6.2 Institutions Available for Regional Monitoring

In the review of institution undertaken by the NWRS it is notable that the DOE is the one organisation that not even local government staff were aware of. The NWRS also reviewed the basic facilities of the laboratories in Bogra. The facilities are quite inadequate to be able to take the responsibilities that a proper monitoring programme would demand. There are also a number of private agencies, NGOs and societies with particular or general interests in the field of general conservation and environment and a large number who are active in the fields of socio-economic and public health.

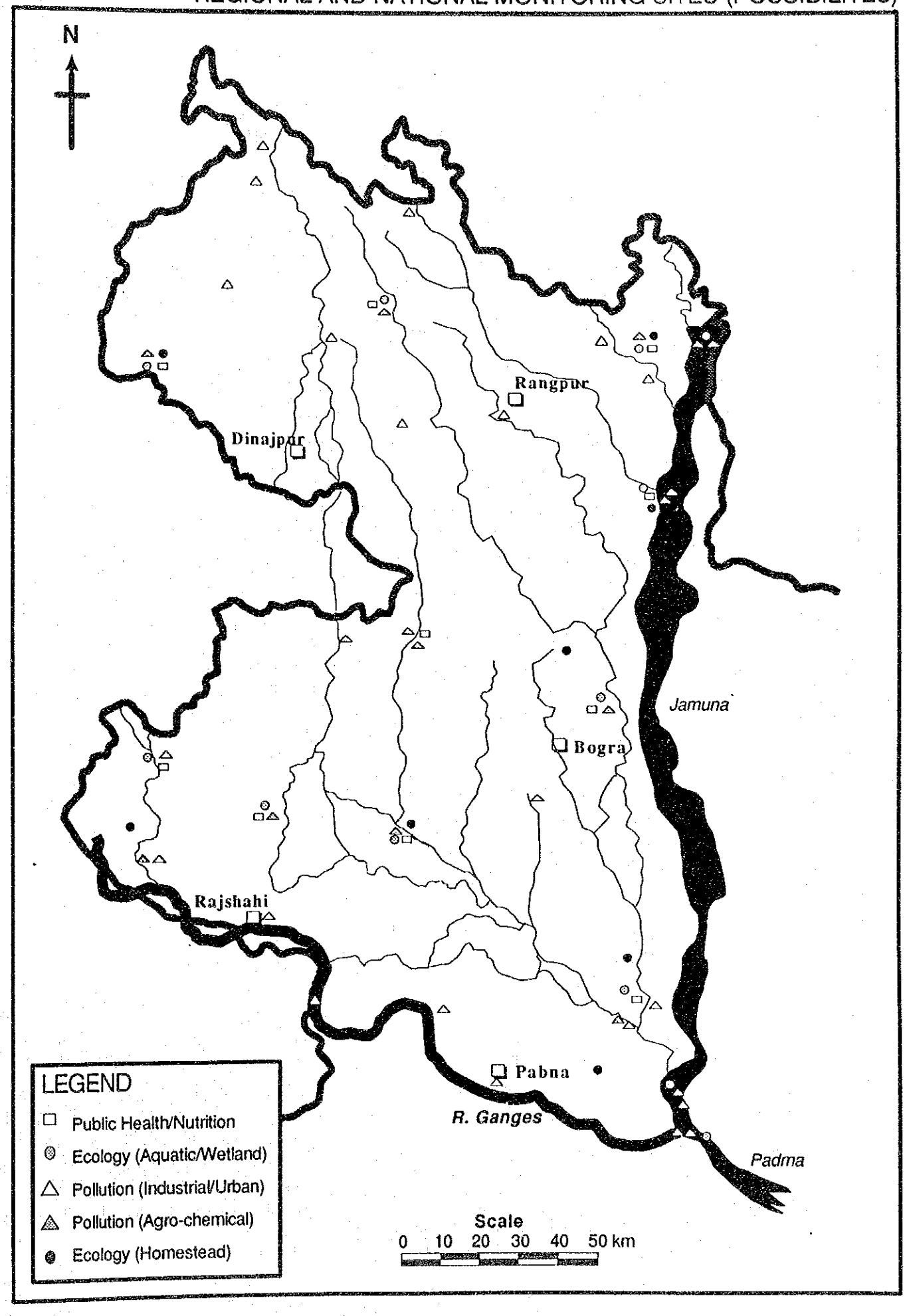
The status of future research recommended under the FAP projects are uncertain. Various supporting studies are working in their own fields of research and it is not clear whether this will be integrated into a long term programme. All that the NWRS can do is to offer some potential layout of sites that would cover the system. This is indicated in Figure 6.1. The ecological and habitat monitoring work should fall under the general coordinating control of the MOEF. They would require the assistance of research institutions, such as IUCN, WWF, ICLARM, BRRI, the various local NGOs and could be assisted if environmental cells were set up under BWDB projects. Some work can also be encouraged through research grants to university students.

Under the current system the institutions which are responsible and available for monitoring are as follows:

SUBJECT AREA	INSTITUTIONS INVOLVED
WATER	
Water Tables	BWDB
River Flow	BWDB
Sedimentation and Morphology	BWDB & SPARRSO
Climate and Rainfall	BWDB & Department of Meteorology, MOD
Navigation	BIWTA
POLLUTION	
Potable Water Quality	Dept Public Health Engineering, MOLGRDC
Water Quality (major towns and rivers)	DOE, MOEF
Pollution Sources (industrial)	DOE, MOEF
Pesticide Research	Plant Protection Division, MOA
Pesticide Residues (limited capability)	DOE, MOEF
Atmospheric (occasional)	DOE, MOEF
Soil Quality	Soil Resource and Development Institute (SRDI)
HERITAGE	
Archaeological Sites	Dept of Archaeology, MOCS & National Museum
BIOLOGICAL	
Wetlands	Revenue Department, MOLGRDC & Natural History
Dept, National Museum	
Forests & Forest Products	Dept of Forests, MOEF
Flora	University Depts of Botany, National Herbarium
Fauna and Birds	University Depts of Zoology, Life Science Institute
(JU), National Zoological Garden	
Fish	Dept of Fisheries, MOFL
Endangered Species	MOEF, BRRI, FRI, WWF & IUCN
Wildlife	Wildlife Advisory Board, MOA
Public Health	DPHE, NIPSOM

Figure 6.1

REGIONAL AND NATIONAL MONITORING SITES (POSSIBILITES)



The key NGOs active for natural resource management are inter alia:

- Bangladesh Centre for Advanced Studies (BCAS)
- Bangladesh Wildlife and Nature Conservation Society (BWNCS)
- Bangladesh Bird Preservation Society (BBPS)
- Bangladesh Academy for Rural Development (BARD)
- Bangladesh Institute of Herbal Medicine
- Barind Protection Society (BPS)
- Centre for Development Research (CDR)
- Coastal Area Resource and Management Association (CARDMA)
- Fisheries Society of Bangladesh (FSB)
- Forum of Environmental Journalists (FEJ)
- Friends of the Earth - Bangladesh (FOEB)
- Nature Conservation Society (NCS)
- Society for the Protection of the Environment (SCOPE)
- Society for Conservation of Nature and Environment (SCONE)
- Wildlife Society of Bangladesh (WSB)
- Zoological Society of Bangladesh (ZSB)

6.3 Project Monitoring

There are a number of areas of monitoring which are likely to prove common to many schemes. Table 6.1 indicates the main monitoring measures and responsibilities that should be assessed in future feasibility studies and the detailed monitoring requirements of individual scheme areas.

6.4 Financing

The estimation of training and other environmental management costs has not been possible at this stage as there are so many policy and strategic issues on which decisions are required by the BWDB, MOEF and the donors.

Table 6.1 Summary of Monitoring Measures

Monitoring Target	Objectives	Methods	Responsible Agency
Flooding in target or external impact area	Identify change in flooding depth and related issues	Monitoring of flood depth and consequences	BWDB
Regulator efficiency	Ensure ongoing efficiency of regulators in maintaining desired wet and dry season water levels for integrated water management	- Monitoring of wetland cover and habitat quality - Periodic inspection of regulators - Community participation	DOF, Thanas and NGOs
Drainage canals	Ensure efficiency of drainage system in alleviating drainage congestion	Community feedback and periodic survey of drainage system and sedimentation levels	BWDB, NGOs
Water quality	Ensure adequate quality standards for domestic uses and wetland functions in surface and groundwater	Immediate research and monitoring to establish seasonality and ecological linkages.	BWDB, DOE, DAE
Groundwater status	Maintain seasonal groundwater levels and responses for desired uses	Systematic and regular monitoring of groundwater and water body levels with community feedback systems	BWDB, DOE, NGOs
Soil status	Improve and sustain soil environment for food and others products and its functional role in floodplain processes	Inter-disciplinary on-going survey and analysis of physical and ecological systems	DAE, IRRI, BRRI
Terrestrial production	Attain sustainable systems and production levels in agriculture, livestock, forestry and horticulture	Ongoing analysis of farmer, womens and institutional responses	DAE, BARC, Universities
Aquatic production	Floodplain and wetland bio-diversity and production	Ongoing analysis of wetland stocks, harvests and management systems	DOF, IRRI AWB, IUCN, ICLARM
Biodiversity	Increase in diverse vegetation cover for enhancing flora and faunal habitats and species to reduce pests and diseases, provide fuelwood, improve nutrition and enhance soil and water quality.	Monitoring the performance of the existing indigenous species and other introduced species	DAE, BARC, FD
Threatened habitats, species and gene pools	Establish protected area networks and community based conservation management to sustain habitats and species utility	Baseline and monitoring ecological survey of wetland quantity, quality, species diversity and ecological integrity	MOEF, IUCN, Universities, NGOs
Communities at risk	Ensure status of displaced and impacted communities	Annual survey of relocated and flood proofed households	LGEB
Protected communities	Ensure status of target communities	Annual survey of key social, economic and health indicators	Thanas
Disease vectors	Disease vector occurrence and abundance	Periodic survey of habitat status and vector abundance	NIPSOM, DPHE
Flood events exceeding design criteria	Disaster preparedness to reduce losses by anticipating potentially damaging floods	Continuous climatic monitoring in upper catchment and timely flood forecasting and warning systems	BWDB, JRC
Structural integrity	Disaster preparedness for system failures due to erosion breaches, public cuts and seismic events or liquefaction.	Proper survey and supervision prior to during construction. Periodic and thorough inspection of embankments. Coordinated response plan	BWDB and independent reviews

APPENDIX A

STATUS OF SELECTED WILDLIFE FOUND IN BANGLADESH

A comprehensive and consistent survey of wildlife is Bangladesh has never been carried out. Assessing the present status is thus particularly difficult. A number of sources have started to bring together the present state of knowledge from the personnel knowledge and islotated surveys of specialists in various fields. These have formed the basis of the record which follows. This cannot be regarded as a particularly scientific and definitive statement of the past or current situation. It is a presentation of the best information available to date. To aid an understanding of where particular action or management strategies may be needed in planning exercises like the FAP a breakdown into various categories of status is given. Many confusions can arise in the use of definitions and the distinctions between them are important to recognis. Thus, if a particular species is recorded as being rare it may well be that the species is naturally rare because the habitat upon which it depends is not a commonly occuring feature of the landscape, either in Bangladesh or elswhere. Similarly species that may be rare in Bangladesh may be very common elsewhere and thus strategically Bangladesh is not a country where major protection programmes would be beneficial overall. These confusions still exist in the lists that follow and will be a task for future researchers to follow up on. The list is thus an aid to the extent of potential problems and indicative.

Wherever, possible reference has been made to the IUCN Red List of Threatened Animals, 1990. Even this source is only based on reports that IUCN receive from interested parties in Bangladesh or researchers that have worked in Bangladesh. What has been attempted is to ensure that the definitions used by IUCN have been followed in aggretating the list from its various sources. Assistance in compiling this list and checking its contents has been received from FAP 16 and the National Herbarium.

The definitions used by IUCN are as follows:

EXTINCT: Species not definately located in the wild during the past 50 years.

ENDANGERED: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Includes taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced or altered that they are deemed to be in immediate danger of extinction.

VULNERABLE: Taxa believed to be move into the "Endangered" category in the near future if the causal factors continue operating. Typical reasons include over-exploitation, destruction of habitats or other environmental disturbances or degradation. This category may include taxa that temporarily are beginning torecover as a result of remedial action but whose recovery is insufficient to justify their transfer to another category.

RARE: Taxa with small global populastions that are not at present "Endangered" or "Vulnerable", but are at risk. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more scattered range.

INDETERMINATE: Taxa known to be "Endangered" or "Vulnerable" or "Rare" but where there is insufficient information to say which of these three categories is appropriate. This category has not been used in the following list.

UNCERTAIN: This category has been used wherever there has been insufficient data available to the study to make any assessment at all. It is titled more strongly as "Insufficently Known" by IUCN to apply to suspected risks to taxa falling in any of the other categories.

THREATENED: This is a general term to denote species which are in any of the categories above.

Key: 1 = Very Common, 2 = Fairly Common, 3 = Common, 4 = Uncertain
5 = Threatened, 6 = Endangered, 7 = Rare, 8 = Vulnerable

* = No Longer Believed to be Found in Bangladesh ** = Present in NWR

CATEGORY/NAME		PAST STATUS (@ 1940)	PRESENT STATUS
MAMMALS			
Antilope cervicapra Black Buck		4	4*
Axis porcinus Hog Deer		4	4*
Bandicota bengalensis Lesser Bandicot Rat		3	3
Bos gaurus Gaur		4	8*
Bos javanicus Banteng		4	8*
Bosephalus tragocamelus Blue Bull/Nilgai		4	4*
Bubalus bubalis Wild Water Buffalo		4	6*
Canis Lupus Grey Wolf		4	8*
Capricornis sumatraensis Serow		2	6
Caprolagus hispidus Hispid Hare		3	6
Cervus unicornis Sambar		3	5
Didermocrus sumatrensis Sumatran Rhinoceros		4	6*
Elephas maximus Asiatic Elephant		3	6
Felis bengalensis Leopard Cat		4	4
Felis viverrina Fishing Cat	**	2	6
Felis chaus Jungle Cat	**	2	5
Herpestes auropunctatus Small Mongoose		3	3
Herpestes edwardsi Common Mongoose		3	3
Hylobates hoolock Hoolock Gibbon		3	6
Lutra lutra Common Otter		3	4
Lutra perspicillata Smooth Coated Otter		3	4
Macaca mulatta Rhesus monkey		3	3
Macaca fascicularis Crab Eating Macaque		2	5
Muntiacus muntjak Barking Deer		3	5
Neofelis nebulosa Clouded Leopard		2	6
Nycticebus coucang Slow Loris		2	6
Panthera tigris Tiger		2	6
Pantheris pardus Leopard		3	5
Platanista gangetica Ganges River Dolphin		2	8
Presbytis entellus Common Macaque		2	6
Rhinoceros unicornus Great Indian Rhinoceros		4	6*
Sus scrofa Wild Boar		3	7
Viverra zibethina Large Civet		3	6
Vulpes bengalensis Bengal Fox		3	4

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CATEGORY/NAME		PAST STATUS (@ 1940)	PRESENT STATUS
REPTILES 150 total species known, and include:			
Crocodylus palustris Marsh Crocodile		4	7*
Crocodylus porosus Estuarine Crocodile		3	6
Gavialis gangeticus Gharial	**	3	6
Turtles/Tortoises 31 total species known, of which 3 terrestrial and 24 freshwater, 4 marine include:			
Batagur baska Batagur Turtle		3	6
Chelonia mydas Green Turtle		3	6
Chitra indica Soft Shelled Turtle	**	4	7
Coratta coratta Loggerhead Turtle		3	6
Dermochelys coriacea Leatherback Turtle		3	6
Eretmochelys imbricata Hawksaw Bill Turtle		3	6
Geochelone emys Land Tortoise	**	3	6
Kachuga kachuga Red-crowned Roofed Turtle		4	4
Kachuga tectum Common Roofed Turtle		4	3
Kachuga sylthensis Sylhet Roofed Turtle		4	7
Lepidochelys olivacea Olive Ridley Turtle		3	6
Lissemys punctata Spotted Flap Shell Turtle	**	4	3
Morenia petersii Smithi Roofed Turtle		4	3
Pelochelys bibroni Coast Soft Shelled Turtle	**	4	7
Trionyx gangeticus Ganges Soft Shelled Turtle	**	4	3
Trionyx hurum Pezcock Soft Shelled Turtle		4	3
Trionyx nigricans Bostami Turtle		3	7
Cyclemys dentata Freshwater Tortoise	**	4	7
Geochelone elongata Burmes Tortoise		4	7
Hardella thurji River Turtle	**	4	3
Melanochelys tricarinata Three Keeled Tortoise		4	7
Melenochelys triguga Pond Tortoise	**	4	7
Caretta caretta Loggerghead Sea Turtle		4	7
Chelonia mydas Green Sea Turtle		4	6
Eretmochelys imbricata Hawksbill Sea Turtle		4	6
Lepidochelys olivacea Olive Ridley Sea Turtle		4	6
Lizards and Skinks 18 total species, include:			
Calotes versicolor Garden Lizard	**	4	3
Gekko gecko Wall Gecko	**	4	3
Hemidactylus brooki House Lizard	**	4	3
Hemidactylus flaviviridis Wall Lizard	**	4	3
Mabuya carinata Common Skink	**	4	3
Mabuya dissimilis Striped Skink	**	4	3
Varannus salvator Monitor/Ring Lizard		1	5
Varanus bengalensis Grey Lizard	**	3	5
Varanus flaviscens Yellow Lizard	**	3	5
Varanus nebulosa Clouded/Black Lizard		3	5

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CATEGORY/NAME		PAST STATUS (@ 1940)	PRESENT STATUS
REPTILES (cont)			
Snakes 78 total species known, floodplain and aquatics include:			
Ahitulla nasutus Vine Snake	**	4	3
Amphiesma stolata Striped Keelbacked Snake	**	4	3
Bangarus fasciatus Banded Krait	**	4	3
Bangarus caeruleus Common Krait	**	4	7
Boiga trigonata Common Cat Snake	**	4	3
Chrysopelea ornata Flying Snake	**	4	7
Dendrelaphis tristis Bronzeback Tree Snake	**	4	3
Dendrelaphis pictus Painted Bronzebacked Tree Snake	**	4	7
Elachistodon westermanni Indian Egg-eating Snake		4	7
Elapha helena Common Trinket Snake		4	7
Elapha radiata Copperheaded Trinket Snake		4	7
Lycodon fasciatus Banded Wolf Snake	**	4	3
Lycodon aulicus Common Wolf Snake	**	4	3
Lycodon jara Yellow Spectacle Wolf Snake		4	7
Naja naja Cobra	**	4	3
Oligodn arnensis Banded Kukri Snake		4	7
Ophiophagus hannah King Cobra		4	6
Ophiophagus hannah King Cobra		2	6
Ptyas mucosur Rat Snake	**	4	3
Python reticulatus Common Royal Python		4	7
Python molurus Rock Python	*	2	6
Rhabdophis subminiata Rednecked Keelbacked Snake		4	7
Typhlops porrectus Slender Worm Snake	**	4	3
Typhlops braminus Common Worm Snake	**	4	3
Typhlina cliardi Large Worm Snake	**	4	3
Vipera russellii Russells Viper	**	4	7
Atretium schistoeum Olive Keelbacked Water Snake	**	4	3
Cerberus rhynchops Dog-faced Water Snake		3	5
Enhydris enhydris Common Water Snake	**	4	3
Xenochrophis cerasogaster Darkbellied March Snake	**	4	7
Xenochrophis piscator Checkered Keelbacked Water Snake	**	4	3
Enhydrina schistosa Hooknosed Sea Snake		1	5
Hydrophis cyanocinctus Annulated Sea Snake		4	3
Hydrophis obscurs Estuarine Sea Snake		4	5
Hydrophis cantoris Cantor's Narrowheaded Sea Snake		3	5
Hydrophis gracilis Common Narrowheaded Sea Snake		3	5
Hydrophis fasciatus Banded Sea Snake		4	5
Hydrophis obscurus Estuarine Sea Snake		3	5
Hydrophis cyanocintus Hook-nosed Sea Snake		1	7
Pelamis platurus Yellow-bellied Sea Snake		4	7

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5 = Threatened, 6 = Endangered, 7 = Rare, 8 = Vulnerable

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CATEGORY/NAME		PAST STATUS (@ 1940)	PRESENT STATUS
AMPHIBIANS 19 total species known and include:			
Rana tigrina Bull Frog	**	1	5
Rana hexadactyla Green Frog		4	5
Rana tyleria ??? Frog	**	4	7
Rana limnocharis Cricket Frog	**	4	3
Rana temporalis ??? Frog	**	4	7
Rana cyanophyctis Skipper Frog	**	4	3
Rhacophorus bimaculatus Tree Frog	**	4	3
Rhacophorus maximus Tree Frog	**	4	3
Uperodon globulosus Balloon Frog		4	7
Bufo melanostictus Toad	**	4	3
BIRDS			
Alcedo hercules Blyth's Kingfisher		4	7
Anastomus oscitans Openbill Stork	**	3	6
Anhinga rufa Darter		2	5
Ardea cinerea Grey Heron	**	3	5
Ardea purpurea Purple Heron		2	6
Bubo zeylonensis Brown Fish Owl	**	2	6
Buceros bicornis Great Hornbill		3	6
Cairna scutulata White Winged Wood Duck		2	6
Chaetornis striatus Bristled Grass Warbler		4	4
Ciconia episcopus Whitenecked Stork	**	2	6
Columba punica Pale-capped Pigeon		4	7
Coturnix coromendelica Rain Quail		3	6
Dendrocygna bicolor Greater Whistling Teal		3	6
Elanus caeruleus Black Winged Kite	**	3	6
Eupodotis bengalensis Bengal Florican		4	4*
Francolinus francolinus Assam Black Partridge		2	6
Francolinus gularis Swamp Francolin		4	8
Gracula religosa Hill Myna		3	5
Gyps bengalensis White Backed Vulture	**	1	5
Haliaetus leucogaster White Bellied Sea Eagle		3	6
Haliaetus leucoryphus Pallas's Fishing Eagle	**	2	6
Hydrophasianus chirurgus Pheasant-tailed Jacana	**	2	5
Ichthyophaga ichthyatus Greyheaded Fishing Eagle	**	3	5
Leptoptilus javanicus Lesser Adjunct		2	6
Moupina altirostris Jordon's Babbler		4	8
Paradoxornis flavirostris Black-breasted Parrotbill		4	4
Paradoxornis ruciceps Rufus-headed Parrotbill		4	7
Pavo cristatus Common Peafowl		2	6
Pavo muticus Burmese/Green Peafowl		4	8*
Perdicula manipurensis Manipur Bush Quail		4	7

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CATEGORY/NAME		PAST STATUS (@ 1940)	PRESENT STATUS
BIRDS (cont)			
Platalea leucorodia Spoonbill	**	2	6
Plegadis falcinellus Glossy Ibis		2	6
Podiceps ruficollis Little Grebe		1	5
Prinia fluviatilis Long-tailed Prinia		4	7
Rhodonessa caryophyllacea Pink-headed Duck		4	Extinct
Rostratula bengalensis Painted Snipe		2	5
Sarkidiornis melanotos Comb Duck		2	6
Silta formosa Beautiful Nuthatch		4	7
Terpsiphone paradisi Paradise Flycatcher		2	5

Sources: MOEF, Draft National Conservation Strategy, July 1991. IUCN 1990 Red List of Threatened Species. World Conservation Monitoring Centre, Cambridge. Sarker, M.D. & Husain, K.Z. appearing in Environmental Aspects of Surface Water Development in Bangladesh. Eds Rahman, A.A., Huq, S., & Conway, G.R. 1990.

APPENDIX B

THREATENED FLORA - TENTATIVE LIST

PTERIDOPHYTA	DISTRIBUTION
Psilotum triquetrum	Khulna, Barisal
Tectaria chattagramica	(endemic) Chittagong
ANGIOSPERMS	
Aglaonema clarkei	Bandarban
Aldrovanda vesiculosa	Dhaka, Rajshahi
Aquillaria agallocha **	Sylhet
Cirrhopetalum roxburghii	(endemic) Sunderban
Cymbopogon osmastonii	Bogra, Dhaka
Debregeasia dentata **	Chittagong
Elaeocarpus lucidus	Chittagong
Hippocratea macrantha	Chittagong
Homalium schichtii	Chittagong
Justica oreophila	Chittagong
Knema bengalensis	(endemic) Cox's Bazar
Limnophila cana	(endemic) Jamalpur, Pabna, Dhaka
Mantisia spathulata **	(endemic) Chittagong, Sylhet
Marsdenia thyrsiflora	Central Regions
Ophiorrhiza villosa **	Chittagong
Phrynium imbricatum	Chittagong
Quercus acuminata	Chittagong
Rotala simpliciuscula	(endemic) Chittagong, Sylhet
Semecarpus subpanduriformis	(endemic) Chittagong
Sonneratia griffithii	Chakaria, Sunderbans
Spatholobus listeri	(endemic) Chittagong
Toournefortia roxburghii	Chittagong, Rangamati
Typhonium listeri	Chittagong
Vatica scaphula	(endemic) Chittagong
Vernonia thomsonia	Chittagong

Source: MOEF, Draft National Conservation Strategy, July 1991.

APPENDIX C

LIST OF BIRDS RECORDED IN THE NORTH WEST REGION

NO	NAME	HABITAT	STATUS
1	Great Cormorant	Wetlands	Former ? resident
2	Indian Shag	Wetlands	Scarce ? resident
3	Little Cormorant	Throughout wetlands	Local breeding resident
4	Dalmatian Pelican	Wetlands	Former visitor
5	Little Bittern	Wetlands	Former resident
6	Yellow Bittern	Wetlands	Local breeding resident
7	Cinnamon Bittern	Near ponds/paddy fields	Common breeding resident
8	Indian Pond Heron	Wetlands	Abundant breeding resident
9	Little Egret	Wetlands	Locally common breeding resident
10	Intermediate Egret	Wetlands	Locally common breeding resident
11	Great Egret	Wetlands	Locally common resident
12	Grey Heron *	Wetlands	Local breeding resident
13	Asian Open Bill	Wetlands	Local wondering resident
14	White Spoonbill *	Near River	Rare winter visitor
15	Greater Flamingo	Wetlands	Former rare visitor
16	Fulvous Whistling Duck	Wetlands	Local winter visitor
17	Lesser Whistling Duck	Wetlands	Common winter visitor and local breeding resident
18	Bar-headed Goose	Wetlands	Local winter visitor
19	Cotton Pygery Goose	Near lakes	Local breeding resident
20	Gadwall	Wetlands	Scarce winter visitor
21	Common Teal	Wetlands	Locally common winter visitor
22	Spot-billed Duck	Wetlands	Rare winter visitor
23	Garganey	Wetlands	Common winter visitor
24	Red-crested Pochard	Wetlands	Winter vagrant Pochard
25	Ferruginous Pochard	Wetlands	Locally common winter visitor
26	Tutted Duck	Wetlands	Locally common winter visitor, sometimes over summering
27	Greater Scaup	Wetlands	Rare winter visitor
28	Black Shouldered Kite *	Open country	Local breeding resident
29	Pariah Kite	Open country and urban areas	Common breeding resident
30	Pallas's Fish Eagle *	Wetlands and large rivers	Rare breeding resident formerly more common
31	Grey-headed Fish Eagle *	Wetlands/fish farms	Local breeding resident
32	Egyptian Vulture	Open country	Rare visitor
33	Long-billed Vulture	Open & wooded country	Scarce ? winter visitor
34	Red-headed Vulture	Open country	Rare breeding
35	Western Marsh Harrier	Near water	Common winter visitor
36	Pied Harrier	Open country	Scarce winter visitor
37	White-eyed Buzzard	Open woodland	Local breeding resident
38	Long-legged Buzzard	Near River	Rare winter visitor
39	Lesser Spotted Eagle	Open country near water	Scarce winter visitor
40	Greater spotted Eagle	Open country near water	Scarce winter visitor
41	Imperial Eagle	Open country	Rare winter visitor
42	Booted Hawk-Eagle	Open country	Scarce winter visitor

43	Red necked falcon	Open wooded areas	Local breeding resident
44	Black Francolin	Open country	? Former resident
45	Common Quail	Grassland and cultivation	Local breeding recident
46	Small Buttonquail	Open country	? Former resident
47	Baillon'Crake	Wetlands	? Former resident
48	Brown Crake	Wetlands	? Former resident
49	White-Breasted Waterhen	Wetlands	Local breedingresident
50	Common Moor Hen	Wetlands	Local breeding resident
51	Purpel Swamp Hen	Wetlands	Scarce breeding resident
52	Water Cock	Large wetlands	Local breeding resident
53	Eurasian Coot	Wetlands	Scarce breeding resident
54	Sarus Crane	Wetlands	?Former resident now extinct
55	Pheasant-tailed Jacana *	Wetlands	Scarce breeding resident
56	Bronze-winged Jacana	Wetlands	Local breeding resident
57	Small Wratincole	Near rivers	Local breeding resident
58	River Lapwing	Near rivers	rare? resident
59	Rufous-necked Stint	Wetlands	Scarce winter visitor
60	Little Stint	Near rivers	Local winter visitor
61	Temmincks Stint	Wetlands	Scarce winter visitor
62	Jack Snipe	Wetlands	?Former winter visitor
63	Pintail Snipe	Wetlands	Common winter visitor
64	Solitary Snipe	Wetlands	Rare winter visitor
65	Eurasian Curlew	Near rivers	Locally common winter visitor
66	Marsh Sandpiper	Wetlands	Scarce winter visitor
67	Black- bellied Tern	Near river	Very local breeding resident
68	White-winged Term	Wetlands	Rare passage migrant
69	Indian Skimmer	Near river	Local winter visitor
70	Rock Dove	Open country & urban areas	Abundant breeding resident
71	Orange-breasted Pigeon	Forest & wood lands	Local breeding resident
72	Yellow-footed Pigeon	Wooded areas	Common breeding resident
73	Blossom-headed Parakeet	Wooded areas	local breeding resident
74	Plaintive cuckoo	Open wooded areas	Common breeding resident
75	Sirkeet Malkoha	Open woodland	? rare resident
76	Brown Fish-Owl	Wooded areas near water	local breeding resident
77	Collared Owlt	Well wooded areas	Scarce resident
78	Brown Boobook	Well wooded areas	Local breeding resident
79	White-throated Kingfisher	Wetlands with trees	Common breeding resident
80	Green Bee-eater	Open country	Common breeding resident
81	Common grey Hornbill	Wooded areas	? former resident
82	Streak-throated Wood Pecker	Woodland, Particularly Sal	Local breeding resident
83	Yellow-Crowned Woodpecker	?	? Former resident
84	Indian Sandlark	Sandy rivers	Local breeding resident
85	Plain Martin	large rivers	Local breeding resident
86	Blyths Pipit	Open country	Large passage migrant
87	long -billed Pipit	Open country	? Former resident
88	Brown Tree Pipit	Open country	Rare winter visitor
89	Common wooded-Shrike	Wooded areas	Common breeding resident
90	Common Iora	Wooded areas	Common breeding resident
91	Plumbeous Redstart	Near water	Rare passage migrant
92	Indian Chat	Open country & fields	? Former resident]
93	Ashy Prinia	Scrub woodland	local breeding resident
94	Jungle Prinia	Scrub and grassland	? Former resident
95	Swamp Prinia	Swamp grass	? Former resident
96	large Grass-Warbler	Swamp grass	? Former resident
97	Blunt-winged Warbler	Wetlands	Rare winter visitor
98	Greenish Warbler	Throughout in trees	Abundant winter visitor

99	Large-Billed Leaf-Warbler	Trees	Scarce winter visitor
100	Grey-headed Flycatcher	Forest and woodland	Locally common breeding resident
101	Tawny-Bellied Babbler	Grassland, scrub and forest	? Former resident
102	Chestnut-Capped Babbler	Scrub	local breeding resident
103	Common Babbler	?	? Former resident
104	Jungle Babbler	Wooded country & scrub	Commn breeding resident
105	Great Grey Shrike	Open country	Rare winter visitor
106	House Crow	Settled areas	Abundant breeding resident
107	Brahminy Starling	Open country	local breeding resident
108	Red Avadavat	Open country with grass	Rare breeding resident
109	Scaly-Breasted Munia	Open country	Common breeding resident
110	Chestnut-Eared Bunting	Open country	? Former winter visitor

Note : 1 * Probably internationally significant populations occur in Bangladesh

Source : Harvey, WG Birds in Bangladesh UPL 1990

SUMMARY OF SPECIES BY HABITAT TYPE

Habitat	No of Species	Comment
1 Rivers, beels and sandy rivers	13	Habitat would be affected if project intervention led to chnges in river regime
2 Wetlands, swamps	47	Habitat changes most likely to occur due to project intervention
3 Open country, grassland, dryland	26	Some changes in habitat likely to occur due to extension of agricultural land as a result of project intervention
4 Forest, shrub and woodland	24	Some changes in habitat likely to occur due to extension of agricultural land as a result of project intervention
Total :	110	

Note: Some species have been counted in more than one habitat

APPENDIX D

LIST OF COMMON AND/OR ECONOMICALLY IMPORTANT TREES AND OTHER VEGETATION FOUND IN THE NWR

BOTANICAL NAME - Bangla Name

DRYLAND AND HOMESTEAD TREE CROPS

Acacia catechu - Khain
Acacia chinensis - Chakua koroi, Sesra koroi
Acacia farnesiana - Guhiya babul
Aegle marmelos - Bel
Acacia nilotica - Babla
Albizia chinensis - Sil koroi
Albizzia procera - Sil koroi
Albizzia lebbeck - Shirish
Alstomia scholaris - Satim
Annona squamosa - Ata Phal
Annona reticalata - Nona phal
Anthocephalus chinensis - Kadam
Areca catechu - Supari
Artocarpus heterophullus - Kanthal
Averrhoa carambola - Kamranga
Azadirachta indica - Neem
Bambusa spp. - Bans
Bambusa balcooa - Barak, Barua, Bora
Bambusa vulgaris - Jai, Baijja, Jowa bans
Barringtonia racemosa - Hijol
Bombax ceiba - Shimul
Borassus flabellifer - Tal
Butea monosperma - Palash
Caesalpinia palcherrima - Radhachura
Careya arborea - Kumbi, Gadila
Carica papaya - Pepe
Cassia fistula - Sonalu
Cassia siamea- Minjiri
Cocos nucifera - Narikel/Dab
Dalbergia sissoo - Shisoo
Delonix regia - Krishnachura
Dendrocalamus spp. - Bans
Diospyros peregrina - Gab
Erythrina spp. - Mandar
Ficus hispida - Dumur
Ficus infectoria - Pakur
Ficus religiosa - Aswatha
Ficus benghalensis - Bot
Gliricidia sepium - Madder tree
Litchi chinensis - Litchu
Mallotus phillipensis - Sinduri
Mangifera indica - Am
Melia azedarach - Kowa nim
Mimusops elengi - Bakul
Moringa oleifera - Sajna
Morus alba - Tut
Musa spp. - Kola
Peltophorum pterocarpum - Halud, Krishna Chura
Phoenix sylvestris - Khejur
Phyllanthus emblica - Amloki
Pithecolobium dolce - Babla
Polyalthia longifolia - Debdaru
Psidium gaujava - Piara
Sesbania grandiflora - Bakphul
Shorea robusta - Sal/Gazari
Spondias dulcis - Amra
Streblus aeper - Sheora
Sumanea saman - Koroi (Rendi)
Swietenia mahagoni - Mahagony
Syzygium spp. - Jam
Tamarindus indica - Tentul
Tectona grandis - Segum
Terminalia chebula - Haritaki
Terminalia belerica - Bahera
Terminalia arjuna - Arjun
Zanthoxylum rhetsa - Bajna
Zizyphus mauritiana - Boroi/Kul

CULTIVATED FLOODPLAIN CROPS AND FODDER WEEDS

Alternanthera spp.
Ananassa sativa - Anaras
Arachis hypogea - China bolum
Brassica unca -
Brassica nigra - Sarisa
Brassica spp. - Kapi
Caesulia axilaris Karenda
Citrillus vulgaris - Tormuz
Corchorus spp. - Pat

Cyperus spp.
Lablab spp. -
Lathyrus sativus -
Lens culnaris -
Nicotinia tabacum - Tamak
Oryza sativa - Dhan
Phaeseolus mungo - Sim
Saccharum officina - Akh
Sesamum indicum - Til
Solanum melongena - Mishti Alu
Solanum tuberosum - Alu

WETLAND AND RIVER BANK VEGETATION

Aldrovenda vesiculosa
Alisma spp.
Alternanthera spp.
Ammophila arenaria
Andropogon contortus - Chorkata
Arundinaria spp.
Arundo spp.
Barringtonia acutangula - Hijol
Barringtonia racemosa - Hijol
Butomus spp.
Ceratophyllum spp.
Cyperus spp. - Mothaghas
Eclipta spp.
Eichhornis crassipes - Pana (Kachuri)
Eleocharis spp.
Enhydra fluctosa
Erianthus ravanae
Euryle ferox - Makhna
Fimbristylis spp.
Geum spp.
Hottonia spp.
Hydrilla spp.
Hydrocharis spp.
Hygrorhiza spp.
Hymenachne pseudointerrupta Dal
Ipomoea aquatica; - Kalmilata
Lemna spp. - Pana (Khudi)
Lepidium sativum
Ludwigia adsendens
Menyanthes spp.
Monochoria spp.
Monochoria spp.
Myriophyllum spp.
Nasturtium palustre
Nechamandra spp.
Nelumbo nucifera - Paniphal
Nymphea spp. - Shapla
Nymphoides spp.
Oryza spp. - Dhan
Otellia spp.
Panicum spp.
Paspalum spp.
Phragmites spp. Nalkhagra
Pistia stratiotes - Pana (Topa)
Polycarpacea spp.
Polygonum spp. - Bishkata
Polygonum amphibium
Potamogeton spp.
Potentilla spp.
Ranunculus aquatilis
Saccharum spp.
Sagittaria spp.
Schumannianthus dichotomus - Padma
Scirpus spp.
Setaria spp.
Spirodela spp.
Spirodela spp.
Spirodela polyrhiza - Patibet
Thysanoleana maxima
Trapa bispinosa
Utricularia spp.
Utriculuria stellaris - Jhangi
Vallisneria spiralis

Sources: Field Surveys, IUCN, AWB et al, Directory of Asian Wetlands, 1989. Fodder Trees of Bangladesh, Bangladesh Forest Research Institute.

APPENDIX E

SITES OF HISTORICAL OR ARCHAEOLOGICAL INTEREST IN THE NWR.

Number Key for Figure

No.	Name
1.	Nayabad mosque
2.	Katanargar temple
3.	Bagduar dibbi
4.	Mithapukur mosque
5.	Shah Ismail shrine
6.	Sura mosque
7.	Sitakot vihar
8.	Daraown fort
9.	Baigram temple
10.	Dargah shrine
11.	Ghoraghat Fort
12.	Ghoraghat Fort
13.	Bardhankuti palace
14.	Birat Rajar Dibhi
15.	Shahebganj Mound
16.	Parshurames Palace
17.	Buddhist Bihar Mound
18.	Vasu Bihar
19.	Khetlal Mound
20.	lakhindir Medh
21.	Fort
22.	Kherua Mosque
23.	Mahasthangarh city ruins
24.	Holud Vihar
25.	Paharpur Vihar
26.	Mangalbari
27.	Jagdal Dibhi
28.	Mohi Shantosh Mound
29.	Agradigun Dibhi
30.	Baugarh Mosque
31.	Darash Bari Mosque
32.	Chotto Sona Mosque
33.	Unamed Mosque
34.	Shah Niamat Ullah Shrine
35.	Rohonpur ancient Shrine
36.	Kushumba mosque
37.	Duruha Hati Palace
38.	Biharail Dibhi
39.	Dhanora Dibhi
40.	Dewpara Dibhi/Dewpara Par.
41.	Kumarpur Dibhi
42.	Shrine
43.	Kismat Maria & Bibi Ghar
44.	Shib Temple
45.	Jagat Datti Temple
46.	Putia Palace
47.	Bagha Mosque
48.	Jaganath Temple
49.	Chad Bihin Mosque
50.	Potazia Temple
51.	Shahzadpur Mosque
52.	Chatmohor Mosque
53.	Samaj Mosque
54.	Mandial Shib Temple
55.	Navagram Mosque
56.	Hatkumrul palace
57.	Sherpur mosque
58.	Sirajgang Ghat Temple
59.	Sherpur Palace
60.	Buddhist Mosque near R.D.A. of Bogra
61.	Rani Bhabanis Palace
62.	Dubal Hati Palace.
63.	Mithapukur Mosque
64.	Chandipur Mosque
65.	Dariapur Mosque
66.	Bamondanga Temple
67.	Naldanga Temple
68.	Pirgacha Temple
69.	Sadra Temple
70.	Rajib Temple
71.	Tulshighat Temple
72.	Rasulpur Temple
73.	Bharat Khali Temple
74.	Bamondanga Palace
75.	Naldanga Palace
76.	Pirgacha Palace
77.	Itakumari Palace
78.	Rasulpur Palace
79.	Begum Rokeya's Palace

Additional Listed Sites But Not Mapped

Bogra district

1. Mahastan Mosque
2. Khader Pabor vita
3. Malkatir kunda
4. Bairagir Vita
5. Netai Dhopanis Ghat
6. Gobinda Dhap
7. Raja Gopinaths Dhap
8. Skandas Dhap
9. khamar Dhap
10. Dhon Bhander
11. Sadagar Bhita
12. Kacher Angina
13. Shashtitala
14. Rash Mancha
15. Dulu Majheer Bhita
16. Ojha Dhannantarir Bhita
17. Sannasir Dhap-A
18. Sannasir Dhap-B
19. Sannasir Dhap-C
20. Narapatir Dhap
21. Dakinir Dhap
22. Surdighir Dhap
23. Kanjirhari Dhap
24. Dhanapati Dhap
25. Malinir Dhap
26. Khullarnar Dhap
27. Lahnar Dhap
28 Madarir shrine
29. Padmer Bari
30. Vish Marden
31. Narapatir Dhap
32. Sanashir Dhap
33. Totaram Pandits Dhap
34. Mongol Kote
35. Shalbon Rajbari Debhi
36. Godair Bari Dhap
37. Madartola Nisan Mati Dibhi
38. Dolmoncha Dibhi
39. Kanai Dhap

Rangpur District

40. Batasan Dibhi
41. Birat Dibhi
42. Chapra Kote Dhibi
43. Dharmapal Gar

Dinajpur District

44. Aurun Dhap
45. Chor Chakrabarti Dibhi
46. Kaninchar Hari Dibhi
47. Baro Sykur Gar
48. Gopalganj Temple

Rajshahi District

49. Bara Annik Temple
50. Choto Annik Temple
51. Hawa Khana
52. Kest khepar Temple
53. Gopal Temple
54. Rush temple
55. Doll Temple
56. Shib Temple
57. Gobinda Temple
58. Gopal Temple
59. Nawda Buruj
60. Duruha hati Place
61. Badal Piller
62. Dhibar piller
63. Digha Patia Palace
64. Darash Bari Madrasa Dibhi
65. Danai Chak Mosque

Pabna District

66. Jor Bangla Temple
67. Bangla Temple
68. Rabindranath Tagor's Court
69. Nabaratna Temple
70. Bangla Temple
71. Birat Palace

Source: Dept of Archaeology and Museums, Dhaka and Study Surveys in Gaibandha District.

APPENDIX F

FISH SPECIES - PRELIMINARY DATA

SPECIES NO LONGER FOUND IN NWR

Scientific Name	English Name	Bangali Name
Family - Cyprinidae 1. Tor tor	Mahseer	Mohasol
Family - Cyprinidae 2. Labeo nandina	Major carp	Nandina
Family- Cyprinidae 3. Rasbora elanga	Minor carp	Along
Family- Polynemidae 4. Polynemus paradiscus	Thread-fin	Tapasi

SPECIES THREATENED IN NWR

Family- Cyprinidae 1. Labeo gonius	Major carp	Gonia
Family- Siluridae 2. Ompok pabda	Butter catfish	Pabda
Family- Clupeidae 3. Gudusia chapra	?	Chapila
Family-Bagridae 4. Mystus aor	Catfish	Aor, Ayra
Family- Mastacembelidae 5. Macrognathus aculeatus	Spiny eel	Tara baim
Family- Channidae 6. Channa punctatus	Snake Head	Taki
Family-Notopteridae 8. Notopterus chitala	Featherback	Chital
Family - Nandidae 9. Nandus nandus	Mudperch	Meni

NWR SPECIES PREVIOUSLY ABUNDANT, NOW SCARCE IN INLAND WATERS

SPECIES GROUP	LOCAL NAME	SCIENTIFIC NAME
Major Carps	Rui	Labeo rohita
Major Carps	Kalibaus	Labeo calbasu
Major Carps	Mrigal	Cirrhinus mrigala
Major Carps	Katla	Catla catla
Lesser Carps	Sarpunti	Puntius sarana
Lesser Carps	Nandil	Labeo nandina
Cat fish	Rita	Rita rita
Cat fish	Air	Mystus aor
Cat fish	Kaunia	Mystus menada
Cat fish	Tengra	Batasio and Mystus spp.
Cat fish	Kajuli	Ailia coila
Cat fish	Pangas	Pangasius batrachus
Cat fish	Magur	Clarias batrachus
Cat fish	Singi	Heteropneustes fossilis
Clupeids	Chapils	Gudusia chapra
Climbing Perch	Koi	Anabas testudineus
Climbing Perch	Khalisa	Colisa spp.
Snake Heads	Shol	Channa striatus
Snake Heads	Gajar	Channa marulius
Snake Heads	Taki	Channa punctaus

Source: IDA, Bangladesh Fishery Sector Review, October, 1990. Reports from Fisheries Department. Staff, Fishermen and Fish Traders during FAP2 Field Surveys.

PROVISIONAL LIST OF FISH SPECIES OCCURRING IN THE NORTH WEST REGION

Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : SYNGNATHIDAE				
Doryichthys cuncalus	Kumirer Khil	*		
Doryichthys chokderi	"	*		
Family : ANGUILLIDAE				
Anguilla bengalensis	Bamoch, Banehara	*		*
Family : SYNBRANCHIDAE				
Monopterus cuchia	Kuchia	*	*	
Family : TETRAODONTIDAE				
Tetraodon cutcutia	Tepa, Potka	*	*	
Chelonodon patoca	Potka	*		
Family : BELONIDAE				
Xenentodon cancila	Kakila	*	*	
Family : HEMIRHAMPHIDAE				
Hyporhamphus gaimardi	Ekthuita	*		
Family : CYPRINODONTIDAE				
Aplocheilus panchax	Kanpona	*	*	
Family : CHANNIDAE				
Channa striatus	Shol		*	
Channa marulius	Gajar		*	
Channa barca	Pipla, Tila		*	
Channa punctatus	Taki, Lata		*	
Channa orientalis	Gachua		*	
Family : PSILORHYNCHIDAE				
Psilorhynchus sucatio	Titari	*		*
Psilorhynchus balitora	Balitora	*		*
Psilorynchus gracilis	Balitora	*		*

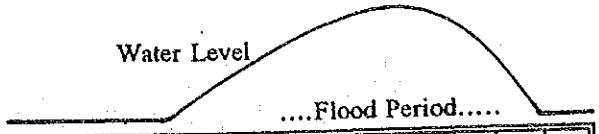
Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : CYPRINIDAE				
Oxygaster gora	Ghorachela	*	*	
Salmostoma bacaila	Katari	*	*	
Esomus danricus	Darkina		*	
Chela cachius	Chep chela	*		
Chela laubuca	Laubuca	*	*	
Aspidoparia jaya	Jaya	*		
Aspidoparia morar	Morari	*		*
Rasbora elanga	Along	*		
Rasbora rasbora	Darkina	*	*	
Rashbora daniconius	Darkina	*	*	
Barilius bola	Bhol, Bol	*		*
Barilius shacra	Koksa,Saku koksha	*		
Barilius titleo	Tila,Tila kakara,Patharchata	*		
Barilius barna	Koksa, Bani koksa	*		
Barilius vagra	Koksa, khoksa	*	*	
Danio devario	Debari chapehala	*	*	
Danio rerio	Anju	*		
Danio acquipinnatus	Chebli	*	*	
Amblyphayngodon mola	Mola	*	*	
Amblypharyngodon microlepis	Mola	*	*	
Rohtee cotio	Keti	*	*	
Chagunius chagunio	Jarua, Utti	*	*	*
Labeo gonius	Goni	*	*	
Labeo nandina	Nandil	*	*	*
Labeo calbasu	Kalibaus	*	*	
Labeo rohita	Rui	*		
Labeo angra	Angrot	*	*	*
Labeo bata	Bata	*		
Labeo boga	Bhangan	*		
Labeo dero	Kursha	*		
Cirrhinus mrigala	Mrigal	*	*	
Cirrhinus reba	Tatkini, Laacho	*	*	
Puntius sarana	Sarpunti	*	*	
Puntius chola	Chalapunti	*	*	
Puntius phutunio	Phutani punti	*	*	
Puntius conchonius	Takapunti	*		
Puntius tieto	Tit punti	*	*	
Pantius gelius	Gili punti	*	*	
Puntius sophore	Jat punti	*	*	
Puntius terio	Teri punti	*	*	
Puntius cosuatis	Kosati punti	*	*	
Tor tor	Mohashol, Mohal	*		
Tor putitora	Mohashol, Mahaseer	*		
Catla catla	Katla, Katal	*	*	
Crossocheilus latius	Kalabata	*		
Garra gotyla	Ghar Poia	*		*

Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : COBITIDAE				
Nemachilus botia	Balichata, Natwa	*		*
Nemachilus corica	Koirka, Korica	*		*
Nemachilus zonatus	Dari	*		*
Nemachilus savona	Savon Khorka	*		*
Acanthophthalmus pangia	Panga	*		*
Somileptes gongota	Poia, Pahari-gutum	*		*
Botia dario	Rani	*		*
Botia lohachata	Rani, Putul	*		*
Botia dayi hora	Rani, Purual	*		*
Lepidecephalus guntea	Gutum	*		*
Lepidocephalus annandae	Puiya	*		
Neoeucirrhichthys nalbant	?	*		*
Family : CLARIDAE				
Clarias batrachus	Magur	*	*	
Family : SILURIDAE				
Wallago attu	Boal	*	*	
Ompok bimaculatus	Kani pabda	*	*	
Ompok pabda	Madhu pabda	*	*	
Ompok pabo	?	*		
Family : HETEROPNEUSTIDAE				
Heteropneustes fossilis	Shingi	*	*	
Family : CHACIDAE				
Chaca chaca	Cheka	*	*	
Family : SCHILBEIDAE				
Silonia silonida	Shillong	*		
Pangasius pangasius	Pangas	*		
Ailia coila	Kajuli	*		
Ailiichthys punctata	Kajuli	*		
Pseudeutropius atherinoides	Batasi	*		
Eutropiichthys vacha	Bacha	*		*
Clupisoma murius	Muribacha	*		*
Clupisoma garua	Ghaura	*		
Family : AMBLYCIPITIDAE				
Amblyceps mangois	?	*		
Family : BAGRIDAE				
Rita rita	Rita	*		
Mystus aor	Ayre, Air	*	*	
Mystus seenghala	Guizza	*	*	
Mystus menoda	Ghagla	*	*	
Mystus cavasius	Golsha	*	*	
Mystus bleekeri	Tengra	*	*	
Mystus tengara	Bajari-tengra	*	*	
Mystus vittatus	Tengra	*	*	

Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : SISORIDAE				
Sisor rhabdophorus	Sisor	*		*
Cona conta	?	*		
Glyptothorax shawi	?			*
Glyptothorax riberioi	?			*
Pseudecheneis sulcatus	?			*
Gagala gagata	Gang-tengra	*		
Gagata viridescens	Gang-tengra	*		*
Gagata cenia	Cenia, Jungla	*		
Bagarius bagarius	Baghair	*		*
Hara hara	Kutakanti	*		*
Family : NOTOPTERIDAE				
Notopterus chitala	Chital	*	*	
Notopterus notopterus	Foli	*	*	
Family : ENGRAULIDAE				
Setipinna phasa	Phasa		*	
Setipinna taty	Teli-phasa		*	
Family : CLUPEIDAE				
Hilsa ilisha	Ilish	*		
Corica soborna	Kachki	*		
Ilisha motius	Choukka	*		
Gonialosa manminna	Chapila	*		
Family :MASTACEMBELIDAE				
Macrognathus aculeatus	Tara baim	*	*	
Mastacembelus armatus	Baim	*	*	
Mastacembelus pancalus	Baim	*	*	
Family : MUGILIDAE				
Rhinomugil corsula	Bata, Khalla	*		
Mugil cascasia	Bata	*		
Family : ANABANTIDAE				
Colisa sota	Boicha	*	*	
Colisa fasciatus	Khalisha	*	*	
Colisa lalius	Boicha	*	*	
Ctenops nobilis	Neftani	*	*	
Anabas testudineus	Koi	*	*	
Family : GOBIIDAE				
Glossogobius giuris	Bele	*		
Family : NANDIDAE				
Nandus nandus	Bheda	*	*	
Family : PRISTOLEPIDAE				
Badis badis	Koi-bandi		*	

Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family: SCIAENIDAE				
Pama pama	Poa	*		
Family : CENTROPOMIDAE				
Chanda nama	Chanda	*	*	
Chanda beculis	Chanda	*	*	
Chanda ranga	Chanda	*	*	

CAPTURE FISHERIES: FRESHWATER FISH AND PRAWN BREEDING PERIODS



FISH SPECIES/GROUPS	J	F	M	A	M	J	J	A	S	O	N	D
Major Carps:												
- Labeo spp, Catla catla				*	*	*	*					
- Cirrhinus Mrigala					*	*	*					
Minor Carps:												
- Oxygaster & Puntius spp				*	*	*	*	*	*			
- Rasbora, Danio, Rohtee spp				*	*	*	*					
- Esomus danricus								*	*	*		
- Amblyphryngodon				*	*	*	*	*	*	*	*	
Clupeids												
- Hilsa ilisha	*	*	*				*	*	*	*	*	
Catfish												
- Wallagu attu					*	*	*	*				
- Ompok spp.						*	*	*				
- Schilbeids (Pangasius,Clupisoma)			*	*	*	*	*	*				
- Clarias batrachus					*	*	*					
- Mystus spp				*	*	*	*	*				
Minnows												
- Aplocheilus panchax		*	*	*	*	*	*	*	*	*		
Snakeheads												
- Channa spp.				*	*	*						
Perciforms												
- Chanda nama			*	*	*	*	*	*	*	*		
- Nandus nandus				*	*	*	*	*				
Anabantids												
- Colisa spp.						*	*	*	*	*		
- Anabas testudineus						*	*					
Gobies												
- Glassogobius giuris			*	*	*	*	*	*	*	*		
Spiny Eels												
- Mastacembelus				*	*	*	*					
Freshwater Prawn												
- Macrobrachium resenbergii				*	*	*						

Sources: Account of the fishes of the Padma; M.S. Islam & M.S. Hossain, 1983.
MPO Technical Report No. 17, November 1985.
Freshwater Fishes of Bangladesh, A.K. Rahman, 1989.

APPENDIX G

IMPACT ASSESSMENT SHEETS FOR REGIONAL SUB PROJECTS

Table G.1 Assessment of Impacts for Mohananda

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
PHYSICAL									
Flood frequency and duration	0	+4	+3	0	-1	0	+4	+3	
Drainage conditions	0	-2	0	0	-2	0	-2	0	
Morphological change	0	0	0	0	-2	-1	0	0	
Seasonal groundwater availability	-2	-3	0	0	0	0	-1	0	
Water quality	-1	-3	-2	0	0	0	-2	0	
Soil quality	0	-2	-1	0	-1	0	-2	-1	
Disposal of construction spoil	0	-1	0	0	0	0	-1	0	
BIOLOGICAL									
Terrestrial species/habitat diversity	-3	-4	-3	0	0	0	-1	0	
Aquatic species/habitat diversity	-3	-4	-3	0	-3	-2	-1	0	
Habitats for threatened species	-3	-4	-4	0	-4	-3	-1	0	*
Pests and diseases	-3	-4	-3	0	0	0	-1	0	
Wetland functions and productivity	-2	-4	-2	0	0	0	-2	0	
SUSTAINABLE RESOURCE USE									
Crops and livestock	-3	-3	-3	0	0	0	0	0	
Fuel and energy	-4	-4	-4	0	0	0	0	0	
Capture fisheries	-2	-3	-2	-1	-2	-1	-1	0	
Culture fisheries	0	+4	+2	0	0	0	+4	+2	
INCOMES AND EMPLOYMENT									
Construction	0	+2	0	0	+1	0	+2	0	
Farming	0	+3	+2	0	0	0	+3	+2	
Fisheries	-1	-3	-1	-1	-2	-1	-2	0	
Navigation	0	-3	-2	0	-4	-1	-3	-2	*
Landless	-2	+2	0	-2	+1	0	+4	+2	
Equity	0	-4	-2	0	-4	-2	-4	-2	*
INFRASTRUCTURE									
Cross border developments	-2	-1	-2	-2	-3	-2	+1	0	
Road network	0	+3	0	0	+3	0	+3	0	
Navigation network	0	-4	-3	0	-5	0	-4	-3	*

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
SOCIAL									
Community and family cohesion	0	-4	-2	0	-4	-2	-4	-2	*
Impacts on women	0	-3	-1	0	0	0	-3	-1	
Impacts on children	0	-2	0	0	0	0	-2	0	
Minority groups	0	-4	-3	0	0	0	-4	-3	
Attitudes to flood risks	0	+4	+2	0	-2	-2	+4	+2	
Access to flood survival strategies	-2	-4	0	0	-4	0	-2	0	*
Land acquisition displacement	0	-4	0	0	0	0	-4	0	
Settlement patterns	0	0	0	0	0	0	0	0	
HEALTH AND SANITATION									
Nutritional disorders	-2	-3	-2	0	0	0	-1	0	
Water-related diseases	0	-3	-1	0	0	0	-3	-1	
Sewage and sanitary systems	0	-3	-1	0	0	0	-3	-1	
CULTURAL									
Archaeological, cultural and religous sites	x	x	x	x	x	x	x	x	
INSTITUTIONAL									
Public participation	0	-3	-3	0	-4	-3	-3	-3	*
Institutional complexity	0	-3	-2	0	0	0	-3	-2	
DAMAGE - RESPONSE TO HAZARD									
Design criteria floods	0	+3	+2	0	-1	0	+3	+2	
Exceptional floods and disasters	-4	-5	-4	-4	-5	0	-1	0	*
Drought losses (field crops)	0	-2	-2	0	0	0	-2	-2	
Liquefaction	0	-2	0	0	0	0	-2	0	

+1 = Slightly Beneficial, +2 = Somewhat Beneficial, +3 = Beneficial, +4 = Very Beneficial, +5 = Highly Beneficial

0 = No Reponse or Effect Detectable, X = No data sources to assess

-1 = Slightly Negative, -2 = Somewhat Negative, -3 = Negative, -4 = Very Negative, -5 = Highly Negative

Table G.2 Assessment of Impacts for Lower Atrai

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
PHYSICAL									
Flood frequency and duration	+1	+2	+2	-2	-3	-3	+1	+1	
Drainage conditions	-1	-2	-3	-2	-2	-2	-1	-1	
Morphological change	0	0	0	-2	-2	-2	0	0	
Seasonal groundwater availability	-3	-3	-3	0	0	0	0	0	
Water quality	-2	-2	-2	0	0	0	0	0	
Soil quality	-1	-1	-1	0	0	0	0	0	
Disposal of construction spoil	0	0	0	0	0	0	0	0	
BIOLOGICAL									
Terrestrial species/habitat diversity	-3	-4	-4	-3	-3	-3	-1	-1	
Aquatic species/habitat diversity	-3	-4	-4	-3	-3	-3	-1	-1	
Habitats for threatened species	-4	-4	-5	-4	-4	-4	0	-1	
Pests and diseases	-3	-4	-4	-3	-3	-3	-1	-1	
Wetland functions and productivity	-3	-4	-4	-3	-3	-3	-1	-1	
SUSTAINABLE RESOURCE USE									
Crops and livestock	-3	-3	-3	-3	-3	-3	0	0	
Fuel and energy	-4	-4	-4	-4	-4	-4	0	0	*
Capture fisheries	-1	-2	-4	-1	-2	-3	-1	-2	
Culture fisheries	+1	+2	+3	0	0	0	+1	+2	
INCOMES AND EMPLOYMENT									
Construction	0	+3	+4	0	+2	+2	+3	+4	
Farming	+3	+3	+3	0	0	0	0	0	
Fisheries	-2	-2	-3	0	-1	-2	0	-1	
Navigation	-2	-2	-3	0	-1	-2	0	-1	
Landless	-1	-1	-2	0	0	0	0	-1	
Equity	-3	-4	-5	-3	-4	-5	-1	-2	*
INFRASTRUCTURE									
Cross border developments	0	0	0	0	0	0	0	0	
Road network	+1	+2	+3	0	0	0	+1	+2	
Navigation network	-1	-2	-3	0	-1	-2	-1	-2	

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
SOCIAL									
Community and family cohesion	-2	-2	-4	-2	-2	-4	0	-2	*
Impacts on women	+2	+2	+3	0	0	0	0	+1	
Impacts on children	+1	+1	+2	0	0	0	0	+1	
Minority groups	0	0	0	0	0	0	0	0	
Attitudes to flood risks	+2	+2	+3	0	0	0	0	+1	
Access to flood survival strategies	+1	+1	+2	0	0	0	0	+1	
Land acquisition displacement	0	-2	-3	0	0	0	0	0	
Settlement patterns	0	0	0	0	0	0	0	0	
HEALTH AND SANITATION									
Nutritional disorders	-2	-2	-3	-2	-2	-2	0	-1	
Water-related diseases	-2	-2	-3	-2	-2	-2	0	-1	
Sewage and sanitary systems	-1	-1	-2	0	0	0	0	-1	
CULTURAL									
Archaeological, cultural and religous sites	x	x	x	x	x	x	x	x	
INSTITUTIONAL									
Public participation	-3	+1	-3	-3	+1	-3	+4	0	*
Institutional complexity	0	+3	-3	0	0	-3	+3	-3	*
DAMAGE - RESPONSE TO HAZARD									
Design criteria floods	0	+4	+4	-2	-2	-2	+4	+4	
Exceptional floods and disasters	-5	-5	-5	-5	-5	-5	0	0	*
Drought losses (field crops)	-1	-1	-1	0	0	0	0	0	
Liquefaction	-1	-1	-4	0	0	0	-1	-3	

+1 = Slightly Beneficial, +2 = Somewhat Beneficial, +3 = Beneficial, +4 = Very Beneficial, +5 = Highly Beneficial

0 = No Reponse or Effect Detectable, X = No data sources to assess

-1 = Slightly Negative, -2 = Somewhat Negative, -3 = Negative, -4 = Very Negative, -5 = Highly Negative

Table G.3 Assessment of Impacts for Hurasagar

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
PHYSICAL									
Flood frequency and duration	+1	+4		+1	0		+4		
Drainage conditions	0	-2		0	0		-2		
Morphological change	0	0		-5	-5		0		
Seasonal groundwater availability	0	-2		0	0		-2		
Water quality	0	-2		0	0		-2		
Soil quality	0	-3		0	0		-3		
Disposal of construction spoil	0	-1		0	0		-1		
BIOLOGICAL									
Terrestrial species/habitat diversity	-3	-4		0	0		-1		
Aquatic species/habitat diversity	-3	-4		0	0		-1		
Habitats for threatened species	-4	-5		0	0		-1		
Pests and diseases	-3	-4		0	0		-1		
Wetland functions and productivity	-1	-4		0	0		-3		
SUSTAINABLE RESOURCE USE									
Crops and livestock	-3	-4		0	0		-1		
Fuel and energy	-4	-4		0	0		0		
Capture fisheries	-2	-4		-1	-3		-2		
Culture fisheries	0	+2		0	0		+2		
INCOMES AND EMPLOYMENT									
Construction	0	+3		0	+2		+3		
Farming	+1	+3		+1	+1		+2		
Fisheries	-1	-3		-1	-2		-2		
Navigation	-1	-3		0	-2		-2		
Landless	+1	+3		+1	+2		+2		
Equity	+1	-3		+1	-3		-4		
INFRASTRUCTURE									
Cross border developments	0	0		0	0		0		
Road network	0	+3		0	+3		+3		
Navigation network	0	-3		0	-3		-3		

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
SOCIAL									
Community and family cohesion	+1	-3		+1	-3		-4		*
Impacts on women	-2	-3		-2	-3		-1		
Impacts on children	-2	-2		-2	-2		0		
Minority groups	0	0		0	0		0		
Attitudes to flood risks	+1	+4		+1	-3		+3		
Access to flood survival strategies	+2	+2		+2	-2		0		
Land acquisition displacement	0	-3		0	0		-3		
Settlement patterns	0	0		0	0		-3		
HEALTH AND SANITATION									
Nutritional disorders	-2	-3		-2	-3		0		
Water-related diseases	0	-4		0	0		-4		*
Sewage and sanitary systems	0	-3		0	0		-3		
CULTURAL									
Archaeological, cultural and religous sites	x	x		x	x		x		
INSTITUTIONAL									
Public participation	0	-3		0	-4		-3		*
Institutional complexity	0	-3		0	0		-3		
DAMAGE - RESPONSE TO HAZARD									
Design criteria floods	+1	+4		+1	+1		+3		
Exceptional floods and disasters	-1	-5		-1	-1		-4		*
Drought losses (field crops)	0	-1		0	0		-1		
Liquefaction	-4	-4		-4	-4		0		

+1 = Slightly Beneficial, +2 = Somewhat Beneficial, +3 = Beneficial, +4 = Very Beneficial, +5 = Highly Beneficial

0 = No Reponse or Effect Detectable, X = No data sources to assess

-1 = Slightly Negative, -2 = Somewhat Negative, -3 = Negative, -4 = Very Negative, -5 = Highly Negative

Table G.4 Assessment of Impacts for Bangali Drain

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
PHYSICAL									
Flood frequency and duration	0	+4	+2	0	+4	+2	+4	+2	x
Drainage conditions	0	+3	-3	0	+3	+2	+3	-3	
Morphological change	0	0	0	0	-5	-4	0	0	x
Seasonal groundwater availability	0	-4	-2	0	-4	-2	-4	-2	x
Water quality	0	-3	-2	0	-3	-2	-3	-2	
Soil quality	0	-2	-2	0	-1	-1	-2	-2	
Disposal of construction spoil	0	-5	0	0	0	0	-5	0	
BIOLOGICAL									
Terrestrial species/habitat diversity	-3	+1	0	-3	-3	+3	+4	+3	
Aquatic species/habitat diversity	-3	-4	-4	-3	+1	+2	-1	-1	
Habitats for threatened species	-4	-5	-5	-3	-5	-4	-1	-1	*
Pests and diseases	-3	-4	-4	-3	-4	-4	-1	-1	*
Wetland functions and productivity	-1	-5	-5	-1	-4	-1	-4	-4	*
SUSTAINABLE RESOURCE USE									
Crops and livestock	-3	-4	-4	-3	-4	-4	-1	-1	*
Fuel and energy	-4	-4	-4	0	0	0	0	0	
Capture fisheries	-2	-4	+4	-2	+4	+4	-2	+6	*
Culture fisheries	0	+4	+4	0	0	0	+4	+4	
INCOMES AND EMPLOYMENT									
Construction	0	+5	+5	0	+5	+5	+5	+5	*
Farming	0	+3	+3	0	-5	-3	+3	+3	
Fisheries	-2	-4	-3	0	+3	+4	-2	-1	*
Navigation	0	-4	-4	0	+5	+4	-4	-4	*
Landless	-1	-3	-2	-1	-3	-2	-2	-1	
Equity	+1	-3	-2	+1	-3	-2	+4	-4	*
INFRASTRUCTURE									
Cross border developments	0	0	0	0	0	0	0	0	
Road network	0	+3	+3	0	+3	+3	+3	+3	
Navigation network	0	-3	-3	0	+4	+3	-3	-3	*

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
SOCIAL									
Community and family cohesion	+1	-3	-3	+1	-4	-1	-4	-4	*
Impacts on women	-2	-3	-3	-2	-4	-2	-1	-1	*
Impacts on children	-2	-3	-3	-2	-4	-2	-1	-1	*
Minority groups	0	0	0	0	0	0	0	0	
Attitudes to flood risks	+1	+4	+2	+1	-5	-5	+3	+1	*
Access to flood survival strategies	+2	+3	+3	+2	+2	+2	+1	+1	
Land acquisition displacement	0	-4	-4	0	-5	0	-4	-4	
Settlement patterns	0	+3	+2	0	-4	0	+3	+2	*
HEALTH AND SANITATION									
Nutritional disorders	-2	-3	-3	-2	-4	-2	-1	-1	*
Water-related diseases	0	+3	-4	0	0	0	+3	+4	*
Sewage and sanitary systems	0	-3	-3	0	0	0	-3	-3	
CULTURAL									
Archaeological, cultural and religous sites	x	x	x	x	x	x	x	x	
INSTITUTIONAL									
Public participation	0	-3	-3	0	-4	-2	-3	-3	x
Institutional complexity	0	-3	-3	0	-4	-2	-3	-3	x
DAMAGE - RESPONSE TO HAZARD									
Design criteria floods	0	+4	+4	0	+4	+4	+4	+4	
Exceptional floods and disasters	-4	-5	-5	-4	-5	-5	-1	-1	*
Drought losses (field crops)	0	-4	-3	0	-4	-3	-4	-3	*
Liquefaction	0	0	0	0	0	0	0	0	

+1 = Slightly Beneficial, +2 = Somewhat Beneficial, +3 = Beneficial, +4 = Very Beneficial, +5 = Highly Beneficial

0 = No Reponse or Effect Detectable, X = No data sources to assess

-1 = Slightly Negative, -2 = Somewhat Negative, -3 = Negative, -4 = Very Negative, -5 = Highly Negative

Table G.5 Assessment of Impacts for Teesta Right Bank

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
PHYSICAL									
Flood frequency and duration	0	+4		0	-2		+4		
Drainage conditions	0	+2		0	0		+2		
Morphological change	-3	-1		0	-4		+2		*
Seasonal groundwater availability	0	-1		0	0		-1		
Water quality	-1	-2		0	-2		-1		
Soil quality	0	-2		0	-1		-2		
Disposal of construction spoil	0	-1		0	0		-1		
BIOLOGICAL									
Terrestrial species/habitat diversity	-3	-4		0	0		-1		
Aquatic species/habitat diversity	-2	-4		0	-2		-2		
Habitats for threatened species	-3	-5		0	-4		-2		*
Pests and diseases	-3	-4		0	0		-1		
Wetland functions and productivity	0	-4		0	0		-4		
SUSTAINABLE RESOURCE USE									
Crops and livestock	-3	-4		0	0		-1		
Fuel and energy	-4	-4		0	0		0		
Capture fisheries	-2	-4		-1	-3		-2		
Culture fisheries	0	+4		0	0		+4		
INCOMES AND EMPLOYMENT									
Construction	0	+4		0	+4		+4		*
Farming	0	+3		0	0		+3		
Fisheries	-1	-4		-1	-2		-3		
Navigation	0	-3		0	-2		-3		
Landless	-2	+3		-2	+2		+5		*
Equity	0	-1		0	-1		-1		
INFRASTRUCTURE									
Cross border developments	-2	-1		-2	-3		-1		
Road network	0	+3		0	+3		+3		
Navigation network	0	-3		0	-3		-3		

ISSUE/*Important Environmental Component*	*Impacts inside Target Area*			*Impacts Outside Target Area*			*Difference FW-FWO*		*Important External Issues*
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
SOCIAL									
Community and family cohesion	0	-3		0	-3		-3		
Impacts on women	0	-3		0	-3		-3		
Impacts on children	0	-3		0	-3		-3		
Minority groups	0	0		0	0		0		
Attitudes to flood risks	0	+4		0	-3		+4		
Access to flood survival strategies	-2	+1		0	-3		+3		
Land acquisition displacement	0	-3		0	-3		-3		
Settlement patterns	0	0		0	-2		0		
HEALTH AND SANITATION									
Nutritional disorders	-2	-3		-2	-2		-1		
Water-related diseases	0	-5		0	0		-5		*
Sewage and sanitary systems	0	-3		0	0		-3		
CULTURAL									
Archaeological, cultural and religous sites	x	x		x	x		x		
INSTITUTIONAL									
Public participation	0	-3		0	-4		-3		*
Institutional complexity	0	-3		0	0		-3		
DAMAGE - RESPONSE TO HAZARD									
Design criteria floods	0	+4		0	-2		+4		
Exceptional floods and disasters	-4	-5		-4	-4		-1		*
Drought losses (field crops)	0	-2		0	0		-2		
Liquefaction	0	-4		0	0		-4		

+1 = Slightly Beneficial, +2 = Somewhat Beneficial, +3 = Beneficial, +4 = Very Beneficial, +5 = Highly Beneficial

0 = No Reponse or Effect Detectable, X = No data sources to assess

-1 = Slightly Negative, -2 = Somewhat Negative, -3 = Negative, -4 = Very Negative, -5 = Highly Negative

Table G.6 Assessment of Impacts for Teesta Left Bank

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
PHYSICAL									
Flood frequency and duration	0	+1	0	0	-2	0	+1	0	
Drainage conditions	0	-2	-2	0	0	0	-2	-2	
Morphological change	-3	-1	-1	0	-4	-4	+2	+2	*
Seasonal groundwater availability	0	0	0	0	0	0	0	0	
Water quality	0	-1	-2	0	-2	-2	-1	-2	
Soil quality	0	-2	-2	0	-1	-1	-2	-2	
Disposal of construction spoil	0	-1	-1	0	0	0	-1	-1	
BIOLOGICAL									
Terrestrial species/habitat diversity	-3	-4	-4	-0	-0	-0	-1	-1	
Aquatic species/habitat diversity	-3	-5	-4	0	-2	0	-2	-1	
Habitats for threatened species	-3	-5	-4	0	-4	0	-2	-1	
Pests and diseases	-3	-4	-4	0	0	0	-1	-1	
Wetland functions and productivity	0	-4	-3	0	0	0	-4	-3	*
SUSTAINABLE RESOURCE USE									
Crops and livestock	-3	-3	-3	0	0	0	0	0	
Fuel and energy	-4	-4	-4	0	0	0	0	0	
Capture fisheries	-2	-4	-3	-1	-3	-1	-2	-1	
Culture fisheries	0	+2	+2	0	0	0	+2	0	
INCOMES AND EMPLOYMENT									
Construction	0	+2	+3	0	+2	+2	+2	+3	
Farming	0	+2	+2	0	0	0	+2	+2	
Fisheries	-1	-4	-3	-1	-2	-2	-3	-2	
Navigation	0	-3	-2	0	-3	-2	-3	-2	
Landless	-2	+2	+2	-2	+1	+1	+4	+4	
Equity	0	-1	-1	0	-1	-1	-1	-1	
INFRASTRUCTURE									
Cross border developments	-2	-1	-1	-2	-3	-3	+1	+1	
Road network	0	-3	+4	0	+3	+3	+3	+4	
Navigation network	0	-2	-2	0	-2	-2	-2	-2	

ISSUE/Important Environmental Component	Impacts inside Target Area			Impacts Outside Target Area			Difference FW-FWO		Important External Issues
	FWO	FW1	FW2	FWO	FW1	FW2	1	2	
SOCIAL									
Community and family cohesion	0	-3	-2	0	-3	-2	-3	-2	
Impacts on women	0	-3	-3	0	-3	-3	-3	-3	
Impacts on children	0	-3	-3	0	-3	-3	-3	-3	
Minority groups	0	+2	+2	0	0	0	+2	+2	
Attitudes to flood risks	0	+1	+1	0	0	0	+1	+1	
Access to flood survival strategies	-1	+1	0	0	-3	-2	+2	+1	
Land acquisition displacement	0	-3	-3	0	-3	-3	-3	-3	
Settlement patterns	0	0	0	0	0	0	0	0	
HEALTH AND SANITATION									
Nutritional disorders	-2	-3	-3	-2	-2	-2	-1	-1	
Water-related diseases	0	-4	-5	0	0	0	-4	-5	*
Sewage and sanitary systems	0	-3	-3	0	0	0	-3	-3	
CULTURAL									
Archaeological, cultural and religous sites	x	x	x	x	x	x	x	x	
INSTITUTIONAL									
Public participation	0	-3	-3	0	-4	-4	-3	-3	
Institutional complexity	0	-3	3	0	0	0	-3	-3	
DAMAGE - RESPONSE TO HAZARD									
Design criteria floods	0	+4	+4	0	-2	-2	+4	+4	
Exceptional floods and disasters	-4	-5	-5	-4	-4	-3	-1	-1	*
Drought losses (field crops)	0	-1	-1	0	0	0	-1	-1	
Liquefaction	0	-3	-3	0	-3	-3	-3	-3	

+1 = Slightly Beneficial, +2 = Somewhat Beneficial, +3 = Beneficial, +4 = Very Beneficial, +5 = Highly Beneficial

0 = No Reponse or Effect Detectable, X = No data sources to assess

-1 = Slightly Negative, -2 = Somewhat Negative, -3 = Negative, -4 = Very Negative, -5 = Highly Negative

APPENDIX H

GLOSSARY

Absorption: movement of pesticides from a surface into a body; the process by which a chemical is sucked or taken into plants or animals.
Acaricide: pesticides used to control mites and ticks.
Active Ingredient: the biologically active portion of a pesticide present in a formulation.
Adulterated: any pesticide whose strength or purity falls below the quality stated on its label. Also a food, feed or product that contains illegal pesticide residues.
Agro-ecosystem: an agricultural area sufficiently large to permit long-term interactions of all the living organisms and their non-living environments.
Aman: Rice grown during kharif-2 season with the exception of broadcast aman which is sown in the kharif-1 season and harvested in the kharif-2 season.
Aquaculture: Artificial and commercial cultivation of aquatic products.
Aus: Rice grown during the kharif-1 season.
Baniya: A local term meaning sudden onrush of water form overspill and through dyke breaches which causes extensive damage to crops, vegetation, livestock and property.
Baor: Ox-bow lake
Barga: Share cropping
Bari: A homestead consisting of a number of households in which the residents are related to one another usually by kinship
Barsha: Normal seasonal flooding
Baseline survey: A survey with the aim to provide and verify data on hydrological, engineering, agricultural, socio-economic and environmental aspects prior to during and on completion of the pilot project.
Beel: A natural depression, the bottom of which normally remains wet throughout the year
Beneficial Species: naturally-occurring insects and other organisms which prevent expansion of pest populations and reduce the severity of damage.
Biological Control Measures: methods which utilize naturally-occurring organisms to regulate pest populations at acceptable levels.
Biophysical: that part of the natural environment which includes physical, chemical and biological components such as air, soil, water quality, plants and animals.
Boro: Rice grown during rabi season
Bounding: is the process to determine spatial and temporal boundaries that an environmental impact assessment will include based upon physical, chemical, biological, social, economic, jurisdictional, and administrative factors.
Bungari: A local name of smuggling
Carcinogenic: producing or tending to produce cancer.
Compartment: An area in which effective water management, particularly through controlled flooding and controlled drainage, is made possible through structural and institutional arrangements. A compartment can be sub-divided into sub-compartments.
Compartmentalization: The spreading of the flood water over the flood plains by establishing interlinked compartments, with the objective to provide a more secure environment for agriculture, fisheries and integrated rural and urban development through water management (controlled flooding and drainage).
Compensation plan: is the portion of the Environmental Management Plan that describes the compensation measures that will be undertaken and committed to if a project proceeds. It includes how much compensation will be paid to whom, by whom, and under what conditions.

Compensation: is the provision for enhancement, replacement, restoration, and restitution for any damage done to the environment. Often there is payment in funds or replacement in-kind for losses attributed to a developed. Funds may also be used to recreate lost habitat or other valued resources.
Controlled drainage: The control of the water flow out of a (sub) compartment according to the local or regional requirements.
Controlled flooding: The spreading of the flood over the land in a (semi) controlled way with the help of provisions incorporated in compartments, embankments, roads, etc.
Cultural Control Measures: crop protection practices transferred from generation to generation, usually consisting of farm-based technology with little dependence on outside resources.
Cumulative impacts: are those environmental impacts that are recognizable in regional patterns of environmental deterioration caused by: a) multiple human activities; and/or b) natural events; which are either repeated or occur in combination. Example include lowering of the groundwater in a large regional aquifer or water pollution in the large river such as the Ganges. Global climate change is one of the largest cumulative effects on the planet.
Dadan: Advance sale of crops before harvesting
District: An administrative unit comprising a number of Upazilas in the charge of a Deputy Commissioner
Doon: An indigenous appliance for lifting surface water for irrigation from a height of less than a meter
Economic Threshold: the pest density at which control measures should be determined to prevent a population build-up to the economic injury level; a critical level at which the cost of control will be compensated by preventing further damage by the pest.
Ecosystem: is a marine, freshwater or terrestrial system or combination of systems that include some or all of the living and non-lining components. Boundaries of an ecosystem are often specified for a particular application.
Efficacy: a measure of the effectiveness of a particular pesticide against a specific target pest.
Environment: the totality of the natural and human environments on which the project will exhibit influence. It includes: a) all biophysical components of land, water and air and atmosphere, and all inorganic and organic matter, both living and dead: b) all socio-economic components including, but not limited to, social, economic, administrative, cultural, historical, archaeological, architectural, land and resource usage, structures, sites, and human health, nutrition and safety.
Environmental Protection Plan (EPP): is a plan that describes specific actions that will be undertaken during project design, construction, operation, rehabilitation and abandonment to lessen the effects of the project on the environment usually with specific instructions for personnel involved in project activities. It is a key component of the environmental management plan that integrates existing legislation, codes of good engineering practice, proponent commitment, and designated mitigation measures.
Environmental Effects Monitoring (EEM): is the taking of repetitive measurements of environmental components to detect changes caused by external influences directly or indirectly attributable to a specific anthropogenic activity or development. It is undertaken for many reasons such as: a) to improve environmental understanding of cause-effect relationships, b) to provide an early warning of undesirable change in the environment, c)to verify earlier EIA predictions, d) to evaluate uncertainty, and e) to check on the effectiveness of the environmental management plan.
Environmental Management Plan (EMP): is a plan to undertake an array of follow-up activities which provide for the sound environmental management of a project so that adverse environmental impacts are minimized and mitigated; beneficial environmental effects are maximized; and sustainable development is ensured.
Environmental Impact Assessment (EIA): is the environmental assessment report prepared at the feasibility level of environmental assessments.

Environmental impact: is in respect to a project, a) any change that the project may cause to the environment; b) any change to the project that may be caused by the environment; c) any cumulative effect caused or exacerbated by the project. [Note: environmental impact and environmental effect are considered as synonymous].
Environmental assessment: is the process for making environmentally-sound decisions in regard to ensuring the concept of sustainable development is achieved in respect to projects including plans leading to projects. It has three components. a)early planning to avoid environmental impacts, b)identification of environmental impacts, and c) environmental management plan to determine residual environmental impacts and their management.
Formulation: the combination of various ingredients designed to render a product useful and effective for the purpose claimed; the form of the pesticide as purchased by the users.
Fully-controlled structure: A structure through which the water flow can be fully regulated.
Fungae: small plant organisms that lack chlorophyll and which cause rots, mildews and other diseases (singular; fungus).
Fungicide: pesticide used to kill or control fungi which cause plant disease.
Gano: People
Haor: Water body formed in the monsoon season by the inundation of several beels under one continuous water body.
Herbicide: a substance or mixture of substances intended to control unwanted plants, including algae or aquatic weeds.
Hormone: Product of living cells that passes into the blood or plant fluid that produces a specific effect and thereby acts to modify its structure or function.
Host: animal or plant supporting a pest.
Impact matrix: is a square or rectangular array of rows (project activities) and columns (important environmental components) used for organizing the analysis of positive and negative environmental impacts of a project.
Important Environmental Component (IEC): are environmental components of biophysical or socio-economic importance to one or more interested parties. The use of important environmental components helps to focus the environmental assessment.
Infestation: vermin, insects, weeds or diseases occurring in or about a place where they are regarded as pests.
Initial Environmental Evaluation (IEE): is the environmental assessment report prepared for a regional or pre-feasibility level study. It is considered to be a pre-feasibility level of environmental assessment.
Insecticide: any substances or mixture of substances intended for preventing, killing, repelling or controlling an insect pest.
Insignificant Environmental Effect: is a residual environmental effect that is not considered significant regardless of level of associated mitigation.
Integrated Pest Management: a pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible to maintain the pest populations at levels below those causing economically unacceptable damage or loss.
Interested Party: include residents of the plan or project area, elected Bangladesh representatives, Government of Bangladesh officials in various departments, Bangladesh professionals, non-governmental organizations (NGOs), the general public in Bangladesh, and donor organizations.
Jalmahal: A leased out water body

Justified in the circumstances: occurs when circumstances occur, which when balanced against the public interest, public health ad safety, and the protection of natural resources, constitute the best alternative for ensuring sustainable development.
Kabiraj: Traditional herbal practitioner
Kathi: A local weight unit of paddy, equivalent to 16.74 kg. of paddy
Kendra: Centre
Key Pest: an insect pest or disease normally present at some time during the growing season that causes economic damage to a crop.
Khal: Natural channel
Kharif 2: Late summer and fall (July through October)
Kharif 1: Early summer (March through June)
Khasland: State owned land
Macha: A temporary flood-protection shelter made of bamboo on higher platform
Magnitude: is the degree of change in a important environmental component that results from a project activity.
Mahila: Women
Mauza: Revenue village with a separate Jurisdiction List Number.
Mirajdar: A local name for Jalmahal lease holder
Miticide: pesticide used for the control of mites and ticks; same as acaricide.
Mitigation: is the elimination, reduction or control of the adverse environmental impacts of a project. Mitigation measures are specified in the environmental management plan.
Monsoon: Period of rain starting in June and ending in October
Mouza: The smallest revenue unit
Mulluscicide: pesticide used for the control of snails and slugs.
Multi-criteria Analysis: A wide ranging analysis and display of impacts of proposed structural and non-structural works in which many criteria are used. Impacts can be quantified in financial terms, or may be evaluated using a scale from -5 to +5, or dealt with in a descriptive way.
Nematocide: pesticide used to control nematodes.
Niketan: Home
Oncogenic: relating to tumour formation; ending to cause tumours.
Organochlorines: a group of synthetic organic pesticides which contain carbon chlorine and hydrogen and which are generally very persistent with long residual effects.
Organophosphates: a group of synthetic organic pesticides which contain carbon and are derived from phosphoric acid esters, such as parathion, malathion, DDVP and diazinon.
Pagard: A small water body, generally excavated near a home stead, which is used for fish stocking as well as for household activities.
Pahari Dhol: A local term for baniya or flash floods
Pangu: Paralysed
Parasite: a plant, insect or organism that lives and feeds on or in a living host plant, insect or animal.
Pathogen: an organism or agent that lives on host plants and is capable of causing disease.
Persistence: the ability of a pesticide to remain effective for a period of time. Persistence is dependent upon such properties as resistance to chemical breakdown and volatility.
Pest: any animal, plant or pathogen which causes damage or annoyance to humans, their animals, crops or possession.
Pesticide Residue: pesticide remaining on or in a plant or treated area following a time lapse after application.

Pesticide: any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or substances administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant-growth regulator, defoliant, desiccant, or agent for thinning fruit or preventing the premature fall of fruit, ad substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.
Plant Growth Regulator: substance or mixture causing acceleration or retardation of the rate of growth or rate of maturation.
Predator: an animal (mammal, bird, insect) which feeds on and destroys other animals.
Project Phase: the main project activities expressed sequentially: preconstruction, construction, operation and abandonment.
Project Stage: refers to the main stages of project planning including: pre-feasibility (regional study), feasibility, and design.
Proponent: in respect to a project, means the person, body, authority, environment or donor that proposes the project, or who is responsible for the environmental assessment or implementation of the project.
Pyrethroid: a group of synthetic pesticides with structures resembling the natural pyrethrins, which have high biological activity and generally lower mammalian toxicity than other insecticidal groups.
Rabi: Winter season (November through February)
Rapid Rural Appraisal: A systematic, but semi-structured activity carried out in the field by a multi-disciplinary team and designed to quickly acquire information on, and new hypotheses for integrated rural development.
Record: is any correspondence, memorandum, book, plan, map, drawing, diagram, pictorial or graphic work, photograph, film, microfilm, sound recording, videotape, machine readable record, and any other documentary material, regardless of physical form of characteristics, and any copy relating to them.
Residue: any substances in food, agricultural commodities, or animal feed resulting from the use of a pesticide. The term includes derivatives of a pesticide, such as conversion products, metabolites, reaction products, and impurities of toxicological significance. "Pesticide residue" includes residues from unknown or unavoidable sources, as well as known uses of the chemical.
Resistance: (a) a characteristic that exists or is developed by natural selection that enables a pest population to survive the poisonous effect of a pesticide; (b) a complex of properties of plants or animals that enables them to fight, partially or completely, the pathogenic effects of infection.
Rodenticide: pesticide used to control rats, mice and other rodents.
Sahajogi: Collaborative
Samity: Association
Scoping: is the process by which the important environmental issues, project alternatives and important environmental components are identified by the interested parties.
Selective Pesticide: a pesticide which kills specific pest species, but spares the crops and many other organisms, including beneficial species, either through different toxic action or because of the manner in which the insecticide is used.
Semi-controlled structure: an unregulated structure that can not be regulated.
Shangstha: Organisation
Shishu: Children
Significant environmental impact: an adverse residual environmental impact that is not justified.

Socio-economic: the human environment which includes social and economic components that are not termed biophysical.
Somobay: Co-operative
Species: a group of plants or animals, with similar characteristics and common name, that reproduce true to type.
Sub-Compartment: a sub-unit of a compartment, in which water management might be controlled by the people living in the area represented in a Water Committee. The sub-compartment is mostly separated from the adjoining ones by embankments or roads provided with (semi) controlled structures.
Sustainable development: many definitions have been coined one is - development that ensures preservation and enhancement of environmental quality, and sound and sustainable use of natural resources thereby providing for economic growth which meets the needs of the present without compromising the ability of future generations to meet their own needs (adapted from the Brundtland Commission, 1987).
Systemic: a pesticide which is translocated to other parts of a plant or animal than those to which the pesticide is applied.
Taka: name of Bangladesh currency
Teratogenic: a substance causing physical birth defects or deformities in unborn animals following exposure of pregnant females.
Tolerance: (a) a term referring to the amount of pesticide that can remain in a plant or animal product to be eaten by humans or animals (same as Maximum Residue Limit); (b) ability of a plant to develop even though attacked by disease or insects; (c) ability to resist the effect of a pesticide.
Toxicity: a physiological or biological property which determines the capacity of a chemical to do harm or produce injury to a living organism by other than mechanical means.
Union: Smallest administrative unit of the Local Government
Unnayan: Development
Upazila: An administrative unit (now a Thana) comprising a number of Unions.
Water management: Controlled management of surface and ground water throughout the year.
Weeds: unwanted plants as defined by one group, often another group sees productive values in the same category.

Sources: FAP 16, FPCO, NWRS Supporting Volumes and fieldwork.

APPENDIX I

STUDY TEAM AND LIST OF RESEARCH SOURCES

List of Personnel Involved in Study

Tom Franks, Team Leader
Don Moore, Regional Planner
Bryan Spooner, Impact Analysis Co-ordinator
Faruq Aziz Khan, Environmentalist
A. Mahmoud, Assistant Environmentalist
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K.A. Annam, Terrestrial Ecologist
Dr. M. Bhouyain, Aquatic Ecologist
Dr. A. Taludar, Water Quality Surveyor
Pat Watson, Fisheries Specialist
Dr. Shahidat Ali, Fisheries
O.Ejaz, Fisheries
Mohammad Azam Ali, Health and Nutrition
Advocate Afsana Wahab, Health and Nutrition
S.M. Rahman, Archaeologist
Shahad Ali, Navigation and Country Boats
Jim Monan, Sociologist
Marion Glazier, Sociologist
David Todd, Sociologist
M.D. Kibria, Rural Sociologist
Jhanna Nath, Junior Sociologist
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H. Terashima, Implementation Planner
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M.A. Aziz, Agricultural Economist
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S.N. Anwar, Hydrologist
Dr.Charles Reeve, Hydraulic Modeller
Nigel Walmsley, Hydraulic Modeller
Anwar Hossain, Hydraulic Modeller
Roger Bettess, Morphology Modeller
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M. Sakamoto, River Engineer
S. Watanabe, River Engineer
Shahidul Alam, River Engineer
Subash Roy. River Engineer
T. Imai, Drainage Engineer
H. Araki, Drainage Engineer
H. Tanabe, Design Engineer
N. Nishihata, Soil Engineer
S. Chowdhury, Drainage Engineer
M.S. Ali, Drainage Engineer

D. List of Agencies and People Contacted

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Shamsul Huda
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Mujibul Huq, Co-Team Leader

International Panel of Experts
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Jim Dempster
Steve Jones, Socio-Economist
Hugh Brammer, Agriculturalist
Ed Clay, Economist

Kathy Alison, Flood Action Plan Conference Organiser

World Bank
Ross Wallace
Ted Hermann
Abdul Salam

ODA
John Hoy
Peter Roberts
Linda Brown

REGIONAL FAP STUDIES

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Chris Pastakia, Environmentalist

North Central Region (FAP 3)
Don Brown, Team Leader,
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M. Le Gash, Agricultural Economist
Jim Scullion, Fisheries Specialist
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Jamulpur Priority Project (FAP 3.1)
Alan Bird, Environmentalist
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South West Region (FAP 4)
Raj Thiagarajah, Team Leader
Mike Pooley, GIS Specialist
Mr D U Khan, Environmentalist
Tony Watkins, Agricultural Economist
Chris Pastakia, Environmentalist

South East Region (FAP 5)
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Rodney Dyer, Engineer
Dan Marsh, Economist
Antony Baker, Regional Planner
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Alan Bird, Environmentalist

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FAP 9A Secondary Towns Protection
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FAP 20 Compartmentalisation
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FAP 23 Flood Proofing / FAP 14 Flood Preparedness
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Mr Mahmoud
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FAP 25 Hydraulic Modelling
Alistair McDonald
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Jamuna Bridge Environmental Study
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Deep Tubewell Programme
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