49.6	51.4	50.3	52.9	52.5	56.8	54.3
		Average	55.4	54.0	55.6	53.9	58.0	56.7	58.6	57.1	60.3	57.8
	Night time	21:00:00-21:59:00	50.4	48.9	48.6	49.5	55.1	53.1	50.3	49.7	58.0	56.3
		22:00:00-22:59:00	51.0	52.6	47.7	48.3	52.1	50.5	48.7	47.5	52.2	53.7
23:00:00-23:59:00		49.1	47.5	48.3	46.5	49.5	48.7	47.9	48.6	48.7	50.3	
24:00:00-24:59:00		48.3	49.6	47.5	47.9	47.4	48.2	48.0	47.5	47.0	49.7	
01:00:00-01:59:00		48.7	47.5	47.6	46.2	47.8	47.5	48.3	49.6	45.5	47.5	
02:00:00-02:59:00		49.0	47.2	46.6	45.3	48.4	46.6	48.1	48.7	45.7	48.4	
03:00:00-03:59:00		48.2	46.6	45.0	47.5	47.5	47.9	47.1	46.3	47.2	46.8	
04:00:00-04:59:00		48.2	49.5	47.2	46.2	47.9	46.7	47.7	48.4	47.8	45.2	
05:00:00-05:59:00		47.4	48.6	47.7	45.5	48.1	46.3	49.7	47.4	48.7	47.8	
		Maximum	51	52.6	48.6	49.5	55.1	53.1	50.3	49.7	58	56.3
	Minimum	47.4	46.6	45.0	45.3	47.4	46.3	47.1	46.3	45.5	45.2	
	Average	48.9	48.7	47.4	47.0	49.3	48.4	48.4	48.2	49.0	49.5	
Zone (according to		Mixed Area		Mixed Area		Commercial		Commercial		Commercial		

Hour

Hourly equivalent noise level (dB(A))

	NQ1 Close to Baggasara (Between Pekua and Eidmoni)		NQ2 Ekata Bazar		NQ3 Yunuskhali Bazar		NQ4 Janata Bazar		NQ5 Ilisha Bazar (Between Eidmoni and Badarkhali)	
	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season

**Environmental
Quality Standard
1997 and subsequent
amendment in 2006)
Bangladesh
Standard at Day time
Bangladesh
Standard at Night
time**

Area

Area

Area

60

60

70

70

70

50

50

60

60

60

Dry Season



Figure: Noise Sampling at Close to Baggasara (Between Pekua and Eidmoni)



Figure: Noise Sampling at Ekata Bazar



Figure: Noise Sampling at Yunuskhali Bazar



Figure: Noise Sampling at Janata Bazar



Figure: Noise Sampling at Ilisha Bazar (Between Eidmoni and Badarkhali)

Rainy season



Figure: Noise Sampling at Close to Baggasara (Between Pekua and Eidmoni)



Figure: Noise Sampling at Ekata Bazar



Figure: Noise Sampling at Yunuskhali Bazar



Figure: Noise Sampling at Janata Bazar



Figure: Noise Sampling at Ilisha Bazar (Between Eidmoni and Badarkhali)

ANNEX C

VIBRATION LEVEL RESULT

Vibration Level Analysis Report

Description of Data: Vibration Level data

Data Collector: Collected by EQMS personnel

Sampling Date: 5th June 2013 & 14th June 2013

Reporting Date: 30th June, 2013

Description of Analysis:

Sl.	Location	Sample Code	GPS	Vibration level (Hz)	
				5 th June 2013	14 th June 2013
1.	Yunuskhali Bazar	VL1	21°42'8.16"N 91°55'31.83"E	7-32	6-27
2.	Janata Bazar	VL2	21°42'41.57"N 91°56'5.25"E	9-36	11-30
3.	Ilisha Bazar (Between Eidmoni and Badarkhali)	VL3	21°45'7.72"N 91°58'47.93"E	12-40	10-35
4.	Close to Baggasara (Between Pekua and Eidmoni)	VL4	21°47'57.12"N 91°58'57.50"E	4-19	4-14
5.	Ekata Bazar	VL5	21°49'33.07"N 91°59'2.62"E	6-28	4-30

ANNEX D

SURFACE WATER QUALITY ANALYSIS RESULT

Surface water quality of the study area

Description of Data: Surface Water Quality Data

Data Collector: Collected by EQMS personnel

Sampling Date: 29th March, 2013 (Dry Season) & 4th June, 2013 (Rainy season)

Reporting Date: 21th May & 30th June, 2013

Sl.	Parameters	Sample 3		Sample 4		Sample 5		Bangladesh standards (Best practice based classification)					
		Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Source of drinking water for supply only after disinfecting	Water usable for recreational activity	Source of drinking water for supply after conventional treatment	Water usable by fisheries	Water usable by various process and cooling industries	Water usable for irrigation
1.	Location	Upstream of the proposed bridge		Bridge site		Close to the Mangrove							
2.	GPS	21°42'57.73"N 91°54'53.50"E	21°42'56.64"N 91°54'51.13"E	21°42'34.47"N 91°54'51.89"E	21°42'34.81"N 91°54'48.39"E	21°42'14.89"N 91°54'27.87"E	21°42'15.73"N 91°54'27.73"E						
3.	Clarity (m)	0.62	0.68	0.60	0.67	0.65	0.68	-	-	-	-	-	-
4.	Colour	Nearly colorless	Nearly colorless	Nearly colorless	Nearly colorless	Nearly colorless	Nearly colorless	-	-	-	-	-	-
5.	Temperature(°C)	29.5	27.9	29.8	27.6	30.2	27.8	-	-	-	-	-	-
6.	Salinity (ppt)	2.50	2.30	2.60	2.30	2.60	2.40	-	-	-	-	-	-
7.	pH	7.2	7.4	7.0	7.1	7.2	7.2	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5
8.	Turbidity (NTU)	24	28	25	27	25	27	-	-	-	-	-	-
9.	Suspended Solid (mg/l)	184	156	179	162	192	156	-	-	-	-	-	-
10.	DO (mg/l)	7.3	7.4	7.5	7.3	7.1	7.4	6 or above	5 or above	6 or above	5 or above	5 or above	5 or above
11.	COD (mg/l)	14.7	13.5	13.6	12.6	15.3	12.8	-	-	-	-	-	-
12.	BOD5 (mg/l)	3.5	2.7	3.2	2.6	4.0	2.9	2 or	3 or	6 or	6 or	10 or	10 or

Sl.	Parameters	Sample 3		Sample 4		Sample 5		Bangladesh standards (Best practice based classification)					
		Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season	Source of drinking water for supply only after disinfecting	Water usable for recreational activity	Source of drinking water for supply after conventional treatment	Water usable by fisheries	Water usable by various process and cooling industries	Water usable for irrigation
1.	Location	Upstream of the proposed bridge		Bridge site		Close to the Mangrove							
2.	GPS	21°42'57.73"N 91°54'53.50"E	21°42'56.64"N 91°54'51.13"E	21°42'34.47"N 91°54'51.89"E	21°42'34.81"N 91°54'48.39"E	21°42'14.89"N 91°54'27.87"E	21°42'15.73"N 91°54'27.73"E						
13.	Ammonium Nitrogen (NH ₄ -N) (mg/l)	0.7	0.4	0.6	0.3	0.7	0.4	less	less	less	less	less	less
14.	Nitrate Nitrogen (NO ₃ - N) (mg/l)	0.05	0.04	0.05	0.04	0.07	0.03	-	-	-	-	-	-
15.	Total Nitrogen (mg/l)	3.53	3.10	3.45	3.14	3.49	3.17	-	-	-	-	-	-
16.	Phosphate (PO ₄ -P) (mg/l)	0.636	0.421	0.626	0.576	0.640	0.616	-	-	-	-	-	-
17.	Total Phosphorous (mg/l)	0.207	0.196	0.216	0.185	0.203	0.179	-	-	-	-	-	-
18.	Total Coliform (n/100ml)	23000	21000	25000	22000	21000	20000	-	-	-	-	-	-
19.	Oil and Grease content (mg/l)	0.1	BDL	0.1	BDL	0.1	BDL	-	-	-	-	-	-
20.	Mercury (mg/l)	0.002	BDL	0.002	BDL	0.002	BDL	-	-	-	-	-	-
21.	Arsenic (mg/l)	0.005	BDL	0.005	BDL	0.005	BDL	-	-	-	-	-	-
22.	Lead (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
23.	Chromium (mg/l)	0.021	BDL	0.020	BDL	0.020	BDL	-	-	-	-	-	-
24.	Cadmium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
25.	Copper (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-
26.	Nickel (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-
27.	Zinc (mg/l)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-

Dry Season



Upstream of the proposed bridge



Bridge site



Close to the Mangrove



On site water analysis



On site water analysis

On site water analysis

Rainy season



Upstream of the proposed bridge



Bridge site

ANNEX E

GROUND WATER QUALITY ANALYSIS RESULT

Ground water quality of the study area

Description of Data: Ground water data

Data Collector: Collected by EQMS personnel

Sampling Date: 29th March, 2013 (Dry Season) & 4th June, 2013 (Rainy season)

Reporting Date: 19th April & 30th June, 2013

Sl.	Parameters	Sample 1		Sample 2		Bangladesh Standards
		Dry Season	Rainy season	Dry Season	Rainy season	
1.	Location	Close to the proposed bridge		Younuskhali village		-
2.	GPS	21°42'34.21"N 91°54'56.22"E		21°42'10.27"N 91°55'28.83"E		-
3.	Clarity	Clear	Clear	Clear	Clear	-
4.	Colour	Colourless	Colourless	Colourless	Colourless	-
5.	Temperature(°C)	26.6	23.4	27.2	25.5	20-30
6.	Salinity (ppt)	0.30	0.20	0.20	0.20	-
7.	pH	6.8	6.6	6.5	6.5	6.5-8.5
8.	Turbidity (NTU)	2	2	2	2	10
9.	DO (mg/l)	4.5	4.3	4.2	4.1	6
10.	COD (mg/l)	5.2	4.8	5.9	5.5	4
11.	BOD5 (mg/l)	0.57	0.55	0.62	0.63	0.2
12.	Ammonium Nitrogen (NH ₄ -N) (mg/l)	0.2	0.2	0.2	0.2	-
13.	Nitrate Nitrogen (NO ₃ -N) (mg/l)	6.5	5.7	7.3	6.8	-
14.	Total Nitrogen (mg/l)	0.14	0.10	0.16	0.13	-
15.	Phosphate (PO ₄ -P) (mg/l)	0.575	0.632	0.622	0.687	6
16.	Total Phosphorous (mg/l)	0.187	0.176	0.168	0.146	-
17.	Total Coliform (n/100 ml)	0	0	0	0	0
18.	Mercury (mg/l)	<0.001	<0.001	<0.001	<0.001	0.001
19.	Arsenic (mg/l)	<0.005	<0.005	<0.005	<0.005	0.05
20.	Lead (mg/l)	<0.01	<0.01	<0.01	<0.01	0.05
21.	Chromium (mg/l)	0.014	0.010	0.010	0.010	0.05
22.	Cadmium (mg/l)	<0.001	<0.001	0.001	<0.001	0.005
23.	Copper (mg/l)	<0.1	<0.1	<0.1	<0.1	1
24.	Nickel (mg/l)	<0.1	<0.1	<0.1	<0.1	0.1
25.	Zinc (mg/l)	<0.05	<0.05	<0.05	<0.05	5

Dry Season



Close to the proposed bridge



Younuskhali village

Rainy season



Close to the proposed bridge



Younuskhali village

ANNEX F

SEDIMENT QUALITY ANALYSIS REPORT

Sediment Quality of the study area

Description of Data: Sediment quality data

Data Collector: Collected by EQMS personnel

Sampling Date: 29th March, 2013 (dry Season) & 4th June, 2013 (Rainy season)

Reporting Date: 2th May & 6th July, 2013

Parameters	SD1		SD2		SD3	
	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season
Location	Upstream of proposed bridge		Proposed bridge site		Close to the mangrove	
GPS	21°42'58.67"N 91°54'52.28"E	21°42'57.08"N 91°54'52.25"E	21°42'35.13"N 91°54'50.95"E	21°42'34.33"N 91°54'50.06"E	21°42'14.82"N 91°54'26.64"E	21°42'16.60"N 91°54'27.52"E
Appearances	Grey	Grey	Grey	Grey	Grey	Grey
Odor	Earthy	Earthy	Earthy	Earthy	Earthy	Earthy
Colour	Grey yellow	Grey yellow	Grey yellow	Grey yellow	Grey yellow	Grey yellow
Grading (mm)	2.5-4.4	2.1-4.2	2.6-4.9	2.3-4.4	2.5-3.9	2.3-4.1
Density (gm/cm ³)	1.97	2.0	2.05	2.1	2.16	2.1
Water content (%)	24	28	27	30	31	29
Ignition loss (gm/gm)	0.13	0.17	0.15	0.16	0.10	0.13
COD (µg/g)	37	34	32	30	35	29
Mercury (µg/g)	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic (µg/g)	0.30	0.20	0.30	0.20	0.40	0.20
Lead (µg/g)	8.12	6.27	6.32	8.43	5.21	6.78
Chromium (µg/g)	4.8	3.1	3.2	2.6	3.6	3.0
Cadmium (µg/g)	BDL	BDL	BDL	BDL	BDL	BDL
Copper (µg/g)	13.42	10.32	10.21	14.26	9.13	11.43
Nickel (µg/g)	4.20	3.70	3.02	2.79	2.56	3.15
Zinc (µg/g)	45	49	51	43	48	42
Particle size distribution	Sand-28% Silt-47% Clay-25%	Sand-31% Silt-50% Clay-19%	Sand-27% Silt-49% Clay-24%	Sand-30% Silt-52% Clay-18%	Sand-27% Silt-48% Clay-25%	Sand-30% Silt-51% Clay-19%
Texture	Loam	Silt loam	Loam	Silt loam	Loam	Silt loam

BDL = Below Detection Limit

ANNEX G

BENTHOS ANALYSIS REPORT

Benthos in the study area

Description of Data: Benthos quantity

Data Collector: Collected by EQMS personnel

Sampling Date: 28th March & 4th June, 2013

Reporting Date: 30th April & 6th July, 2013

Parameters	Macrobenthos Abundance (ind/m ²)					
	BS1		BS2		BS3	
	Dry Season	Rainy season	Dry Season	Rainy season	Dry Season	Rainy season
Location	Upstream of proposed bridge		Proposed bridge site		Close to the mangrove	
GPS	21°42'58.67"N 91°54'52.28"E	21°42'57.08"N 91°54'52.25"E	21°42'35.13"N 91°54'50.95"E	21°42'34.33"N 91°54'50.06"E	21°42'14.82"N 91°54'26.64"E	21°42'16.60"N 91°54'27.52"E
Taxonomic Group						
Polychaeta	1243	987	925	1472	1356	776
Oligochaeta	780	1073	1328	956	1876	2163
Bivalvia	19	47	17	30	174	105
Decapoda	145	287	167	62	23	46
Amphipoda	5	104	26	132	11	86
Isopoda	19	3	78	5	2	0
Gastropoda	22	17	70	49	53	29
Nematoda	378	179	512	121	80	234

Dry Season



Upstream of proposed bridge



Proposed bridge site



Close to the mangrove

Rainy season



Upstream of proposed bridge



Proposed bridge site

ANNEX H

CHECKLIST OF FLORA (DRY SEASON)

A) Hill side forest area (Quardrate 1 & 4)

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: VC – Very Common C – Common, R – Rare, VR – Very rare

	Scientific Name	Family Name	Common Name	Habitat	Usage	IUCN Status	Status of distribution	Observed Quardrate	
								Q1	Q4
1.	<i>Anacardium occidentale</i>	Anacardiaceae	Kajubadam	T	Fruit/ wood	Not Assessed	C	√	-
2.	<i>Aporusa dioica</i>	Euphorbiaceae	Patakorolla	T	Fire wood	Not Assessed	R	√	-
3.	<i>Bursera serrata</i>	Burseraceae	Gutgutia	T	Firewood	Not Assessed	C	√	√
4.	<i>Elaeocarpus sp.</i>	Elaeocarpaceae	Pahari Jalpai	T	Fruit	Not Assessed	C	√	√
5.	<i>Garcinia cowa</i>	Clusiaceae	Cao	T	Fruit	Not Assessed	C	√	-
6.	<i>Glochidion multilochulare</i>	Euphorbiaceae	Poniatori	ST	Firewood	Not Assessed	C	-	√
7.	<i>Tectona grandis</i>	Lamiaceae	Shegun	T	Timber	Not Assessed	C	√	-
8.	<i>Gmelina arborea</i>	Meliaceae	Gamari	T	Timber	Not Assessed	C	√	-
9.	<i>Holigarna longifolia</i>	Anacardiaceae	Barola	T	Fire wood	Not Assessed	R	-	√
10.	<i>Lepisanthes rubiginosa</i>	Sapindaceae	Chagnoladi	ST	Firewood	Not Assessed	C	√	-
11.	<i>Lepisanthes senegalensis</i>	Sapindaceae	Kakrabadi	ST	Medicinal	Not Assessed	C	√	-
12.	<i>Pandanus sp.</i>	Pandanaceae	Kea Kanta	ST	Medicinal	Not Assessed	C	-	√
13.	<i>Grewia nervosa</i>	Tiliaceae	Datoi	T	Medicinal	Not Assessed	R	√	-
14.	<i>Raphis sp.</i>	Arecaceae	Talpalm	T	Ornamental	Not Assessed	R	√	-
15.	<i>Streblus asper</i>	Moraceae	Sheora	T	Fire wood/	Not Assessed	C	√	√
16.	<i>Hymenodictyon excoelsum</i>	Rubiaceae	Bhuikadam	T	Paking wood	Not Assessed	C	-	√
17.	<i>Syzygium fruticosum</i>	Myrtaceae	Khudijam	T	Medicinal	Not Assessed	C	-	√
18.	<i>Pongamia pinnata</i>	Fabaceae	Karach	T	Timber	LC	C	√	√
19.	<i>Phyllanthus embelica</i>	Euphorbiaceae	Amloki	T	Medicinal & fruit	Not Assessed	C	√	-
20.	<i>Garcinia sp.</i>	Clusiaceae	Kauargula	T	Timber	Not Assessed	R	-	-

	Scientific Name	Family Name	Common Name	Habitat	Usage	IUCN Status	Status of distribution	Observed Quardrate	
								Q1	Q4
21.	<i>Calamus sp.</i>	Arecaceae	Bet	ST	Commercial	Not Assessed	C	√	-
22.	<i>Eucalyptus citriodora</i>	Myrtaceae	Eucalyptus	T	Timber	Not Assessed	C	-	√
23.	<i>Acacia auriculiformis</i>	Mimosaceae	Acashmoni	T	Timber	LC	C	-	√
24.	<i>Clerodendrum viscosum</i>	Verbenaceae	Vhat, Bhait	H	Medicinal	Not Assessed	C	√	√
25.	<i>Pandanus furcatus</i>	Pandanaceae	Kashiyakanta	H	Medicinal	Not Assessed	C	√	-
26.	<i>Panicum sp.</i>	Poaceae	Dhanigach	H	Weed	Not Assessed	C	√	-
27.	<i>Uena lobata</i>	Malvaceae	Banghagra	H	Weed	Not Assessed	C	√	-
28.	<i>Alpinia malascensis</i>	Zingiberaceae	Pahari Tara	S	Medicinal	Not Assessed	C	√	√
29.	<i>Psychotria adenophylla</i>	Rubiaceae	Ipikak	S	Medicinal	Not Assessed	R	√	-
30.	<i>Pavetta indica</i>	Rubiaceae	Beophul	S	Medicinal	Not Assessed	R	√	-
31.	<i>Eupatorium odoratum</i>	Asteraceae	Assamlata, Germanlata	S	Medicinal	Not Assessed	C	√	-
32.	<i>Morinda angustifolia</i>	Rubiaceae	Daruharidra	S	Medicinal	Not Assessed	R	√	-
33.	<i>Smilax zeylanica</i>	Smillaceae	Kumarilata	C	Medicinal	Not Assessed	R	√	-
34.	<i>Blumea densiflora</i>	Asteraceae	Kukurshinga	H	Medicinal	Not Assessed	C	√	-
35.	<i>Dicranopteris liniaris</i>	Pteridophyte	Dhekia	H	Weed	Not Assessed	C	√	√
36.	<i>Lycopodium sp.</i>	Lycopodiaceae	Fern	H	Medicinal	Not Assessed	C	√	-
37.	<i>Heliotropium indicum</i>	Boraginaceae	Hatisur	H	Medicinal	Not Assessed	C	√	-
38.	<i>Trema orientalis</i>	Ulmaceae	Jibon, Nalita	T	Timber	Not Assessed	C	√	√
39.	<i>Terminalia catappa</i>	Combretaceae,	Katbadam	T	Medicinal	Not Assessed	C	√	-
40.	<i>Nicotiana plumbaginifolia</i>	Solanaceae	Bantamak	H	Weed	Not Assessed	C	-	√
41.	<i>Ocimum americanum</i>	Lamiaceae	Bantulsi	H	Medicinal	Not Assessed	C	-	√

B) Road site vegetation

Local Status: VC – Very Common C – Common, LC- Less common, R – Rare, VR – Very rare

SL#	Scientific Name	Family	Local Name	Local Status	Usage	Habit
1.	<i>Acacia auriculiformis</i>	Fabaceae	Akasmoni	VC	Timber and fuelwood	Tree
2.	<i>Albizia lebbek</i>	Leguminosae	Kalo karo	C	Timber and fuelwood	Tree
3.	<i>Areca catechu</i>	Palmae	Supari	VC	Fruit and Timber	Tree
4.	<i>Artocarpus heterophyllus</i>	Moraceae	Kathal	C	Fruit, Timber and fuel wood	Tree
5.	<i>Azadirachta indica</i>	Meliaceae	Nim	C	Timber and medicine	Tree
6.	<i>Carica papaya</i>	Caricaceae	Papay	C	Fruit	Shrub
7.	<i>Mangifera indica</i>	Anacardiaceae	Am	VC	Fruit and Timber	Tree
8.	<i>Ficus benghalensis</i>	Moraceae	Bot	LC	Timber	Tree
9.	<i>Musa paradisiaca</i> var. <i>sapientum</i>	Musaceae	Kala	VC	Fruit	Shrub
10.	<i>Swietenia mahagoni</i>	Meliaceae	Mahogoni	VC	Timber and medicine	Tree
11.	<i>Bambusa sp.</i>	Gramineae	Bash	C	-	Grassy wood
12.	<i>Hyptis suaveolens</i>	Labiatae		C	-	Shrub
13.	<i>Clerodendrum viscosum</i>	Lamiaceae	Vhat	C	-	Shrub
14.	<i>Ranunculus scleratus</i>	Ranunculaceae	Jal Dhunia	R	-	Herb
15.	<i>Calotropis gigantea</i>	Asclepiadaceae	Akondo	C	-	Woody shrub
16.	<i>Leucas aspera</i>	Labiatae	Shetdron	LC	-	Herb
17.	<i>Rumex dentatus</i>	Polygonaceae	Ban palong	C	-	Weedy herb
18.	<i>Cynodon dactylon</i>	Gramineae	Durba gash	C	-	Grass

C) River bank site species (Matarbari bank site)

Sl.	Scientific name	Family	Common name	Habit	Used	Status of distribution	Type
1.	<i>Cocos nucifera</i>	Palmae	Coconut	Tree	Fruit and Fuel wood	Common	Cultivated
2.	<i>Eucalyptus obliqua</i>	Myrtaceae	Eucalyptus	Tree	Timber	Common	Cultivated
3.	<i>Phoenix sylvestris</i>	Arecaceae	Khejur	Tree	Fruit and Timber	Common	Cultivated
4.	<i>Albizia procera</i>	Mimosaceae	Koroi	Tree	Timber	Common	Cultivated
5.	<i>Flacourtia jangomas</i>	Flacourtiaceae	Paniala	Small tree	Fuel wood	Uncommon Resident	Cultivated
6.	<i>Ipomoea fistulosa</i>	Convolvulaceae	Dholkalmi	Shrub	Fuel wood	Common	wild

D) Mangrove Plantation forest Species

	Scientific Name	Family	Common Name	Habit	Used	Status of distribution	Type
1.	<i>Acanthus illicifolias</i>	Acanthaceae	Hargoja	S	-	common	wild
2.	<i>Sonneratia apetala</i>	Sonneratiaceae	Kerpa	T	Wood	common	wild
3.	<i>Ficus sp.</i>	Moraceae	Baigola	T	wood	common	Mangrove tree

ANNEX I

CHECKLIST OF FLORA (RAINY SEASON)

Hill side forest and Land floral species: (Quardrate 1 & 4)

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: VC – Very Common C – Common, R – Rare, VR – Very rare

S.L	Scientific Name	Family Name	Common Name	Habitat	Usage	IUCN Status	Status of distribution	Observed Quardrate	
								Q1	Q4
1.	<i>Bursera serrata</i>	Burseraceae	Gutgutia	T	Firewood	Not assessed	C	√	-
2.	<i>Tectona grandis</i>	Lamiaceae	Shegun	T	Timber	Not assessed	C	-	√
3.	<i>Azadirachta indica</i>	Meliaceae	Neem	T	Medicinal	Not assessed	C	-	√
4.	<i>Gmelina arborea</i>	Meliaceae	Gamari	T	Timber	Not assessed	C	-	√
5.	<i>Grewia nervosa</i>	Tiliaceae	Datoi	T	Medicinal	Not assessed	R	√	√
6.	<i>Eucalyptus citriodora</i>	Myrtaceae	Eucalyptus	T	Timber	Not assessed	C	√	-
7.	<i>Acacia auriculiformis</i>	Mimosaceae	Acashmoni	T	Timber	LC	C	-	√
8.	<i>Leucaena leucocephala</i>	Mimosaceae	Ipil-Ipil	T	Timber	Not assessed	C	-	√
9.	<i>Terminalia arjuna</i>	Combretaceae	Arjun	T	Medicinal	Not assessed	C	√	-
10.	<i>Terminalia catappa</i>	Combretaceae,	Katbadam	T	Medicinal	Not assessed	C		√
11.	<i>Senna siamea</i>	Caesalpiniaceae	Minjiri	T	Firewood	Not assessed	C	-	√
12.	<i>Litsea glutinosa</i>	Lauraceae	Kharajora, Pipulti, Menda	T	Medicinal, Firewood	Not assessed	C	√	-
13.	<i>Lepisanthes rubiginosa</i>	Sapindaceae	Chagnoladi	ST	Firewood	Not assessed	C	-	√
14.	<i>Bambusa sp.</i>	Poaceae	Bans	ST	Commercial	Not assessed	C	√	-
15.	<i>Calamus sp.</i>	Arecaceae	Bet	ST	Commercial	Not assessed	C	√	√
16.	<i>Clerodendrum viscosum</i>	Verbenaceae	Vhat, Bhait	H	Medicinal	Not assessed	C	√	√
17.	<i>Heliotropium indicum</i>	Boraginaceae	Hatisur	H	Medicinal	Not assessed	C	√	√
18.	<i>Ocimum americanum</i>	Lamiaceae	Bantulsi	H	Medicinal	Not assessed	C	-	√
19.	<i>Lindernia rotundifolia</i>	Scophulariaceae	Bhui	H	-	LC	C		√
20.	<i>Mimosa pudica</i>	Mimosaceae	Lajjaboti	H	Medicinal	Not assessed	VC	√	√

S.L	Scientific Name	Family Name	Common Name	Habitat	Usage	IUCN Status	Status of distribution	Observed Quardrate	
								Q1	Q4
21.	<i>Colocasia esculenta</i>	Araceae	Bankachu	H	Vegetable	LC	C	-	√
22.	<i>Cynodon dactylon</i>	Poaceae	Durba	H	Medicinal	Not assessed	C	√	√
23.	<i>Hyptis suaveolens</i>	Lamiaceae	Tokma	H	Medicinal	Not assessed	VC		√
24.	<i>Urena lobata</i>	Malvaceae	Banghagra	H	-	Not assessed	C	√	√
25.	<i>Dryopteris</i>	Dryopteridaceae	Deki sak	H	ornamental	Not assessed	VC	√	√
26.	<i>Alpinia malascensis</i>	Zingiberaceae	Pahari Tara	S	Medicinal	Not assessed	C		√
27.	<i>Eupatorium odoratum</i>	Asteraceae	Assamlata, Germanlata	S	Medicinal	Not assessed	C	√	-
28.	<i>Chromolena odorata</i>	Asteraceae	Motkil lata	S	Medicinal & Ornamental	Not assessed	C	√	√
29.	<i>Melastoma malabathricum</i>	Melastomaceae	Datranga, Bontejpata	S	Ornamental	Not assessed	C	-	√
30.	<i>Ichnocarpus frutiscens</i>	Apocynaceae	Dhudhilata	C	Medicinal	Not assessed	C	√	-

Mangrove Plantation forest Species: 3

T=Tree: 2, S=Shrub: 1)

IUCN Status: CR - Critically Endangered, EN - Endangered, VU - Vulnerable, LR - Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: VC - Very Common C - Common, R - Rare, VR - Very rare

	Scientific Name	Family	Common Name	Habit	Usage	IUCN Status	Status of distribution
1.	<i>Acanthus illicifolias</i>	Acanthaceae	Hargoja	S	-	Not Listed	C
2.	<i>Sonneratia apetala</i>	Sonneratiaceae	Kerpa	T	Wood	LC	C
3.	<i>Ficus sp.</i>	Moraceae	Baigola	T	wood	Not Listed	C

River Bank Side Vegetation (*Matarbari bank site*): 6

T=Tree: 4, ST=Small Tree: 1, S=Shrub: 1)

IUCN Status: CR - Critically Endangered, EN - Endangered, VU - Vulnerable, LR - Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: VC - Very Common C - Common, R - Rare, VR - Very rare

Sl.	Scientific name	Family	Common name	Habit	Usage	IUCN Status	Status of distribution
1.	<i>Cocos nucifera</i>	Palmae	Coconut	T	Fruit and Fuel wood	Not Listed	C
2.	<i>Eucalyptus obliqua</i>	Myrtaceae	Eucalyptus	T	Timber	Not Listed	C
3.	<i>Phoenix sylvestris</i>	Arecaceae	Khejur	T	Fruit and	Not Listed	C

Sl.	Scientific name	Family	Common name	Habit	Usage	IUCN Status	Status of distribution
					Timber		
4.	<i>Albizia procera</i>	Mimosaceae	Koroi	T	Timber	Not Listed	C
5.	<i>Flacourtia jangomas</i>	Flacourtiaceae	Paniala	ST	Fuel wood	Not Listed	R
6.	<i>Ipomoea fistulosa</i>	Convolvulaceae	Dholkalmi	S	Fuel wood	Not Listed	C

Road side forest: 33

T=Tree: 17, H=Herb: 9, S=Shrub: 6, G=Grass: 1)

IUCN Status: CR - Critically Endangered, EN - Endangered, VU - Vulnerable, LR - Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: VC - Very Common C - Common, R - Rare, VR - Very rare

SL.	Scientific Name	Family	Local Name	Habitat	Usage	IUCN status	Status of Distribution
1.	<i>Acacia auriculiformis</i>	Fabaceae	Akasmoni	T	Timber and Fuel wood	LC	VC
2.	<i>Albizia lebbeck</i>	Leguminosae	Kalo karo	T	Timber and Fuel wood	Not Listed	C
3.	<i>Areca catechu</i>	Palmae	Supari	T	Fruit and Timber	Not Listed	VC
4.	<i>Artocarpus heterophyllus</i>	Moraceae	Kathal	T	Fruit, Timber and Fuel wood	Not Listed	C
5.	<i>Azadirachta indica</i>	Meliaceae	Nim	T	Timber and medicine	Not Listed	C
6.	<i>Mangifera indica</i>	Anacardiaceae	Am	T	Fruit and Timber	DD	VC
7.	<i>Ficus benghalensis</i>	Moraceae	Bot	T	Timber	Not Listed	R
8.	<i>Swietenia mahagoni</i>	Meliaceae	Mahogoni	T	Timber and medicine	Not Listed	VC
9.	<i>Delonix regia</i>	Caesalpinae	Krisnachura	T	Ornamental	Not Listed	R
10.	<i>Cocos mucifera</i>	Palmae	Narikel	T	Fruit	Not Listed	C

SL.	Scientific Name	Family	Local Name	Habitat	Usage	IUCN status	Status of Distribution
11.	<i>Phoenix sylvestris</i>	Palmae	Khejur	T	Fruit	Not Listed	C
12.	<i>Barassus flabellifer</i>	Palmae	Tal	T	Fruit	Not Listed	R
13.	<i>Bombax ceiba</i>	Boraginaceae	Shimul	T	Fiber and Timber	Not Listed	C
14.	<i>Eucalyptus teritocornis</i>	Myrataceae	Eucalyptus	T	Timber	Not Listed	C
15.	<i>Leea crispa</i>	Vitaceae	Kat Jiga	T	Timber	Not Listed	R
16.	<i>Cassia fistula</i>	Caesalpinae	Sonalu	T	Timber and Medicine	Not Listed	C
17.	<i>Casuarina equisetifolia</i>	Caesalpinae	Jhau	T	Ornamental	Not Listed	R
18.	<i>Clerodendrum viscosum</i>	Lamiaceae	Vhat	S	-	Not Listed	C
19.	<i>Hyptis suaveolens</i>	Labiatae		S	-	Not Listed	C
20.	<i>Carica papaya</i>	Caricaceae	Papay	S	Fruit	Not Listed	C
21.	<i>Musa paradisiaca var. sapientum</i>	Musaceae	Kala	S	Fruit	Not Listed	VC
22.	<i>Bambusa sp.</i>	Gramineae	Bash	S	Homestead	Not Listed	C
23.	<i>Calotropis gigantea</i>	Asclepiadaceae	Akondo	S	-	Not Listed	C
24.	<i>Ranunculus scleratus</i>	Ranunculaceae	Jal Dhunia	H	-	Not Listed	R
25.	<i>Leucas aspera</i>	Labiatae	Shetdron	H	-	Not Listed	R
26.	<i>Rumex dentatus</i>	Polygonaceae	Ban palong	H	-	Not Listed	C
27.	<i>Heliotropium indicum</i>	Boraginaceae	Hatisur	H	Medicinal	Not Listed	C
28.	<i>Mimosa pudica</i>	Mimosaceae	Lajjaboti	H	Medicinal	Not Listed	C
29.	<i>Alternanthera philoxiroides</i>	Amaranthaceae	Henchi., Maloncha	H	Ornamental	Not Listed	C
30.	<i>Persicaria orientalis</i>	Polygonaceae	Barabishkatali	H	-	Not Listed	C

SL.	Scientific Name	Family	Local Name	Habitat	Usage	IUCN status	Status of Distribution
31.	<i>Xanthium indicum</i>	Asteraceae	Ghagra	H	-	Not Listed	C
32.	<i>Dryopteris</i>	Dryopteridaceae	Deki sak	H	Ornamental	Not Listed	C
33.	<i>Cynodon dactylon</i>	Gramineae	Durba gash	G	-	Not Listed	C

ANNEX J

SPECIES CHECKLIST OF AMPHIBIANS AND REPTILES (DRY SEASON)

Amphibians and Reptiles: 14

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient (* NYA- This taxon has not yet been assessed)

Local Status: CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant

CITES Status: **Appendix I:** includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances. **Appendix II** includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival. **Appendix III** includes species that are Plantation forest at least one country, which has asked other, CITES Parties for assistance in controlling the trade. Changes to **Appendix III** follow a distinct procedure from changes to Appendices I and II, as each Party's is entitled to make unilateral amendments to it.

S.L	Common Name	Family Name	Scientific Name	IUCN Status	CITES Status	Local Status
1.	Common House Gecko	GEKKONIDAE	<i>Hemidactylus frenatus</i>	LC	Not Listed	CR
2.	Common Indian monitor/ monitor Bengal	VARANIDAE	<i>Varanus bengalensis</i>	LC	Not Listed	C
3.	Common sea snake	HYDROPHIIDAE	<i>Enhydrina schistosa</i>	NYA	Not Listed	UR
4.	Oriental Garden Lizard/ Changeable Lizard	AGAMIDAE	<i>Calotes versicolor</i>	NYA	Not Listed	C
5.	Common Garden Skink	SCINCIDAE	<i>Lampropholis guichenoti</i>	NYA	Not Listed	C
6.	Yellow Monitor	VARANIDAE	<i>Varanus flavescens</i>	LR/ LC	I	UR
7.	Checkered Keelback	COLUBRIDAE	<i>Xenochrophis piscator</i>	NYA	III	RR
8.	Dhaman /Oriental Rat snake	COLUBRIDAE	<i>Ptyas mucosus</i>	NYA	II	C
9.	Split Keelback	COLUBRIDAE	<i>Atretium schistosum</i>	LC	III	UR

10.	Common krait	ELAPIDAE	<i>Bungarus caeruleus</i>	NYA	Not Listed	C
11.	Indian Cobra	ELAPIDAE	<i>Naja naja</i>	NYA	II	RR
12.	Asian Common Toad	BUFONIDAE	<i>Duttaphrynus melanostictus</i>	LC	Not Listed	C
13.	Common Indian Tree Frog	RHACOPHORIDAE	<i>Polypedates maculatus</i>	LC	Not Listed	UR
14.	Ornate Narrow-mouthed Frog	MICROHYLIDAE	<i>Microhyla ornata</i>	LC	Not Listed	C

ANNEX K

SPECIES CHECKLIST OF AMPHIBIANS AND REPTILES (RAINY SEASON)

Amphibians and Reptiles: 11

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient (*NYA-This taxon has not yet been assessed)

Local Status: CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant

CITES Status: **Appendix I:** includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances. **Appendix II** includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival. **Appendix III** includes species that are Plantation forest at least one country, which has asked other, CITES Parties for assistance in controlling the trade. Changes to **Appendix III** follow a distinct procedure from changes to Appendices I and II, as each Party's is entitled to make unilateral amendments to it.

S.L	Common Name	Family Name	Scientific Name	IUCN Status	CITES Status	Local Status
1.	Common House Gecko	Gekkonidae	<i>Hemidactylus frenatus</i>	LC	Not Listed	CR
2.	Common Indian monitor/ Bengal monitor	Varanidae	<i>Varanus bengalensis</i>	LC	Not Listed	C
3.	Oriental Garden Lizard/ Changeable Lizard	Agamidae	<i>Calotes versicolor</i>	NYA	Not Listed	C
4.	Common Garden Skink	Scincidae	<i>Lampropholis guichenoti</i>	NYA	Not Listed	C
5.	Yellow Monitor	Varanidae	<i>Varanus flavescens</i>	LR/ LC	I	UR
6.	Checkered Keelback	Colubridae	<i>Xenochrophis piscator</i>	NYA	III	RR
7.	Split Keelback	Colubridae	<i>Atretium schistosum</i>	LC	III	UR
8.	Indian Cobra	Elapidae	<i>Naja naja</i>	NYA	II	RR
9.	Asian Common Toad	Bufoidea	<i>Duttaphrynus melanostictus</i>	LC	Not Listed	C
10.	Common Indian Tree Frog	Rhacophoridae	<i>Polypedates maculatus</i>	LC	Not Listed	UR
11.	Ornate Narrow-mouthed Frog	Microhylidae	<i>Microhyla ornata</i>	LC	Not Listed	C

ANNEX L

SPECIES CHECKLIST OF MAMMALS (DRY SEASON)

Mammals: 11 Species

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant

S.L	Common Name	Family Name	Scientific Name	IUCN Status	Local Status
1.	Little Indian field mouse	Muridae	<i>Mus booduga</i>	LC	CR
2.	House mouse	Muridae	<i>Mus musculus</i>	LC	CR
3.	Roof Rat	Muridae	<i>Rattus rattus</i>	LC	C
4.	Indian Pipistrelle	Vespertilionidae	<i>Pipistrellus coromandra</i>	LC	UR
5.	Greater short-nosed fruit bat	Pteropodidae	<i>Cynopterus sphinx</i>	LC	C
6.	Rhesus macaque	Cercopithecidae	<i>Macaca mulatta</i>	LC	RR
7.	Small Asian mongoose	Herpestidae	<i>Herpestes javanicus</i>	LC	UR
8.	Bengal fox/ Indian fox	Canidae	<i>Vulpes bengalensis</i>	LC	C
9.	Wild boar	Suidae	<i>Sus scrofa</i>	LC	UR
10.	Asian golden cat	Felidae	<i>Pardofelis temminckii</i>	LC	UR
11.	Barking Deer	Cervidae	<i>Muntiacus muntjac</i>	LC	UR

ANNEX M

SPECIES CHECKLIST OF MAMMALS (RAINY SEASON)

Mammals: 11 Species

IUCN Status: CR - Critically Endangered, EN - Endangered, VU - Vulnerable, LR - Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: CR - Common Resident, C - Common, UR - Uncommon Resident, RR - Rare Resident, V - Vagrant

S.L	Common Name	Family Name	Scientific Name	IUCN Status	Local Status
1.	Little Indian field mouse	Muridae	<i>Mus booduga</i>	LC	CR
2.	House mouse	Muridae	<i>Mus musculus</i>	LC	CR
3.	Roof Rat	Muridae	<i>Rattus rattus</i>	LC	C
4.	Indian Pipistrelle	Vespertilionidae	<i>Pipistrellus coromandra</i>	LC	UR
5.	Greater short-nosed fruit bat	Pteropodidae	<i>Cynopterus sphinx</i>	LC	C
6.	Rhesus macaque	Cercopithecidae	<i>Macaca mulatta</i>	LC	RR
7.	Small Asian mongoose	Herpestidae	<i>Herpestes javanicus</i>	LC	UR
8.	Bengal fox/ Indian fox	Canidae	<i>Vulpes bengalensis</i>	LC	C
9.	Wild boar	Suidae	<i>Sus scrofa</i>	LC	UR
10.	Asian golden cat	Felidae	<i>Pardofelis temminckii</i>	LC	UR
11.	Barking deer	Cervidae	<i>Muntiacus muntjac</i>	LC	UR

ANNEX N

SPECIES CHECKLIST OF BIRDS (DRY SEASON)

Birds: 13 Species

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient

Local Status: CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant

Birdlife Status: EX – Extinct, EW - Extinct In The Wild, CR - Critically Endangered, CR (PE) - Critically Endangered (Possibly Extinct), CR (PEW) - Critically Endangered (Possibly Extinct In the Wild), EN – Endangered, VU – Vulnerable, NT - Near Threatened, LC - Least Concern, DD - Data Deficient

S.L	Common Name	Family Name	Scientific Name	IUCN Status	Birdlife Status	Local Status
Aquatic birds						
1.	Eastern Great Egret	<u>Ardeidae</u>	<i>Ardea alba modesta</i>	LC	LC	C
2.	Indian Pond-Heron	Ardeidae	<i>Ardeola grayii</i>	LC	LC	C
3.	Common Sandpiper	<u>Scolopacidae</u>	<i>Actitis hypoleucos</i>	LC	LC	C
4.	Indian Cormorant	Phalacrocoracidae	<i>Phalacrocorax fuscicollis</i>	LC	LC	UR
5.	Common Kingfisher	<u>Alcedinidae</u>	<i>Alcedo atthis</i>	LC	LC	C
Terrestrial birds						
6.	Red-vented Bulbul	Passerines	<i>Pycnonotus cafer</i>	LC	LC	CR
7.	House Crow	Corvidae	<i>Corvus splendens</i>	Not Listed	LC	CR
8.	Spotted Dove	Columbidae	<i>Streptopelia chinensis</i>	Not Listed	LC	UR
9.	Rufous Treepie	Corvidae	<i>Dendrocitta vagabunda</i>	LC	LC	UR
10.	House Sparrow	Passeridae	<i>Passer domesticus</i>	LC	LC	CR
11.	Oriental Magpie-Robin	Muscicapidae	<i>Copsychus saularis</i>	LC	LC	CR
12.	Black Drongo	Dicruridae	<i>Dicrurus macrocercus</i>	LC	LC	C
13.	Common Flame-backed Woodpecker	Picidae	<i>Dinopium javanense</i>	LC	LC	RR
14.	Lesser Golden back	Picidae	<i>Dinopium benghalense</i>	LC	LC	C
15.	Common Myna	Sturnidae	<i>Acridotheres tristis</i>	LC	LC	C
16.	Black-hooded Oriole	<u>Oriolidae</u>	<i>Oriolus xanthornus</i>	LC	LC	UR

ANNEX O

SPECIES CHECKLIST OF BIRDS (RAINY SEASON)

Birds: 18 Species

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient (*NYA-This taxon has not yet been assessed)

Local Status: CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant

Birdlife Status: EX – Extinct, EW - Extinct In The Wild, CR - Critically Endangered, CR (PE) - Critically Endangered (Possibly Extinct), CR (PEW) - Critically Endangered (Possibly Extinct In the Wild), EN – Endangered, VU – Vulnerable, NT - Near Threatened, LC - Least Concern, DD - Data Deficient

S.L	Common Name	Family Name	Scientific Name	IUCN Status	Birdlife Status	Local Status
Aquatic birds						
1.	Eastern Great Egret	Ardeidae	<i>Ardea alba modesta</i>	LC	LC	C
2.	Indian Pond-Heron	Ardeidae	<i>Ardeola grayii</i>	LC	LC	C
3.	Indian Cormorant	Phalacrocoracidae	<i>Phalacrocorax fuscicollis</i>	LC	LC	UR
4.	Common Kingfisher	Alcedinidae	<i>Alcedo atthis</i>	LC	LC	C
5.	Pied Kingfisher	Cerylidae	<i>Ceryle rudis</i>	LC	LC	UR
Terrestrial birds						
6.	Red-vented Bulbul	Passerines	<i>Pycnonotus cafer</i>	LC	LC	CR
7.	House Crow	Corvidae	<i>Corvus splendens</i>	NYA	LC	CR
8.	Spotted Dove	Columbidae	<i>Streptopelia chinensis</i>	NYA	LC	UR
9.	Rufous Treepie	Corvidae	<i>Dendrocitta vagabunda</i>	LC	LC	UR
10.	House Sparrow	Passeridae	<i>Passer domesticus</i>	LC	LC	CR
11.	Oriental Magpie-Robin	Muscicapidae	<i>Copsychus saularis</i>	LC	LC	CR
12.	Black Drongo	Dicruridae	<i>Dicrurus macrocercus</i>	LC	LC	C
13.	Common Flame-backed Woodpecker	Picidae	<i>Dinopium javanense</i>	LC	LC	RR
14.	Baya Weaver	Ploceidae	<i>Ploceus philippinus</i>	LC	LC	C
15.	Chestnut-headed Bee-eater	Meropidae	<i>Merops leschenaultia</i>	NYA	DD	UR

S.L	Common Name	Family Name	Scientific Name	IUCN Status	Birdlife Status	Local Status
16.	Lesser Golden back	Picidae	<i>Dinopium benghalense</i>	LC	LC	C
17.	Common Myna	Sturnidae	<i>Acridotheres tristis</i>	LC	LC	C
18.	Black-hooded Oriole	Oriolidae	<i>Oriolus xanthornus</i>	LC	LC	UR

ANNEX P

CHECKLIST OF BUTTERFLIES

Butterflies: 14

IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient





Local Status: CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant





CITES Status: **Appendix I:** includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances. **Appendix II** includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival. **Appendix III** includes species that are Plantation forest at least one country, which has asked other, CITES Parties for assistance in controlling the trade. Changes to **Appendix III** follow a distinct procedure from changes to Appendices I and II, as each Party's is entitled to make unilateral amendments to it.





S. L	Common Name	Family Name	Scientific Name	IUCN Status	CITES Status	Local Status
1.	Peacock Pansy	Nymphalidae	<i>Junonia almana</i>	LC	X	C
2.	Psyche	Pieridae	<i>Leptosia nina</i>	NYA	X	C
3.	Plain Tiger	Nymphalidae	<i>Danaus chrysippus</i>	NYA	X	CR
4.	Tree Flitter	Hesperiidae	<i>Hyarotis adrastus</i>	NYA	X	C
5.	Yellow Pansy	Nymphalidae	<i>Precis hierta</i>	NYA	X	CR
6.	Lemon Pansy	Nymphalidae	<i>Junonia lemonias</i>	NYA	X	CR
7.	Indian Skipper	Hesperiidae	<i>Spialia galba</i>	NYA	X	C
8.	Forest Hopper	Hesperiidae	<i>Astictopterus jama</i>	NYA	X	C
9.	Common Palmfly	Nymphalidae	<i>Elymnias hypermnestra</i>	NYA	X	CR
10.	Common Grass Yellow	Pieridae	<i>Eurema hecabe</i>	NYA	X	CR
11.	Common Fourring	Nymphalidae	<i>Ypthima huebneri</i>	NYA	X	C
12.	Common Crow	Nymphalidae	<i>Euploea core</i>	LC	X	CR
13.	Common Castor	Nymphalidae	<i>Ariadne merione</i>	NYA	X	CR
14.	Common Bushbrown	Nymphalidae	<i>Mycalesis perseus</i>	NYA	X	CR

ANNEX Q





FIELD OBSERVATION OF THE FLORAL SPECIES OF THE STUDY AREA (DRY AND RAINY SEASON)





	<p>Scientific Name: <i>Aporosa dioica</i> Common Name: Patakharolla Family: Euphorbiaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Garcinia cowa</i> Common Name: Cao Family: Clusiaceae Habit: Tree</p>
	<p>Scientific Name: <i>Bambusa sp.</i> Common Name: Bans Family: Poaceae Habit: Small tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Calamus sp.</i> Common Name: Bet Family: Arecaceae Habit: Small Tree Habitat: Trestrial Forest plantation forest</p>





	<p>Scientific Name: <i>Garcinia sp.</i> Common Name: Kauargula Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Desmos chinense</i> Common Name: Family: Annonaceae Habit: Shrub Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Clausena sufruticosa</i> Common Name: Panparag Family: Rutaceae Habit: Shrub Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Holigarna longifolia</i> Common Name: Barola Family: Anacardiaceae Habit: Tree Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Tephrosia candida</i> Common Name: Swetnil Family: Fabaceae Habit: Shrub Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Syzygium grande</i> Common Name: Dhakijam Family: Myrtaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Elaeocarpus sp.</i> Common Name: Pahari Jalpai Family: Elaeocarpaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Maesa ramentacea</i> Common Name: Maricha Family: Myrsenaceae Habit: Shrub Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Pandanus furcatus</i> Common Name: Kashiyakanta Family: Pandanaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Smilax zeylanica</i> Common Name: Kumarikata Family: Smillaceae Habit: Climber Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Grewia nervosa</i> Common Name: Datoi Family: Tiliaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Streblus asper</i> Common Name: Sheora Family: Moraceae Habit: Tree Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Suregada multiflora</i> Family: Euphorbiaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Raphis sp.</i> Common Name: Talpalm Family: Arecaceae Habit: Small tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Aporusa dioica</i> Common Name: Patakorolla Family: Euphorbiaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Pandanus sp.</i> Family: Pandanaceae Habit: Small tree Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Lepisanthes rubiginosa</i> Common Name: Chagnoladi Family: Sapindaceae Habit: Small tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Psychotria adenophylla</i> Common Name: Ipikak Family: Rubiaceae Habit: Shrub Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Gardenia coronaria</i> Common Name: Gandhyaraj Family: Rubiaceae Habit: Small tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Woodfordia fruticosa</i> Common Name: Dhatriphul, rangkat Family: Rubiaceae Habit: Shrub Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Alpinia malascensis</i> Common Name: Pahari Tara Family: Zingiberaceae Habit: Herb Habitat: Slope of Hill</p>
	<p>Scientific Name: <i>Morinda angustifolia</i> Common Name: Daruharidra Family: Rubiaceae Habit: Shrub Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Pavetta indica</i> Common Name: Beophul Family: Rubiaceae Habit: Shrub Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Clerodendrum viscosum</i> Common Name: Bhat Family: Clerodendrum Habit: Herb Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Lepisanthes senegalensis</i> Common Name: Kakrabadi Family: Sapindaceae Habit: Small tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Michelia champaca</i> Common Name: Champa, Swarnachapa Family: Magnoliaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Glochidion multilochulare</i> Common Name: Poniatori Family: Euphorbiaceae Habit: Small tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Melastoma malabathricum</i> Common Name: Bantejpata, Datranga Family: Melastomaceae Habit: Shrub Habitat: Terrestrial</p>

	<p>Scientific Name: <i>Hymenodictyon excelsum</i> Common Name: Bhutm, Bhuikadam Family: Rubiaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Dicranopteris liniaris</i> Common Name: Dhekia Pteridophyte Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Syzygium fruticosum</i> Common Name: Khudijam Family: Myrtaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Averrhoa carambola</i> Common Name: Kamranga Family: Averrhoaceae Habit: Tree Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Pongamia pinnata</i> Common Name: Karach Family: Fabaceae Habit: Tree Habitat: Amphibian</p>
	<p>Scientific Name: <i>Phyllanthus embelica</i> Common Name: Amloki Family: Euphorbiaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Psidium guajava</i> Common Name: Peyara, Guaya, Sabriam Family: Myrtaceae Habit: Small tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Bursera serrata</i> Common Name: Gutgutia Family: Burseraceae Habit: Tree Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Urena sp.</i> Common Name: Banghagra Family: Malvaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Common Name: Rel Lata Family: Convolvulaceae Habit: Climber Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Panicum sp.</i> Common Name: Dhanigach Family: Poaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Mimosa pudica</i> Common Name: Lajjayaboti Family: Mimosaceae Habit: Perrenial herb Habitat: Terrestrial</p>





	<p>Scientific Name: <i>Imperata cylindrica</i> Common Name: Chhan, Ulu Family: Poaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Alstonia macrophylla</i> Common Name: Barachhatim Family: Apocynaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Anacardium occidentale</i> Common Name: Kajubadam, Hijlibadam Family: Anacardiaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Gmelina arborea</i> Common Name: Gamari Family: Meliaceae Habit: Tree Habitat: Terrestrial</p>

	<p>Scientific Name: <i>Mangifera indica</i> Common Name: Am Family: Anacardiaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Lygodium flexuosum</i> Common Name: Latadhekia Family: Lygodiaceae Habit: Climber Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Phoenix sylvestris</i> Common Name: Khejur Family: Arecaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Artocarpus heterophyllus</i> Common Name: Kathal Family: Moraceae Habit: Tree Habitat: Terrestrial</p>

	<p>Scientific Name: <i>Ananas sativus</i> Common Name: Anaras Family: Bromeliaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Lichi chinensis</i> Common Name: Lichu Family: Sapindaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Musa paradisiaca</i> Common Name: Kabari Kola Family: Mussaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Zizyphus mauritina</i> Common Name: Baroi Family: Rhamnaceae Habit: Tree Habitat: Terrestrial</p>

	<p>Scientific Name: <i>Citrus grandis</i> Common Name: Jambura, batabilebu Family: Rutaceae Habit: Small Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Leucas indica</i> Common Name: Swetdran Family: Lamiaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Thysanulaena maxima</i> Common Name: Phuljharu Family: Poaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Clerodendrum viscosum</i> Common Name: Bhat Family: Verbenaceae Habit: Shrub Habitat: Terrestrial</p>

	<p>Scientific Name: <i>Desmodium triflorum</i> Common Name: Tripatri Family: Fabaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Trema orientalis</i> Common Name: Jiban, Nalita Family: Ulmaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Scoparia dulcis</i> Common Name: Misridana, Bandhoney Family: Scrophulariaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Lycopodium sp.</i> Common Name: Fern Family: Lycopodiaceae Habit: Herb Habitat: Slope of hill</p>

	<p>Scientific Name: <i>Quiaqualis indica</i> Common Name: Madhurilata Family: Combretaceae Habit: Climber Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Hedyotis verticillata</i> Common Name: Family: Rubiaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Uena lobata</i> Common Name: Banghagra Family: Malvaceae Habit: Herb Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Acanthus illicifolias</i> Common Name: Hargoja Family: Acanthaceae Habit: Herb Habitat: Aquatic</p>



Scientific Name: *Ficus sp.*
Common Name:
Family: Moraceae
Habit: Mangrove Tree






Scientific Name: *Sonneratia apetala*
Common Name: Kerpa
Family: Sonneratiaceae
Habit: Mangrove Tree
Habitat: Muddy swamp land



Scientific Name: *Albizia procera*
Common Name: Koroi
Family: Mimosaceae
Habit: Tree
Habitat: Terrestrial



Scientific Name: *Flacourtia jangomas*
Common Name: Paniala
Family: Flacourtiaceae
Habit: Small tree
Habitat: Terrestrial

	<p>Scientific Name: <i>Ipomoea fistulosa</i> Common Name: Dholkalmi Family: Convolvulaceae Habit: Shrub</p>
	<p>Scientific Name: <i>Acacia auriculiformis</i> Common Name: Acashmoni Family: Mimosaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Eucalyptus citriodora</i> Common Name: Eucalyptus Family: Myrtaceae Habit: Tree Habitat: Terrestrial</p>
	<p>Scientific Name: <i>Garcinia cowa</i> Common Name: Kao Family: Clusiaceae Habit: Tree Habitat: Terrestrial</p>



Scientific Name: *Acacia mangium*

Common Name: Mangium akashmoni

Family: Mimosaceae

Habit: Tree

Habitat: Terrestrial

ANNEX R

FIELD OBSERVATION OF THE AMPHIBIAN & REPTIL
SPECIES OF
THE STUDY AREA (DRY AND RAINY SEASON)



Calotes versicolor
Photo - During Field Survey

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
√		√	√	√



Hemidactylus frenatus
Photo - During Field Survey (Shahtabul Islam)

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
√		√	√	√



Lampropholis guichenoti

Photo - During Field Survey (Mirza S A Habib)

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
√		√	√	√



Varanus bengalensis

Photo -commons.wikimedia.org

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Varanus flavescens

Photo- During Field Survey (Shahtabul Islam)

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
√		√	√	√



Xenochrophis piscator

Photo - www.snakesoftaiwan.com

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Enhydrina schistosa
Photo - www.starfish.ch

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Ptyas mucosus
Photo - www.animalsnapshot.blogspot.com

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Atretium schistosum

Photo Source - www.indiansnakes.org

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Bungarus caeruleus

Photo Source - www.indiansnakes.org

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Naja naja

Photo Source - reptarium.cz

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Duttaphrynus melanostictus

Photo - During Field Survey (Shahtabul Islam)

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
√		√	√	√



Polypedates maculatus

Photo Source - calphotos.berkeley.edu

Local Status (Ecological Survey)

Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√



Microhyla ornate



Photo Source - calphotos.berkeley.edu


Local Status (Ecological Survey)



Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
	√	√	√	√


ANNEX S


FIELD OBSERVATION OF THE MAMMALS SPECIES OF THE STUDY AREA (DRY AND RAINY SEASON)


Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Cynopterus sphinx</i></p> <p>Photo : During Field Visit</p>	√		√	√	√
 <p><i>Mus booduga</i></p>		√	√	√	√

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
Photo Source - mammalwatching.com					
 <p><i>Rattus rattus</i></p> <p>Photo Source - taiko.org.nz</p>		√	√	√	√

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Herpestes javanicus</i> Photo Source - wikipedia.org</p>	√		√	√	√
 <p><i>Mus musculus</i></p>		√	√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
Photo Source – wikipedia.org					
 <p><i>Pipistrellus coromandra</i></p> <p>Photo Source – sheepdrove.com</p>		√	√	√	√
		√	√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
<p><i>Vulpes bengalensis</i></p> <p>Photo Source – commons.wikimedia.org</p>					
 <p><i>Sus scrofa</i></p> <p>Photo source- www.sms.si.edu</p>		√	√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Muntiacus muntjac</i></p> <p>Photo source- www.acres-wild.com</p>		√	√	√	√



ANNEX T



FIELD OBSERVATION OF THE BIRDS SPECIES OF THE STUDY AREA (DRY AND RAINY SEASON)



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Copsychus saularis</i> Photo Source- During Field Visit</p>	√		√	√	√
 <p><i>Dicrurus macrocercus</i></p>	√		√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
Photo Source - During field visit					
 <p><i>Ardeola grayii</i></p> <p>Photo Source- During field visit</p>	√		√	√	√
 <p><i>Ardea alba modesta</i></p> <p>Photo Source- commons.wikimedia.org</p>	√		√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Streptopelia chinensis</i> Photo Source- During field visit</p>	√		√	√	√
 <p><i>Corvus splendens</i> Photo Source- During field visit</p>	√		√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Dinopium benghalense</i> Photo Source- During field visit</p>	√		√	√	√
 <p><i>Passer domesticus</i> Photo Source - During field visit</p>	√		√	√	√

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Dendrocitta vagabunda</i> Photo Source- During field visit</p>	√			√	√
 <p><i>Acridotheres tristis</i> Photo Source- During field visit</p>	√		√	√	√

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Phalacrocorax fuscicollis</i> Photo Source- During field visit</p>	√		√	√	√
 <p><i>Oriolus xanthornus</i> Photo- commons.wikimedia.org</p>		√	√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Alcedo atthis</i></p> <p>Photo Source- commons.wikimedia.org</p>	√		√	√	√
 <p><i>Dinopium javanense</i></p> <p>Photo Source: During field visit</p>	√		√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Pycnonotus cafer</i> Photo Source: During field visit</p>	√		√	√	√
 <p><i>Ploceus philippinus</i> Photo Source: During field visit</p>	√		√	√	√



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Merops leschenaultia</i> Photo Source: During field visit</p>	√		√	√	√
 <p><i>Ceryle rudis</i> Photo Source: During field visit</p>	√		√	√	√



ANNEX U



FIELD OBSERVATION OF THE BUTTERFLY SPECIES OF THE STUDY AREA



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Danaus chrysippus</i> Photo Source - During Field Survey</p>	√				
 <p><i>Junonia almana</i> Photo Source - During Field Survey</p>	√				



Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Leptosia nina</i> Photo Source - During Field Survey</p>	√				
 <p><i>Hyarotis adrastus</i> Photo Source - During Field Survey</p>	√				

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Precis hierta</i> Photo Source- During Field Survey</p>	√				
 <p><i>Junonia lemonias</i> Photo Source- During Field Survey</p>	√				

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Spialia galba</i> Photo Source- During Field Survey</p>	√				
 <p><i>Astictopterus jama</i> Photo Source- During Field Survey</p>	√				

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Elymnias hypermnestra</i> Photo Source- During Field Survey</p>	√				
 <p><i>Eurema hecabe</i> Photo Source- During Field Survey</p>	√				

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Ypthima huebneri</i> Photo Source- During Field Survey</p>	√				
 <p><i>Euploea core</i> Photo Source- During Field Survey</p>	√				

Species with Scientific name and Source of Photo	Seen & Recorded	Not seen	Secondary Source (literature review)	Information from Local people	Others (expertise, academician, photojournalist consultation/info share)
 <p><i>Ariadne merione</i> Photo Source- During Field Survey</p>	√				
 <p><i>Mycalesis perseus</i> Photo Source- During Field Survey</p>	√				

Appendix-C15.5-6

**Survey Results on the “Spoon-billed Sandpiper”
(From Dec.7th 2012 to Mar.30th 2013)**

1. Results of survey

Date/Time		Sites		
		In front of the power plant site	Sonadia Island	Transmission Line site
Dec.7	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Dec.8	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Dec.14	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Dec.15	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Dec.21	06:00 - 07:00	0	2	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Dec.22	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Dec.28	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Dec.29	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Jan.4	06:00 - 07:00	0	1	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Jan.5	06:00 - 07:00	0	1	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0

Date/Time		Sites		
		In front of the power plant site	Sonadia Island	Transmission Line site
Jan.11	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Jan.12	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Jan.18	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Jan.19	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	2	0
	18:00 - 19:00	0	0	0
Jan.25	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Jan.26	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Feb.1	06:00 - 07:00	0	3	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Feb.2	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Feb.15	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Feb.16	06:00 - 07:00	0	0	00
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0

Date/Time		Sites		
		In front of the power plant site	Sonadia Island	Transmission Line site
Feb.22	06:00 - 07:00	0	3	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Feb.23	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	1	0
	18:00 - 19:00	0	0	0
Mar.1	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	6	0
	18:00 - 19:00	0	0	0
Mar.2	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Mar.9	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	1	0	0
Mar.10	06:00 - 07:00	0	0	0
	13:00 - 14:00	2	0	0
	18:00 - 19:00	0	0	0
Mar.15	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	5	0
	18:00 - 19:00	0	0	0
Mar.16	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	2	0
	18:00 - 19:00	0	0	0
Mar.22	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0
Mar.23	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	0	0
	18:00 - 19:00	0	0	0

Date/Time		Sites		
		In front of the power plant site	Sonadia Island	Transmission Line site
Mar.29	06:00 - 07:00	0	0	0
	13:00 - 14:00	2	0	0
	18:00 - 19:00	0	0	0
Mar.30	06:00 - 07:00	0	0	0
	13:00 - 14:00	0	13	0
	18:00 - 19:00	0	0	0
Total (within 32 days)		3-days (Max. 2 birds)	11-days (Max. 13 birds)	0-days

2. Analysis and recommendations based on weekly observations of the Spoon-billed Sandpiper

Based on the results of this survey, conducted from December 7th to March 30th 2013, migration behavior indicates that the study area cannot be classified as a wintering ground. That is, during winter while the Spoon-billed Sandpiper comes ashore to the sandy beach in front of the project site, the number of birds observed in the area is extremely small compared to the nearby coastal offshores of Sonadia Island. This is supported by findings by other researchers.

The survey results show landing frequency has been variable at almost all sites from December to March, indicating mass population has been available in the month of March. These results are consistent with the findings of different papers published in BLI¹. Sonadia Island in Bangladesh, where 10% of the known population of the Critically Endangered Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) spends the winter, has been recognized as Bangladesh's 20th Important Bird Area (IBA) by Bird Life International.

In March-April 2010, a minimum of 49 individual birds were recorded during targeted surveys along the coast of Bangladesh, with most of the sightings on Sonadia Island (Bird, et al. 2010²). In addition, over the course of weekly surveys conducted from December 7 to March 30, 2013, birds were only observed flying on 3 days in the project site and on 11 days in the southern front of Sonadia. In one day, at most 2 individual birds were observed flying in one day in the project site, which is about 15%, whereas 13 birds were identified in the southern front of Sonadia in one day.

¹ Bird Life International;
<http://www.birdlife.org/community/2013/04/spoon-billed-sandpiper-wintering-site-becomes-bangladeshs-20th-iba/>

² Information on surveys record is available through "Bangladesh Spoon-billed Sandpiper diary Part I" and "Bangladesh Spoon-billed Sandpiper diary Part II" by <http://birdguides.com/webzine/article.asp?a=2029>, and, <http://birdguides.com/webzine/article.asp?a=2066>

The principal investigator of the Bangladesh Spoon-billed Sandpiper Conservation Project, a group of young conservationists who monitor the wader population and work with local communities to raise awareness and reduce threats, noted in the conclusion of a report that “A series of recent surveys confirms that Bangladesh is still an extremely important wintering ground for the Spoon-billed Sandpiper, and we identified Sonadia Island as the main wintering site in Bangladesh.”

BirdLife Partners and others involved in the “Saving the Spoon-billed Sandpiper” project have been working at Sonadia since 2009 , when hunting of waders on the mudflats was identified as a major threat to the fast-diminishing Spoon-billed Sandpiper population there.

An assistant conservator of forest (coastal) for Bangladesh’s Cox’s Bazar region who has been involved in the restoration of mangrove cover on Sonadia said “We have been supporting the Bangladesh Spoon-billed Sandpiper Conservation Project by avoiding mangrove planting in areas that are important for shorebirds”. He further explained “We have also been protecting the key sites from illegal hunting. I am delighted that Sonadia is receiving the international recognition it deserves by being declared an Important Bird Area.”

Research indicates that the frequency of the Spoon-billed Sandpiper using Matarbari Island as a wintering ground is relatively very low in comparison to the nearby offshore island of Sonadia. Numerous survey results point out that Matarbari Island beach is not a main migratory habitat for migratory birds, especially the Spoon-billed Sandpiper in Bangladesh. This view is supported by many experts and reports.

Appendix-C15.5-7

**“Weekly survey to reveal the habitual behavior of nesting sea turtles
in front of the power plant site and Sonadia Island
from Dec.7th 2012 to Mar. 30th 2013.”**

and

**“The Ecological Survey for Sea Turtle Nesting Distributions around
Matarbari Island, Maheshkhali, Cox’s Bazar
from Mar. 5th to 24th and Apr. 1st to 20th 2013)”**

Two types of survey to reveal the habitual behavior of nesting sea turtles as mentioned follows have been carried out during main nesting season at project site and its near site by local consultant hired by JICA Study Team.

1. Types of survey

1-1. “Weekly survey to reveal the habitual behavior of nesting sea turtles in front of the power plant site and Sonadia Island from Dec.7th 2012 to Mar. 30th 2013.”

(1) Results of survey

Date/Time		Sites		Species Name and No. of individual
		In front of the power plant site	Sonadia Island	
Dec.7	20:00 - 22:00	1(b)	2(a)	a. <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 2 b. <i>Chelonia mydas</i> (Linnaeus, 1758); 1
	05:00 - 8:00	0	0	
Dec.8	20:00 - 22:00	0	0	Did not find any turtles, new footprints, or new nests.
	05:00 - 8:00	0	0	
Dec.14	20:00 - 22:00	0	1	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 4
	05:00 - 8:00	2	1	
Dec.15	20:00 - 22:00	0	0	Did not find any turtles, new footprints or new nests.
	05:00 - 8:00	0	0	
Dec.21	20:00 - 22:00	1	1	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 4
	05:00 - 8:00	0	2	
Dec.22	20:00 - 22:00	0	1(a)	a. <i>Chelonia mydas</i> (Linnaeus, 1758); 1 b. <i>Cetta caretta</i> (Linnaeus 1756); 1
	05:00 - 8:00	1(b)	0	
Dec.28	20:00 - 22:00	0	0	Did not find any new turtles, new footprints or new nests.
	05:00 - 8:00	0	0	
Dec.29	20:00 - 22:00	0	0	Did not find any turtles, new footprints, or new nests.
	05:00 - 8:00	0	0	
Jan.4	20:00 - 22:00	0	0	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758);2
	05:00 - 8:00	0	2	
Jan.5	20:00 - 22:00	0	0	a. <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 3 b. <i>Eritmochelys imbricata</i> (Linnaeus, 1766); 1
	05:00 - 8:00	1(a)	2(a),1(b)	
Jan.11	20:00 - 22:00	1	0	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 6
	05:00 - 8:00	0	5	
Jan.12	20:00 - 22:00	0	1	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 3
	05:00 - 8:00	0	2	
Jan.18	20:00 - 22:00	0	1(b)	a. <i>Chelonia mydas</i> (Linnaeus, 1758); 2 b. <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 3
	05:00 - 8:00	1(a)	1(a),2(b)	
Jan.19	20:00 - 22:00	1(a)	0	a. <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 3 b. <i>Eritmochelys imbricata</i> (Linnaeus, 1766); 1 c. <i>Caretta caretta</i> (Linnaeus 1756); 1
	05:00 - 8:00	0	2(a),1(b),1(c)	
Jan.25	20:00 - 22:00	0	0	a. <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 5 b. <i>Caretta caretta</i> (Linnaeus 1756); 2
	05:00 - 8:00	2(a), 1(b)	3(a), 1(b)	

Date/Time		Sites		Species Name and No. of individual
		In front of the power plant site	Sonadia Island	
Jan.26	20:00 - 22:00	1	0	<i>Eritmochelys imbricata</i> (Linnaeus, 1766); 1
	05:00 - 8:00	0	0	
Feb.1	20:00 - 22:00	0	1	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 8
	05:00 - 8:00	2	5	
Feb.2	20:00 - 22:00	0	1(a)	a. <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 1 b. <i>Chelonia mydas</i> (Linnaeus, 1758); 1
	05:00 - 8:00	0	1(b)	
Feb.15	20:00 - 22:00	4	6	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 10
	05:00 - 8:00	0	0	
Feb.16	20:00 - 22:00	2	3	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 5
	05:00 - 8:00	0	0	
Feb.22	20:00 - 22:00	0	2	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 3
	05:00 - 8:00	0	1	
Feb.23	20:00 - 22:00	3	5	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 10
	05:00 - 8:00	0	2	
Mar.1	20:00 - 22:00	1	0	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); 1
	05:00 - 8:00	0	0	
Mar.2	20:00 - 22:00	0	5	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); -6
	05:00 - 8:00	0	1	
Mar.9	20:00 - 22:00	1(a)	3 (a-2, b-1)	a. <i>Chelonia mydas</i> (Linnaeus, 1758); -3 b. <i>Cetta caretta</i> (Linnaeus 1756); 1
	05:00 - 8:00	0	0	
Mar.10	20:00 - 22:00	0	0	Did not find any turtles, new footprints, or new nests.
	05:00 - 8:00	0	0	
Mar.15	20:00 - 22:00	2	9	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); -12
	05:00 - 8:00	0	1	
Mar.16	20:00 - 22:00	0	4	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); -8
	05:00 - 8:00	1	1	
Mar.22	20:00 - 22:00	1	2	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); -3
	05:00 - 8:00	0	0	
Mar.23	20:00 - 22:00	0	3	<i>Lepidochelys olivacea</i> (Eschscholtz, 1758); -3
	05:00 - 8:00	0	0	
Mar.29	20:00 - 22:00	0	1(b)	a. <i>Chelonia mydas</i> (Linnaeus, 1758); -1 b <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); -1
	05:00 - 8:00	1(a)	0	
Mar.30	20:00 - 22:00	2(a)	0	a <i>Lepidochelys olivacea</i> (Eschscholtz, 1758); -3 b <i>Eritmochelys imbricata</i> (Linnaeus, 1766); 1
	05:00 - 8:00	0	2 (a-1, b-1)	

(Source: JICA Study Team)

Total Number of landing turtles from Dec.7th 2012 to Mar. 30th 2013

Species	Site		Total
	Matabari Peninsula	Sonadia Island	
<i>Lepidochelys olivacea</i> Olive ridley turtle	26	83	109
<i>Caretta caretta</i> Loggerhead turtle	2	3	5
<i>Chelonia mydas</i> Green turtle	4	3	7
<i>Eretmochelys imbricate</i> Hawksbill turtle	0	3	3
Total	32 (26%)	92 (74%)	124

(Source: JICA Study Team)

(2) Analysis and recommendations:

The survey results confirm that tidal behavior somehow controls the spawning habits of two species, the [Hawksbill](#) (*Eretmochelys imbricata*) and Olive ridley (*Lepidochelys olivacea*). Specifically, during neap tide the number of these turtles that come ashore to spawn on the sandy beach is extremely small compared with during the spring tide. This is supported by findings based on observations at other sites.

Landing frequency has been decreasing at almost all sites from March to April. These results are consistent with findings outlined in different papers published in MTN (Marine Turtles Network) by Marine Life Alliance based on surveys of Saint Martin's Island and Sonadia Island, which are located on the same coast.

In 2011, a study conducted from 2009-2010, showed confirmed landings of 192 turtles per year on Sonadia Island. Nineteen turtle landings were confirmed in the course of 24 hours during the same investigation (Islam et al 2011) conducted by the Marine Life Alliance survey. However, only 32 turtle landings were confirmed over 32 days of observation in Matarbari Island. Nesting frequency is also very poor in comparison to nesting frequency in the nearby offshore island of Sonadia.

A CNRS study (Center for Natural Resource Studies) found that the nesting population has been declining day by day on the Bangladesh coast, owing to severe exploitation of eggs, disturbances to the ecosystem, the killing of nesting turtles by fishing nets and dogs, and the effects of structural development for salt extraction and agricultural activities, and climate change. CNRS initiated sea turtle conservation activities on St. Martin's Island and on the Teknaf Peninsula in October 1998 to

sustain the sea turtle population in the territorial waters of Bangladesh. Besides releasing over 35,000 hatchlings through in situ (protecting sea turtle eggs and hatchlings in natural nests) and ex situ hatching (collecting eggs and incubating them in a hatchery until they hatch and subsequently releasing the hatchlings to the sea), CNRS has launched a massive awareness campaign on the southeast coastline¹.

Unedited interviews with two wildlife conservation experts are provided:

1.

Expert: Project Coordinator

Name of the Project: Sea Turtle Conservation Project (STCP)

Name of Employer: IUCN

Funded By: Winrock International, Shell, Caern.

Period of service: From December 1998 to June 2010

Duty Station: Cox's Bazar (Inani beach, Shah parir dip, Saint Martin)

Comments: Community migration, Lukkha nets, trawling nets, dog feeding, feeding the indigenous population, and disturbances caused by lighting are the main threats to turtle breeding. Now the forest department's Jaw plantation is decimating the turtles' nesting area, and Jaw root is destroying batches of turtle eggs.

2.

Expert: Wild Life Conservation Officer

Name of the Project: Coastal and Wetland Biodiversity Management Project (CWBMP)

Name of Employer: Department of Environment, Government of the People's Republic of Bangladesh.

Funded By: UNDP-GEF.

Period of service: From December 2005 to June 2011

Duty Station: Cox's Bazar (Patcher dip, Inani beach, Shah parir dip, Sant Martin, Snadia Island)

Comments: Lukkha nets, trawling nets, set bag nets, dog feeding, feeding the indigenous population, and disturbances caused by lighting are the main treats for turtle breeding. Now the forest department's Jaw plantation is decreasing and destroying the turtle's nesting area, and Jaw root is destroying clutches of turtle eggs. Another major factor is rising temperatures caused by climate change. This contributes to a higher proportion of female hatchlings, which threatens turtle reproductively.

¹ http://www.warpo.gov.bd/rep/coast_news/coast_news6.PDF

1-2. “ The Ecological Survey for Sea Turtle Nesting Distributions around Matarbari Island, Maheshkhali, Cox’s Bazar (From March 5th to 24th and April 1st to 20th 2013)”

(1).Introduction

The Ecological Survey of “Sea Turtle Nesting Distributions” on the sandy coast adjacent to the proposed project site for a 2x600MW coal fired power plant and the offshore sandy coast of Matarbari Island was conducted between Mar. 5th and Apr. 20th 2013 by the Institute of Marine Sciences and Fisheries and the University of Chittagong, Bangladesh. This was in accordance with the recommendation of the EIA (Environmental Impact Assessment), which was carried out for the same project. During the integrated survey for compiling the Environmental Impact Assessment Report on “Flora & Fauna at the Power Plant site & its Surrounding Areas and along the 400kV Transmission Line from Matarbari to Anowara” in connection with the construction of a plant for coal fired thermal power, we observed a few turtle landings on the sandy coast adjacent to the project site of Matarbari. We therefore suspected that the turtles might be laying their eggs somewhere off the coast or at one of the offshore islands nearby. However, there was almost no scientific or statistical information on these sea turtles, which were landing on sandy beaches along the Matarbari coast in order to lay their eggs.

(2). Aim of the survey

The aim of the survey is to provide information on the ecology of the sea turtle and their nesting behavior as part of sea turtle research that was conducted at the time of the survey for compiling an Environmental Impact Assessment (EIA) Report in connection with The Coal Fired Thermal Power Plant Construction Project (TPP). The survey sought to determine the number sea turtles landing to lay eggs on the sandy beaches of Matarbari Island and its adjacent beach, and the on one nearby offshore island of Matarbari. Findings regarding the following items were confirmed and presented by the present survey:

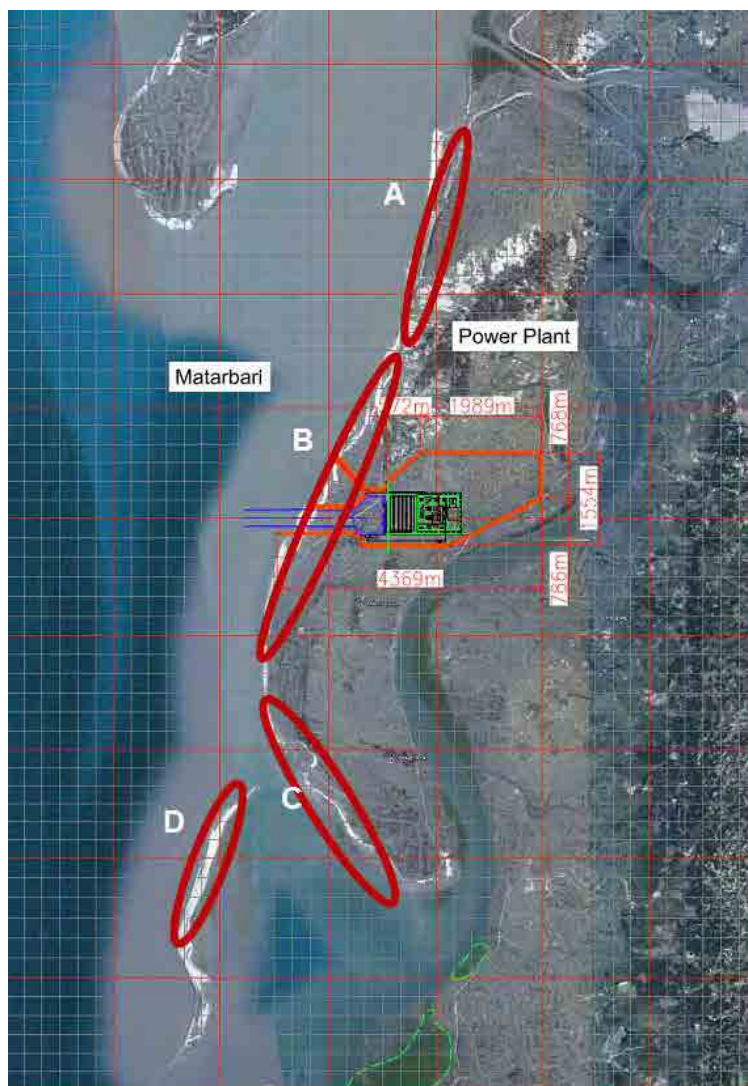
1. The number of sea turtle landings.
2. The name of the sea turtle species.
3. The nesting behavior of landing sea turtles.
4. Records of hearing results on landing sea turtles from concerned people or authorities
5. Ecological data on sea turtle landings from scientists

Specifically, the findings cover issues relevant to the threatened turtle species, including critically endangered (CR), endangered (EN), and vulnerable species (VU) listed in ‘Red Lists’. Every potential impact and risk shall be mentioned in the report. If the impacts are seriously negative, and

the risks quite high, appropriate countermeasures should be offered to minimize those impacts and risks.

(3). Location of Survey Points

The whole survey area (south coast of Matarbari and the nearby offshore island) was divided into four sections, A, B, C and D starting from north to south (Figure-1) to cover the representative area along the sandy coast where sea turtle landings occur and to track the landings.



(Source: JICA Study Team)

Figure-1 Survey sites cover the area where sea turtles land for nesting

Study section A is situated in the north, B in the center and C on the south side of Matarbari west coast. Section D represents the nearby offshore sandy island situated at the southern end zone of Matarbari Island. The geographical boundaries of the study sections are shown below in Table 1.

Table-1 Longitude and Latitude of Study Area

Place	Union	GPS distance	
A. Materbari Sitepara	Materbari	Kankatergonertek - 21°45.36'N - 91°53.011'E	Shairer dil - 21°42.426'N - 91°52.138'E
B. Nakkater bazer (Materbari)- Hamidkhalir khal (Dholghat sitepara)	Materbari + Dalgata	Nakkater bazer- - 21°42.483'N - 91°52.054'E	Hamidkhalir khal (Dhalghata Sitepara) - 21°41.782'N - 91°51.700'E
C. Sharaitaler char-Begun Banier dil (Dhalghata)	Dhalghata	Sharaitaler char - 21°40.528'N - 91°51.446'E	Dalgata (Begun Banier dil) - 21°39.213'N - 91°52.227'E
D. Haser Char (offshore island)	Dhalghata	Haser Char (north) - 21°39.436'N - 91°51.116'E	Haser Char (middle) - 21°38.730'N - 91°50.834'E

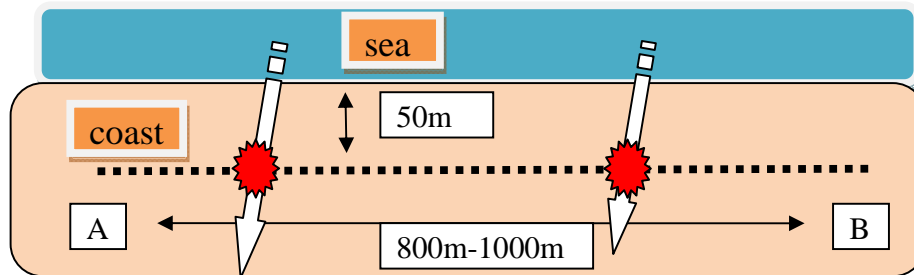
(Source: JICA Study Team)

(4). Survey methodology

Manuals, literature and publications associated with identifying species of sea turtles (including the Oliver ridley, Green Sea Turtle, Hawksbill, Loggerhead and Leatherback) were collected and studied before the survey. GPS was used to record geographic coordinates for the study boundary and nesting patterns for individual turtles, which were plotted on a map. Furthermore, local interviews were conducted to gain information about species existence, their socio-economic-cultural utilization by locals, and their prevalence in the targeted study area. We collected ecological data as well as data from other studies in the nearby area and offshore islands by contacting the agencies involved, via the Internet, and through direct interviews with relevant scientists and job holders. Photographs of species, nesting, eggs and other facets of turtle behavior were also collected as documentation.

Method of identifying the trace for the transect survey was as follows:

1. Sketching a line transect of 800m to 1000m at the coast within 50m from the shoreline along the sea coast (Figure-2) and recording the starting and finishing points by GPS.
2. Recording the identified point of trace on this transect, which are made by landing sea turtles, using a GPS (Figure-1).



(Source: JICA Study Team)

Figure-2 Method of transect survey

The satellite image used for making the map is a landsat satellite image (Lansatt 5) downloaded from the USGS' Glovis website (freely downloadable). The image was processed and gridded (georeferenced) in 'ArcGIS 10' to give it the appearance of a turtle survey map. All the legends of the turtle nesting ground were accurately pointed to the GPS positioning in 'ArcGIS 10'. Final touches to the description and brightness of the map were made with 'Adobe Illustrator CS6'.

(5). Survey Results

The survey results for 40 days (March 5 to 24th and April 1st to 20th 2013) have been tabulated in the following table (Table-2).

- 34 turtle landings of two species were confirmed by the survey during the period mentioned above in the total study area. The two species were Hawksbill (*Eretmochelys imbricata*) and Olive ridley (*Lepidochelys olivacea*)
- Among the turtle species found in the area, Hawksbill (*Eretmochelys imbricata*) is classified as critically endangered and Olive Ridley (*Lepidochelys olivacea*) as vulnerable as in the IUCN Red List 2012 (A2bd ver 3.1)
- In section A of Matabari island (northern west coast of the island), six turtles were confirmed.
- In section B of Matabari island (central west coast area in front of the site), eight turtles were confirmed.
- In section C of Matabari island (southern west coast of the island), four turtles were confirmed.

- In section D (Hasher Dip, the nearby offshore island at the southern end of the Matarbari Island), 16 turtles were confirmed to be spawning; this was overwhelmingly higher than in the other sections.
- **Ecology:** Sandy beaches, with mangrove in the muddy area along the upper coast. Plants include Akanda, Ipomia (locally known as Sagor lata), Kamli data (omari), Nisinda (grown as vegetables). There are few settlements but beaches on the opposite site of the salt extraction fields are highly spread.

Table-2 Turtle nesting distribution as per the survey, along with present ecology and threats

Nest No.	Egg laying Observation stations	Nesting Place & Dated	GPS Reading	Species	Distance (water level to nest)	Potential Threats
01	A. Matarbari Sitepara Ecology: Sandy beach, mangrove is in muddy area. Plants include Akanda, Ipomia (locally called Sagor lata), Kamli data (omari), and Nisinda plant growth. Few settlements but beach opposite site salt culture highly spread	Sitepara 06/03/2013	21°45.467'N 91°53.067'E	<u>Hawksbill</u> (<i>Eretmochelys imbricata</i>)	40m	Dog hunting, human activity & indigenous people that eat the eggs; illegal net use like SBN, Lukka nets
01		Middle Sitepara 07/03/2013	21°43.383'N 91°53.050'E	<u>Hawksbill</u> (<i>Eretmochelys imbricata</i>)	73m	
01		Near Kankatergonertek 14/03/2013	21°45.550'N 91°53.017'E	<u>Hawksbill</u> (<i>Eretmochelys imbricata</i>)	25m	
01		Uttar Sitepara, Sagarpar Masjid 16/03/2013	21°44.093'N 91°52.700'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	45m	
01		Uttar Sitepara, Sgarpar Masjid 17/03/2013	21°44.120' N 91°52.708'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	50m	
01		Kankatergonertek: 15/04/2013	21°45.365'N 91°53.018'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	40 m	
01	B. Nakkater bazer (Matarbari)-Hamid khalir khal (Dholghat sitepara) Ecology: Sandy beach. Plants include Akanda, Ipomia(Sagor lata), Kamli data(omari), and Nisinda. Many settlements but beach opposite site agriculture and salt culture spread	Kartal khaler Char 05/03/2013	21°42.383'N 91°52.217'E	<u>Hawksbill</u> (<i>Eretmochelys imbricata</i>)	24m	
01		Middle Sitepara 06/03/2013	21°42.367'N 91°52.633'E	<u>Hawksbill</u> (<i>Eretmochelys imbricata</i>)	35m	
01		Hamid khalir char 08/03/2013	21°41.700'N 91°51.467'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	28m	
01		Bahir Char Nakkata 19/03/2013	21°42.738' N 91°52.251' E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	120m	
01		Kartal khaler Char 02/04/2013	21°42.350'N 91°52.011'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	45m	
01		Kartal khaler Char 06/04/2013	21°42.300'N 91°52.117'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	35m	
01		Kartal khaler Char 16/04/2013	21°42.348'N 91°52.173'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	35m	
01		Jailla para 17/04/2013	21°42.475'N 91°52.064'E	<u>Olive ridley</u> (<i>Lepidochelys olivacea</i>)	32m	
01	C. Sharaitaler char- Begun Banier dil	Sharaitaler char 07/03/2013	21°40.512'N 91°51.432'E	<u>Hawksbill</u> (<i>Eretmochelys imbricata</i>)	22m	
01		Sharaitaler block	21°40.465'N	<u>Hawksbill</u>	28m	

Nest No.	Egg laying Observation stations	Nesting Place & Dated	GPS Reading	Species	Distance (water level to nest)	Potential Threats
	(Dhalghata)	09/03/2013	91°51.454'E	<i>(Eretmochelys imbricata)</i>		
01	Ecology: Same as B	Sharaitaler block 13/03/2013	21°40.363'N 91°51.468'E	<u>Olive ridley</u> <i>(Lepidochelys olivacea)</i>	12m	
01		Sharaitaler char 18/03/2013	21°40.205' N 91°51.187' E	<u>Olive ridley</u> <i>(Lepidochelys olivacea)</i>	45m	
02	D. Haser Char (D halghata) Ecology: Sandy beach, mangrove is in the upper muddy land area. Plants include Akanda, Ipomia(Sagor lata)	Haser Char North 05/03/2013	a. 21°39.363'N 91°51.118'E b. 21°39.373'N 91°51.163'E	<u>Hawksbill</u> (2sp) <i>(Eretmochelys imbricata)</i>	19m 16m	
02		Haser Char Middle 06/03/2013	a. 21°38.863'N 91°50.118'E b. 21°38.723'N 91°50.663'E	<u>Hawksbill</u> (2sp) <i>(Eretmochelys imbricata)</i>	110m 76m	
03		Haser Char North(1) & Middle(2) 07/03/2013	a. 21°39.353'N 91°51.318'E b. 21°38.723'N 91°50.218'E c. 21°38.753'N 91°50.362'E	<u>Hawksbill</u> (2sp) <i>(Eretmochelys imbricata)</i> <u>Olive ridley</u> <i>(Lepidochelys olivacea)</i>	26m 65m 80m	
02			Haser Char North(1) & Middle(1) 09/03/2013	a. 21°39.413'N 91°51.215'E b. 21°38.842'N 91°50.128'E	<u>Hawksbill</u> (2sp) <i>(Eretmochelys imbricata)</i>	25m 62m
02		Haser Char North 14/03/2013	a. 21°39.337'N 91°51.154'E b. 21°39.328'N 91°51.136'E	<u>Hawksbill</u> (2sp) <i>(Eretmochelys imbricata)</i>	24m 14m	
01		Haser Char Middle 03/04/2013	21°38.345'N 91°50.101'E	<u>Hawksbill</u> <i>(Eretmochelys imbricata)</i>	55m	
01		Haser Char Middle 04/04/2013	21°38.344'N 91°50.307'E	<u>Olive ridley</u> <i>(Lepidochelys olivacea)</i>	65m	
01		Haser Char Middle 12/04/2013	21°38.334'N 91°50.318'E	<u>Olive ridley</u> <i>(Lepidochelys olivacea)</i>	55m	
01		Haser Char Middle 14/04/2013	21°38.339'N 91°50.311'E	<u>Olive ridley</u> <i>(Lepidochelys olivacea)</i>	45m	
01		Haser Char Middle 17/04/2013	21°38.342'N 91°50.311'E	<u>Olive ridley</u> <i>(Lepidochelys olivacea)</i>	42m	

(Source: JICA Study Team)

The findings of the survey have been summarized in a more comprehensive form in Table-3.

Table-3 Results of survey on Sea Turtles at/near Materbari Peninsula
(Mar. 5th to 24th, Apr. 1st to 20th 2013)

Date	Sites				Species
	A: Matarbari Sitepara	B. Nakkater bazer(Materbari)- Hamid khalir khal (Dholghat sitepara)	C. Sharaitaler char- Begun Banier dil (Dhalghata)	D. Haser Char (Dhalghata)	*:see attached map
Mar. 5	0	1 ^a	0	2 ^{2a}	a : Hawksbill (<i>Eretmochelys imbricata</i>)
Mar. 6	1 ^a	1 ^a	0	2 ^{2a}	a : Hawksbill (<i>Eretmochelys imbricata</i>)
Mar. 7	1 ^a	0	1 ^a	3 ^{2a,b}	a : Hawksbill (<i>Eretmochelys imbricata</i>) b : Olive ridley (<i>Lepidochelys olivacea</i>)
Mar. 8	0	1 ^b	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Mar. 9	0	0	1 ^a	2 ^{2a}	a : Hawksbill (<i>Eretmochelys imbricata</i>)
Mar.10	0	0	0	0	-
Mar.11	0	0	0	0	-
Mar.12	0	0	0	0	-
Mar.13	0	0	1 ^b	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Mar.14	1 ^a	0	0	2 ^{2a}	a : Hawksbill (<i>Eretmochelys imbricata</i>)
Mar.15	0	0	0	0	-
Mar.16	1 ^b	0	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Mar.17	1 ^b	0	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Mar.18	0	0	1 ^b	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Mar.19	0	1 ^b	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Mar.20	0	0	0	0	-

Sites Date	Sites				Species
	A: Matarbari Sitepara	B. Nakkater bazer(Materbari)- Hamid khalir khal (Dholghat sitepara)	C. Sharaitaler char- Begun Banier dil (Dhalghata)	D. Haser Char (Dhalghata)	*:see attached map
Mar.21	0	0	0	0	-
Mar.22	0	0	0	0	-
Mar.23	0	0	0	0	-
Mar.24	0	0	0	0	-
Mar.25	-	-	-	-	No Survey
Mar.26	-	-	-	-	No Survey
Mar.27	-	-	-	-	No Survey
Mar.28	-	-	-	-	No Survey
Mar.29	-	-	-	-	No Survey
Mar.30	-	-	-	-	No Survey
Mar.31	-	-	-	-	No Survey
Apr.1	0	0	0	0	-
Apr.2	0	1 ^b	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Apr.3	0	0	0	1 ^a	a : Hawksbill (<i>Eretmochelys Imbricate</i>)
Apr.4	0	0	0	1 ^b	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Apr.5	0	0	0	0	-
Apr.6	0	1 ^b	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Apr.7	0	0	0	0	-
Apr.8	0	0	0	0	-
Apr.9	0	0	0	0	-
Apr.10	0	0	0	0	-
Apr.11	0	0	0	0	-
Apr.12	0	0	0	1 ^b	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Apr.13	0	0	0	0	-
Apr.14	0	0	0	1 ^b	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Apr.15	1 ^b	0	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Apr.16	0	1 ^b	0	0	b : Olive ridley (<i>Lepidochelys olivacea</i>)
Apr.17	0	1 ^b	0	1 ^b	b : Olive ridley

Sites Date	Sites				Species
	A: Matarbari Sitepara	B. Nakkater bazer(Matarbari)- Hamid khalir khal (Dholghat sitepara)	C. Sharaitaler char- Begun Banier dil (Dhalghata)	D. Haser Char (Dhalghata)	*:see attached map
					<i>(Lepidochelys olivacea)</i>
Apr.18	0	0	0	0	-
Apr.19	0	0	0	0	-
Apr.20	0	0	0	0	-
Total	6	8	4	16	34
(%)	6/34=17.65%	8/34=23.53%	4/34=11.76%	16/34=47.06%	100

(Source: JICA Study Team)

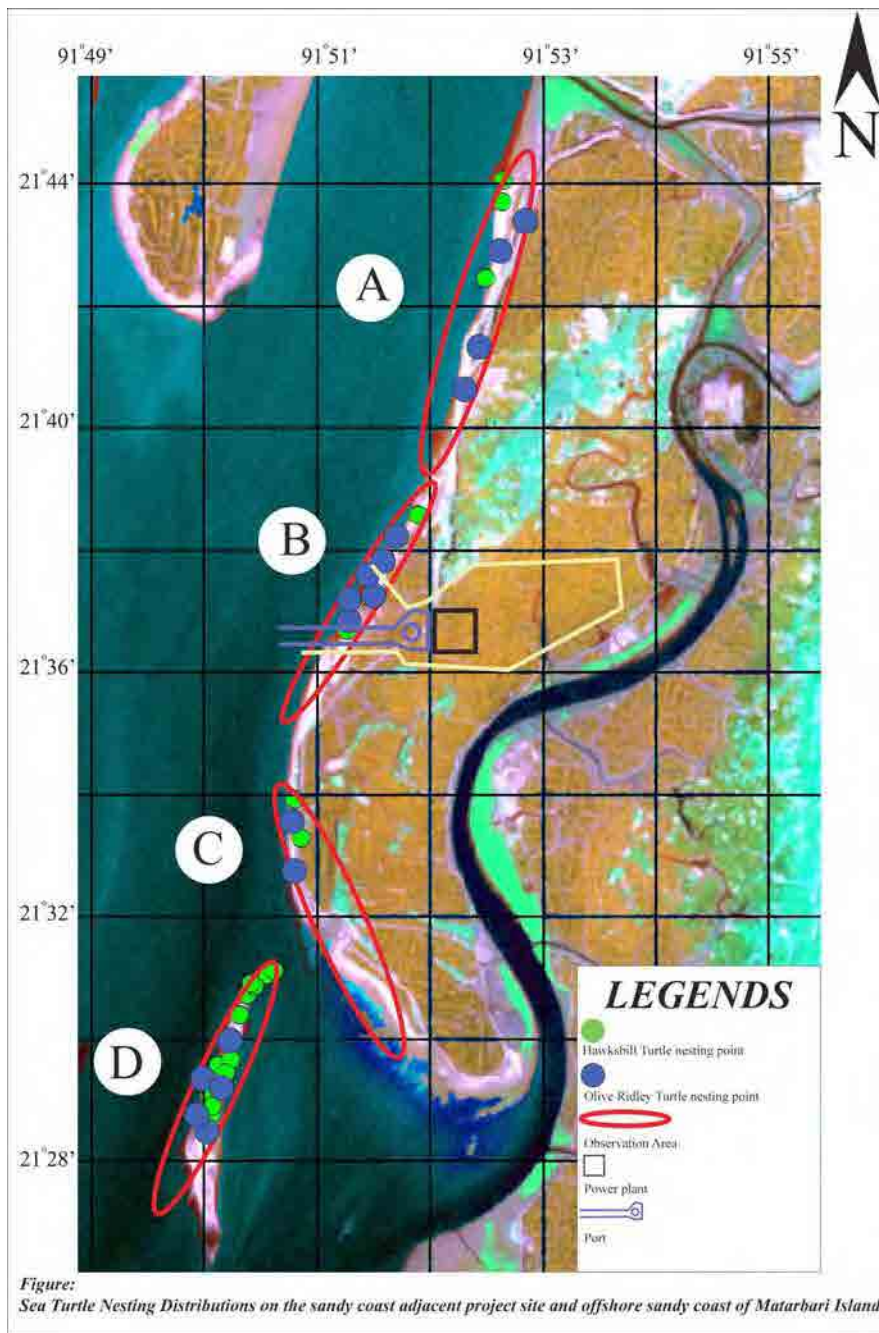
Based on the above findings, we determined that about 47.06% of total sea turtle landings in and around the Matarbari sandbar peninsula were observed at the sandy offshore island (section D) which is a bit far away from the proposed coal fired electricity project. Moreover, about 53% of all nestings were observed in three other sections (A, B, C) of the Matarbari island west coast. Among these three sections, there were very few turtle landings (11.76%) in south west part (C), followed by a slight increase in the north western part (A: 17.65%).

Consequently, spawning is the highest in the sandbar located off the southern coast of Matarbari Island on the west coast and the second-highest nearest the front side of the project (section B).

The nesting distribution covering the whole survey area has been mapped (Figure-3) with GIS (Arc GIS10) for a more comprehensive and standard presentation to the audience.

(6). Risks

It is difficult to assert that risks associated with the project can be avoided given the potential major impact on the existing nesting ecology on the western Matarbari coast because the number of nesting turtles found in the front site sections of the project is the second highest without introductions of effective mitigations as follows. The major potential negative impact can be due to construction, lighting, human intervention, and disturbances during loading and unloading (especially in nesting season of October to May).



(Source: JICA Study Team)

Figure-3 Sea turtle nesting distribution on the sandy coast adjacent to the project site

(7). Analysis and recommendations

The survey results confirmed that tidal behavior somehow controls the spawning habits of two species, the Hawksbill (*Eretmochelys imbricata*) and Olive ridley (*Lepidochelys olivacea*). Specifically, during neap tide the number of these turtles that come ashore to spawn on the sandy beach is extremely small compared with during the spring tide. This is supported by findings based on observations at other sites.

Landing frequency has been decreasing at almost all sites from March to April. These results are consistent with findings outlined in different papers published in MTN (Marine Turtles Network) by Marine Life Alliance based on surveys of Saint Martin's Island and Sonadia Island, which are located on the same coast.

In 2011, a study conducted from 2009-2010, showed confirmed landings of 192 turtles per year on Sonadia Island. Nineteen turtle landings were confirmed in the course of 24 hours during the same investigation (Islam et al 2011) conducted by the MarineLife Alliance survey. However, only 42 turtle landings were confirmed over 40 days of observation in Matabari Peninsula. Nesting frequency is also very poor in comparison to nesting frequency in the nearby offshore island of Sonadia.

A CNRS study (Center for Natural Resource Studies) found that the nesting population has been declining day by day on the Bangladesh coast, owing to severe exploitation of eggs, disturbances to the ecosystem, the killing of nesting turtles by fishing nets and dogs, and the effects of structural development for salt extraction and agricultural activities, and climate change. CNRS initiated sea turtle conservation activities on St. Martin's Island and on the Teknaf Peninsula in October 1998 to sustain the sea turtle population in the territorial waters of Bangladesh. Besides releasing over 35,000 hatchlings through in situ (protecting sea turtle eggs and hatchlings in natural nests) and ex situ hatching (collecting eggs and incubating them in a hatchery until they hatch and subsequently releasing the hatchlings to the sea), CNRS has launched a massive awareness campaign on the southeast coastline².

Unedited interviews with two wildlife conservation experts are provided:

1.

Expert: Project Coordinator

Name of the Project: Sea Turtle Conservation Project (STCP)

Name of Employer: IUCN

Funded By: Winrock International, Shell, Caern.

² http://www.warpo.gov.bd/rep/coast_news/coast_news6.PDF

Period of service: From December 1998 to June 2010

Duty Station: Cox's Bazar (Inani beach, Shah parir dip, Saint Martin)

Comments: Community migration, Lukkha nets, trawling nets, feeding dogs, feeding the indigenous population, and disturbances caused by lighting are the main threats to turtle breeding. Now the forest department's Jaw plantation is decimating the turtles' nesting area, and Jaw root is destroying batches of turtle eggs.

2.

Expert: Wild Life Conservation Officer

Name of the Project: Coastal and Wetland Biodiversity Management Project (CWBMP)

Name of Employer: Department of Environment, Government of the People's Republic of Bangladesh.

Funded By: UNDP-GEF.

Period of service: From December 2005 to June 2011

Duty Station: Cox's Bazar (Patcher dip, Inani beach, Shah parir dip, Sant Martin, Snadia Island)

Comments: Lukkha nets, trawling nets, set bag nets, dog feeding, feeding the indigenous population, and disturbances caused by lighting are the main treats for turtle breeding. Now the forest department's Jaw plantation is decreasing and destroying the turtle's nesting area, and Jaw root is destroying clutches of turtle eggs. Another major factor is rising temperatures caused by climate change. This contributes to a higher proportion of female hatchlings, which threatens turtle reproductivity.

2. Conclusions based on the two types of surveys as mentioned above.

The results of surveys grasping almost all of nesting behavior of sea turtle in and around Matarbari and Sonadia Island conducted by JICA Study Team have made clear that Matarbari Island is not main nesting spots for egg laying sea turtles and impacts to these nesting sea turtles would be caused by project will be minimized to the level of not disturbing their egg laying behavior by carrying out effective mitigations.

Photographs



Spawning nest dug up by local residents



Mother returning to the sea after laying eggs

