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Analysis of trend & impacts of fisheries land use implications of Bangladesh

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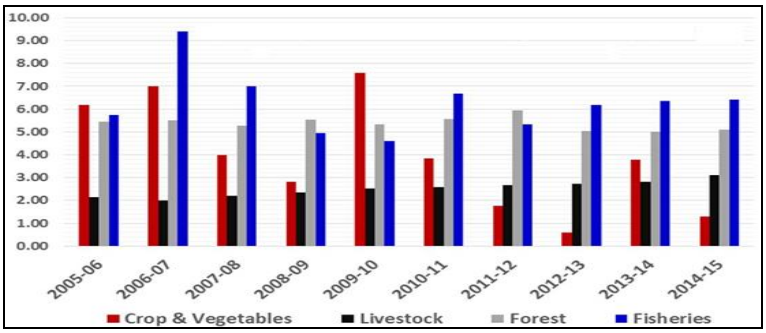
Abstract
The vision 2021 of the Bangladesh Government targeted to achieve its goals of self-sufficiency in food and thus increased food security, which includes attaining self-sufficiency in fish production for which a clear long-term policy is needed. In the development of fisheries policy, inter-government departmental coordination, coordination between Government and NGOs, and the stimulation of public response are important. Following the fisheries policy, the GoB must enact a comprehensive legal framework for the proper management and utilization of its resources for the purposes of the sustainable development of the country and well-being of its population. Although social and economic influences greatly affect the use of land and water bodies, it is becoming generally recognized that the classification of land and water bodies should be based on its natural characteristics rather than upon the skill of the individual operating it or upon prevailing economic conditions. This is essential if the classification is to serve as a basis for the most intensive sustained use consistent with preservation of the land and water bodies as a permanent productive resource.

Keywords: fisheries, land use, land zoning, blue economy, shrimp. Hilsa fish

Introduction

Bangladesh is blessed with the world richest and most diversified inland aquatic ecosystem having a wide variety of aquatic resources such as rivers - canals, depressions and ox-bow lakes (baor), ponds and floodplains (haor), covering a huge area of water resources of 4.70 million hectares. Besides, there is a huge marine fisheries resources expanding over an Exclusive Economic Zone (EEZ) of 1, 66,000 sq. km. As an aqro-based country, the contribution of fisheries sector to national economy has always been considered important and main source of animal protein, employment opportunities, food and nutritional security, foreign earnings, aquatic biodiversity conservation and socio-economic development. Fisheries sector contributes 3.69% to GDP and 22.60% to agricultural GDP. Last 10 years average growth performance of fisheries sector was around 5.4. Fish supplements to about 60% of our daily animal protein intake and about 11% of the population depends directly and indirectly on the fisheries for their livelihood. The national fisheries production of Bangladesh showed an increasing trend. It was 22.48 lakh MT in 2005-2006 that was gradually increased to 36.84 lakh MT in 2014-2015 (*Figure 1*)**.**



***Source*:** Fisheries Statistical Report of Bangladesh, (July 2014 - June 2015)

Fig 1: Sector wise GDP growth rate (%) during last 10 years.

Bangladesh is ranked on 4th in the world inland fish production by capture and also is ranked 5th in world aquaculture production according to FAO's state of world fisheries and aquaculture 2015 [14] (FAO's state of world fisheries and aquaculture 2015) [14]. The survival of ecologically sensitive wetlands is a burning issue which needs due importance for maintaining our rich fisheries ecosystem. LRM (land Resource management) are very important for ensuring easy access to wetland by the beneficiaries that they could get the ownership and active maximum per unit production from the particular water body. Fisheries Land Zoning is necessary for formulating plan and proper utilization of fisheries resources. It is necessary for a sustainable development of fisheries

resources to ensure fish production and nutrition security. A detailed study has been taken up to increase fish production of the country.

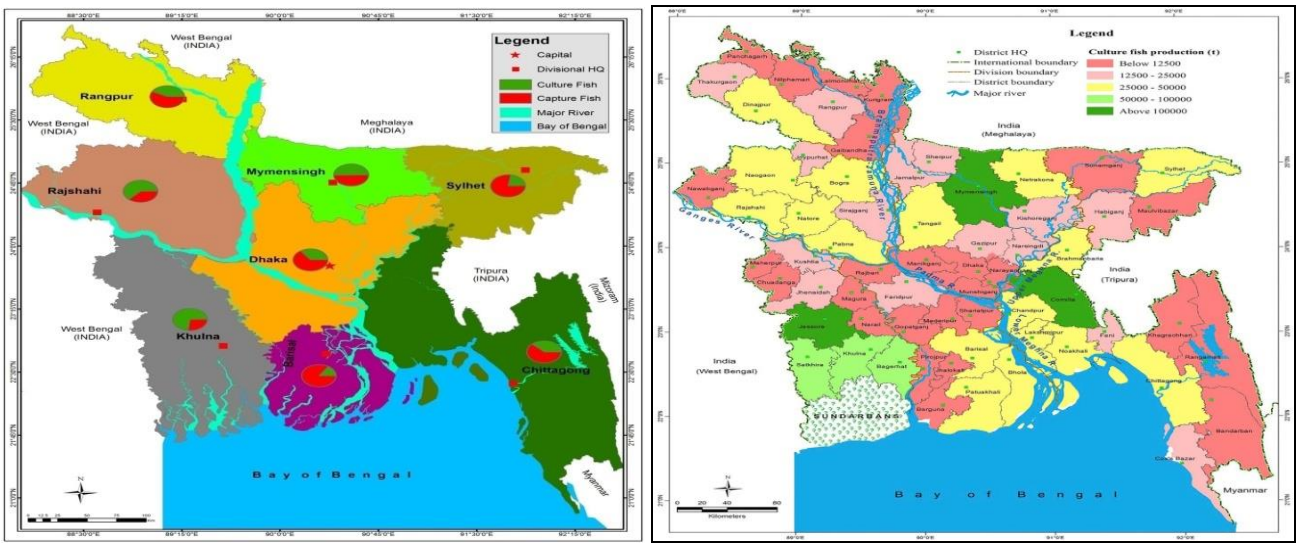
Objectives of the Study

The present study aimed at achieving the following objectives-

- To develop an inventory and assessment of capture and culture fisheries area and their current status;
- Proper Utilization of Blue Economic Resource;
- To make inventory of wetlands and it's zoning for conservation and management;
- To identify protective measures for our wetland habitats and its sustainable development.

Data Sources and Methodology

The present research is totally based on secondary data. Secondary data for this study has been collected in two steps. In first step, before going to field, literatures such as journal, articles, book chapters, reports, seminar/conference proceedings, these and important websites were consulted. In second step, NLZP team has been carried out up to union level to collect all kinds of relevant data, maps, reports and information from field survey using proper tools and techniques. The relevant secondary data on fisheries land uses, satellite image classification and information pertinent to present status of fisheries had also been collected from Department of Fisheries (DoF), BBS and CEGIS respectively to develop a data bank for classifying land and water bodies on the basis of fisheries land suitability and assign it to one or a few specific uses for which the land will technically most suitable and economically viable. Study has been conducted through PRA tools like Key Informant Interview (KII) with the related fish farmer, local people and government officials to determine present fisheries land use situation. Information has also been taken mainly from Fisheries Statistical Year Book of Bangladesh of DoF (2014-2015) [7] and present field observations from (2007-2012 and 2013 to 2015) under two projects ministry of land, Bangladesh named Study of Detailed Coastal Land Zoning with Two Pilot Districts of Plain Land Project and NLZP. Primarily, Bangladesh was divided into 4554 unions based on the occurrence of Fisheries Land. Data were manually processed and thus frequency distribution was prepared. Analysis was done mostly with bar charts, pie charts and line graphs. Now the wetland distribution, wetland status of capture and culture fisheries and fisheries production of last 10 years have been consolidated to arrive at district figures subsequently divisional figure followed by national figure. The trend and impacts of these extreme events in Bangladesh was calculated and a comparison was also made (Map 1).



Map 1: Present Fisheries Land Use Map of Bangladesh and spot Point of this study (NLZP Field survey 2013-2015, BBS 2011, CEGIS 2013, FRSS 2015)

Present Sector Wise Fisheries Status in Bangladesh

Bangladesh is among the countries with large number of people vulnerable to the potential impacts of climate change. The extensive coastal floodplains in the lower Ganges-Brahmaputra delta are important for natural fisheries, shrimp farming, agriculture, and other natural resources including the Sundarbans mangrove forest. The livelihoods of over 160 million people are based largely on the biodiversity of this region. However, the inhabitants are already prone to floods, cyclones, salinity intrusion, and seasonal drought, and the incidence of these hazards is rising.

Fresh water culture fisheries of Bangladesh represent the mainstay of pond aquaculture, gher, canal, haor, baor etc. Total areas of capture and culture fisheries in Bangladesh are 1,22,4398 hectare and 8, 44, 756 hectares respectively (Table: 1).The average fish production of Bangladesh capture fisheries is 750kg/ha and culture fisheries (pond aquaculture) is1800kg/ ha (DoF 2015, NLZP field survey 2013-2015) [8].

Bangladesh is one of the world's leading fish producing country. The fisheries production of Bangladesh showed an increasing trend. The national fisheries production over the last four decades the fish production increased almost five times 7.54 lakh MT in 1983-84 to 36.84 lakh MT in 2014-15 (Fig 1.1).

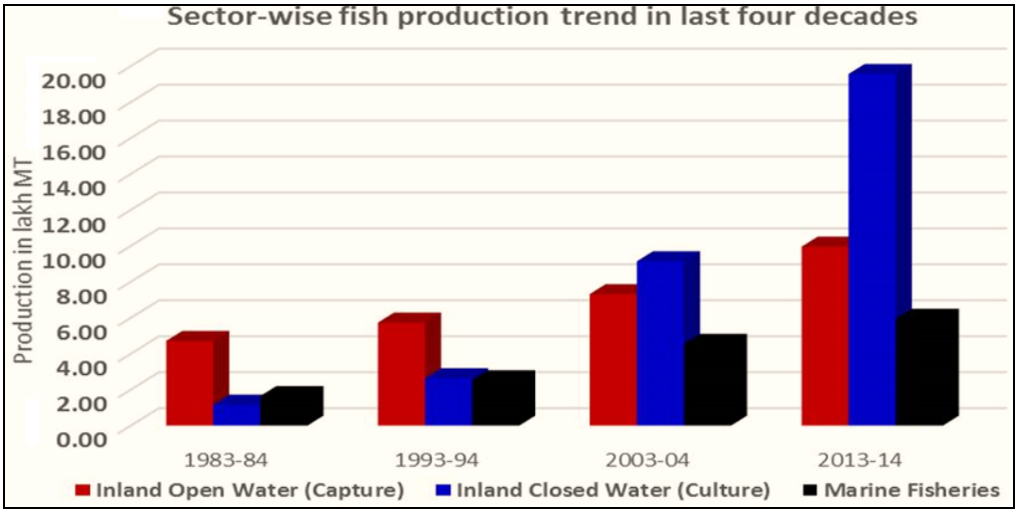


Fig 1.1: Sector-wise fish production trend during last four decades (Fisheries Statistical Report of Bangladesh, July 2014 - June 2015)

The overall growth performance from inland aquaculture shows a moderate increased trend due to dissemination of improved technological packages and supportive/ need-based extension services at farmer's level. During the last seven years, the aquaculture production became more than double 10.06 lakh MT in 2007-08 to 20.60 lakh MT in 2014-15(Fig 1.1). A slight growth in the production from both inland capture and marine fisheries was also noticed during the recent past years with some exceptions. At present Bangladesh is ranked 4th in inland capture fisheries production and 5th in aquaculture production all over the world.

Productivity status of Bangladesh is prospective due to application of scientific technical knowledge about stock enhancement, seed production, and old culture technology, pond management system. Basic inputs like fish seeds, fish feeds and other on-farm inputs are available to most ponds, gher owners. More especially availability of quality seeds is single largest limitation in expansion of aquaculture. But due to two cyclones (known as Ailaand Sidr) seriously affected in fishery sector 2007-2010 in Bangladesh. These natural calamities have been stressful to the already vulnerable livelihood strategies of many poor people: fish catches are declining, and demand for labour has fallen resulting in rural to urban migration. Climate change will exacerbate many current problems and natural hazards due to increasingly frequent and severe tropical cyclones leading to more damage, heavier and more erratic rainfall, resulting in higher river flows, river bank erosion, and sedimentation, melting of the Himalayan glaciers, lower and more erratic rainfall, and sea level rises (The International Climate Change Strategy and Action Plan 2008,) [9]. So should be needed demonstration of aquaculture technology.

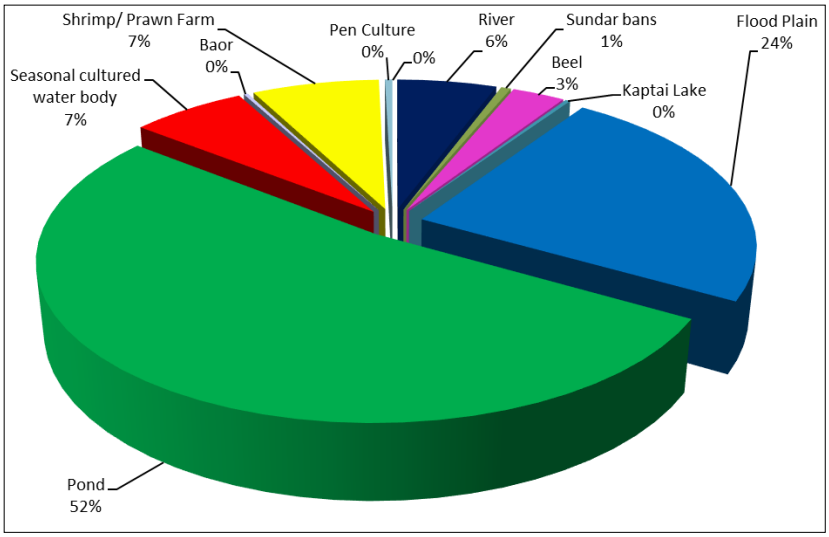


Fig 1.2: Sector-wise Annual Fish Production in Inland Water 2014-15(Fisheries Statistical Report of Bangladesh, July 2014 - June 2015 NLZP field survey 2013-2015, Study of Detailed Coastal Land Zoning with Two Pilot Districts of Plain Land Project under Government of the People's Republic of Bangladesh, Ministry of Land, 2009)

The present study has identified that the pond, shrimp farmers, hatchery owners and nursery owners in Bangladesh are severely affected by climate change. Maximum shrimp/fish farmer said that they are fully unknown to severity of climate change, they cannot market their crops in proper time, they face late PL availability, high price of PLetc and they become economically looser. Climate change is inevitably a challenge for fisheries and aquaculture in the region. The aquaculture production has been greatly reduced due to uncertain climate change in the southwest region of Bangladesh.

Fisheries Land Use Distribution of Bangladesh

Bangladesh is regularly flooded by flash floods the Padma, the Jamuna, the Teesta, the Meghna, the Brahmaputra and the Surma River. The affected areas remain water logged for a few days after every flood and thus sustain severe damage. The areas are often lashed by cyclones. Landslides are a common occurrence during the monsoon. People blamed increasing siltation of the rivers due to soil erosion, deforestation, faulty agricultural practices, etc., for the land - slides. River bank erosion results in substantial losses of people's farming and homestead lands, livelihoods and assets. Besides causing destruction of the physical infrastructure like roads, bridges and market centers, river erosion uproots people from their communities and social networks. Most of the land remains fallow in the dry season (January- May) because of soil salinity, lack of good quality irrigation water and late draining condition (Karim *et al*., 1990; Mondal, 1997 and SRDI, 2001) [10, 11, 12].

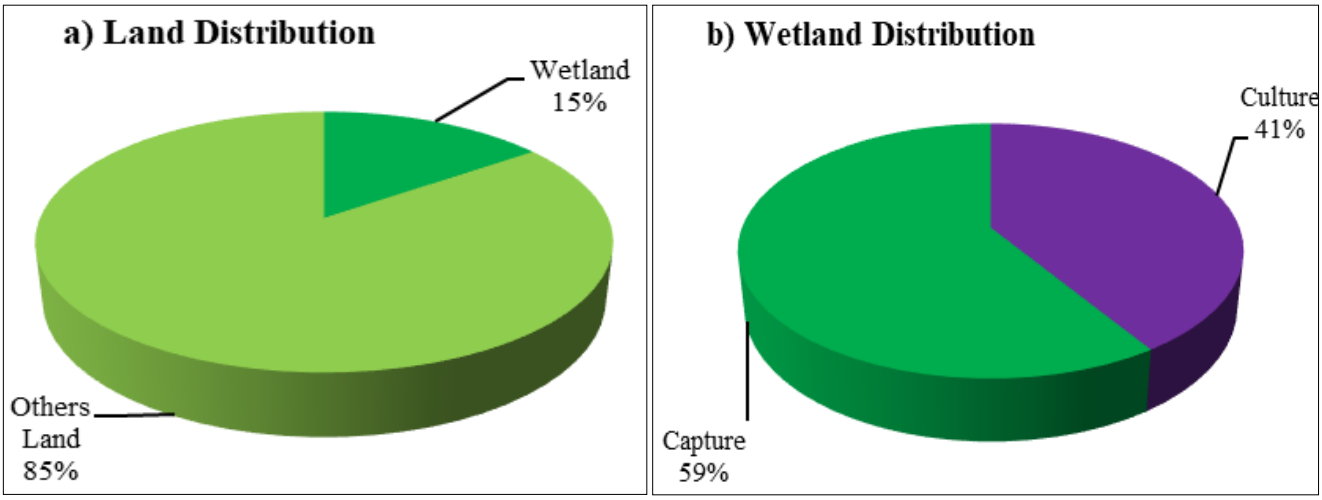
Bangladesh Bureau of Statistics publishes land utilization statistics regularly on a national basis. Emphasis remains mainly on agriculture. Land uses are classified as: net cropped area, current fallow, current waste, forest and area not available for cultivation. Recently, an estimate was made capturing based on broader perception of land use and recognizing seasonal variations (ASB 2003) [13]. Two complications were identified: areas under river and water bodies increase greatly in the wet season and estuarine/riverine chars cultivated during dry season, goes under water in wet season.

As already mentioned land use in coastal Bangladesh is diverse, competitive and conflicting. Land uses have gone through major changes. Land use in the 50s had been mainly for paddy cultivation. Salinity intrusion and tidal flooding prevented further intensification. Hence, in the 60-80s, more than hundred polders were built. Paddy production boosted. A decade later, drainage congestion inside and heavy siltation outside the polder made the south-west area, unsuitable not only for agriculture but in extreme cases, even for human habitation. As southwest has a history of traditional shrimp farming, polders provided opportunity for intensive shrimp farming. Land for agriculture, mangroves was transformed to shrimp farming. This created social conflict (Islam 2005) [14]. Moreover, About 60% of the lands are inundated to a depth of 30cm or more. Agriculture, shrimp farming, salt production, forestry, ship breaking yards, ports, industries, settlements and wetlands are some of the major uses and are described in detail below. Dominant land use in all coastal districts is still agriculture. Bangladesh has a total wetland area of 2069154.71 hectare of which1224398 hectares are under open water capture fisheries and 844756.3 hectares are under culture fisheries. Land distribution including wetland, wetland distribution of capture and culture fisheries under different division has been shown below (Table 1.).Barisal, Sylhet and Khulna division shows good potential for fisheries production of Bangladesh which covers 39.69%, 23.46% and 22.62% of total wetland respectively.

Table 1: Wetland Distribution of Bangladesh (Area in Hectare Excluding Sundarban and Bay of Bengal):

Division Name	Division Area	Culture Fisheries		Total culture	*Total capture (In dry season)	Total Wetland
		Pond Culture	Others culture			
Rangpur	1537930	32051.73	15013.98	47055.82	64358.37	111414.2 (7.24%)
Sylhet	1256010	24014.51	20457.11	36922.87	128902.6	294728.1 (23.46%)
Mymensingh	1029506	42451.93	18281.65	60737.39	59762.51	120499.9 (11.70%)
Dhaka	1910618	41241.29	32758.75	73967.54	138226.1	212193.6 (11.10%)
Rajshahi	1,769,047.49	67199.89	66352.2	133907.5	78,913.53	212821 (12.03%)
Khulna	1637225	64718.71	205751.9	270466.8	100035.8	370502.6 (22.62%)
Barisal	1235219	38944.92	46753.34	77839.49	412881.69	490298.93 (39.69%)
Chittagong	3299293	91514.47	69202.2	143858.9	241317.8	385176.7 (11.67%)
Total	1,3674848.49	402137.5	474571.1	844756.3	1224398	2069154.71 (15.13%)

***Source*:** BBS 2011,*GIS data from CEGIS 2013, NLZP Field Survey 2013-2015



***Source*:** BBS 2011,*GIS data from CEGIS 2013 and Field Survey2013- 2015)

Fig 1.3: a) Distribution of Land b) Distribution of Capture & Culture Fisheries Wetland of Bangladesh.

Out of total area of 13674848.49 hectare 15% represents wetland which covers 59% capture and 41% culture fisheries respectively (*Figure 1.3 a, b).* Generally it varies in dry and wet season. During dry season, situation of water level becomes alarming. As the progressive river siltation occurs, this reduces the water holding capacity of the water bodies. On the other hand, these water bodies are also dried up quickly in the dry season as they are located at a higher elevation.

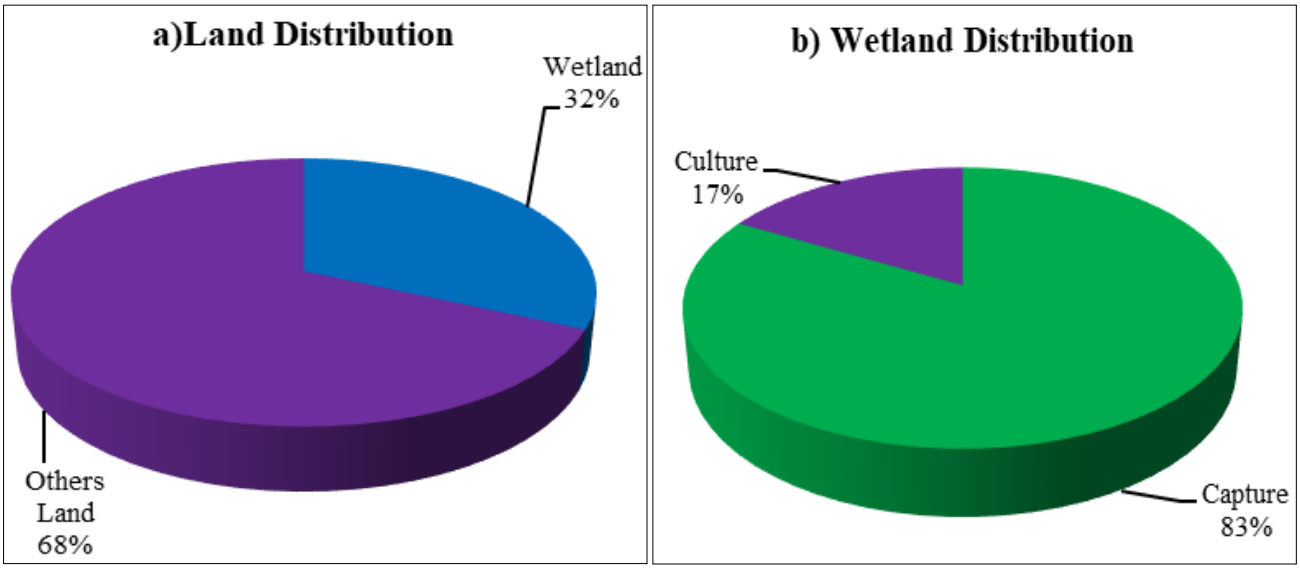


Fig 1.4 a) Distribution of Land b) Sector Wise Wetland Distribution of Bangladesh. (Fisheries Statistical Report of Bangladesh, July 2014 - June 2015)

Out of total area of 4700795 hectare 32% represents wetland which covers 83% capture and 17% culture fisheries respectively (*Figure 1.4: a,b*).The national wetland area is higher than that of our study survey area report due to inclusion of Sundarban and bay of Bengal area.

Open Water Capture Fisheries o Bangladesh

Bangladesh has potential of inland open water fisheries resources that consist of the seasonal water bodies, rivers, natural depressions or beels and reservoir. There are above 19.2 million people involved and beneficiaries in fisheries activities of Bangladesh. Despite the existence of huge resources the inland capture fisheries have been replaced as top fish producing sources over the years by aquaculture due to decline and degradation of resources. But, over a few years aquatic biodiversity especially fish species and other aquatic organism in inland open water have been declined due to natural and anthropological causes. The priority is given to improved biological management that will restrict the degradation of resources and production. Major native capture species are:

Anabas testudineus (koi), *Clariasbatrachus* (magur), *Hetropneustesfossilis* (sing), *Channapunctatus* (taki), *Ompokpabda*. (pabda), *Mystustengra* (tengra), *Notpterusnotopterus* (foli), *Glossogobiusgiuris* (baila), *Gadusiachapra* (chapila), *Chandaranga* (chanda), *Colisa* sp. (kholisha), *Chanastriatus* (shoal), *Salmostomaphulo* (chela), *Amblypharyngodonmola* (mola) and small indigenous fish like *P. sarana* (raj punti), *Mastacembalus spp.*(baim), *M. gulio* (gulsha), *Nadus nandus* (raina), *Ailia coila* (bashpata), *Xenentodon cancila* (kakila), *Scoliodonsorrakowah (*hangor*)* and shrimp species like bagdachingri *(Penaeusmonodon),* (*P. japonicus),* chagachingri *(Peneaus. indicus)* etc.It is very alarming that these open water fisheries are now under threat due to different man-made causes and natural hazards.

Closed Water Culture Fisheries in Bangladesh

Bangladesh is blessed with huge open water resources with a wide range of aquatic diversity. Biodiversity is also enriched, comprising almost 260 freshwater fish species. But due to mainly decline and degradation of wetland resources, the share of inland capture fisheries has been reduced remarkably during the two and half decades. In 1983-84, the contribution of inland capture and culture fisheries to total fish production were 62.59 % and 15.53% , respectively; whereas in 2014-15, inland culture fisheries contributes 55.93 percent to total fish production(Fisheries Statistical Report of Bangladesh, July 2014 - June 2015). At present improved biological management is the first priority in the development policy that will restrict the declination of resources and enhance production

Fresh water aquaculture is an important component of Bangladesh. The culture fisheries of Bangladesh include ponds, cage culture, pen culture, shrimp /prawn farm, baor, seasonal water body, canals and are also gradually coming under culture-based capture fisheries practice. The seasonal water bodies, aquaculture pond and the gher offering tremendous scope and potential for augmenting fish production by adopting aquaculture based enhancement techniques in Bangladesh. It is expected that with the introduction of scientific method of fish culture, the present production will be increased substantially. Closed water aquaculture has been practicing in a total area of about 844756.3ha which cover about 41% of total inland water *(Fig 1.3: b).* On the other hand, covering an area of about

7.89 lakh ha and produces more than 56% of the total fish production (Fig: 1.5).

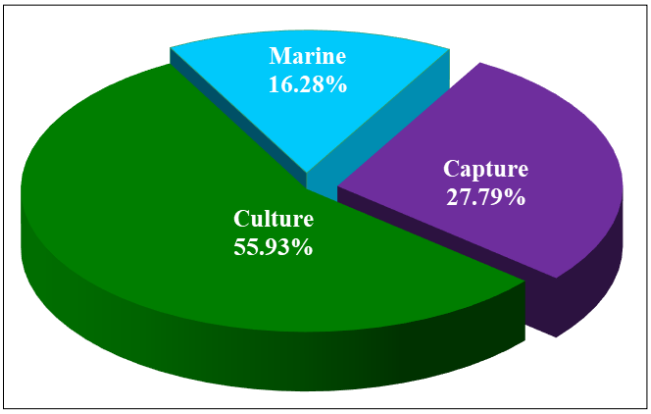


Fig 1.5: Sector wise land distribution of Bangladesh
(Fisheries Statistical Report of Bangladesh, July 2014 - June 2015)

This output is contributed mainly due to adoption of improved farming practices. In addition, vast paddy fields have enormous potential for rice-fish farming. Considering the agro-ecological context of the country, there is a wide scope of flourishing the fisheries resource potentials both at vertical and horizontal dimensions. Realizing the sector potentials, government/DoF along with development partners and NGOs has implementing different initiatives to maximize fish production in a sustainable manner. Major native culture species are:Rui (*Labeo rohita*), Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*) Kalibaus (*Labeo calbasu*), Bata (*Labeo Bata*),Silver Carp (*Hypophthalmichthys molitrix*), Grass Carp (*Ctenopharyngodon idella*), Common Carp (*Cyprinus carpio*),Pangas (*Pangasius pangasius*), Boal/Air/Guizza Air (*Wallago attu/ Sperata aor /Sperata seenghala*), Shol/Gazar/Taki (*Channa striatus/C.* Magur (*Heteropneustes fossilis/Clarias batrachus*), Tilapia/Nilotica (*Oreochromis mossambicus/ O. niloticus*), Sarpunti (*Puntius sarana*).

Problems of Capture & Culture Fisheries in Bangladesh

- Indiscriminate use of destructive fishing gears like current jal (mono filament twin net).
- The fish species diversity and stocks were under threats of depletion due to indiscriminate and uncontrolled harvesting.
- Indiscriminate harvesting of brood/mother fish during breeding season.
- Deposition of silt in river mouths limits migration of fish to upstream.
- Extensive use of pesticides and agro-chemicals ultimately hamper spawning and damage fish habitats.
- The demand for agricultural production, particularly cereals, encourage attempts to dry out the wetland with a reduction in the capture area particularly beel and its fisheries resources.
- Erratic rainfall, prolong flooding, six month dry season and sandy soil is a major problems for full time aquaculture practices.

Suggested Measures for Development of Capture & Culture Fisheries in Bangladesh

- Current net must be stopped by creating public awareness.
- Use of destructive gears must be prohibited.
- Formulation of land zoning for fisheries areas and its implementation is an immediate necessity.
- Deposition of silt from the river mouths should be removed to facilitate fish migration.
- Provision for fish passes should be kept at vital points during construction of roads, sluice gate, cross dam and embankments etc.
- Prohibition law on fish fry collection should be implemented properly.
- Transfer of wetland for other purposes/uses is to be strictly prohibited.
- Cage aquaculture and pen culture techniques should be practiced in capture fisheries.
- Before construction of embankment, road, culverts etc. its impacts on fisheries and other aquatic fauna and flora should be assessed properly.
- Establishment of fish sanctuary and beel nursery in the suitable areas.
- Intensive stocking of fingerlings with free of cost in open water bodies (river, canal, creeks, etc.) should be initiated by Department of Fisheries.

Fisheries Land Suitability in Bangladesh

The physical and chemical characteristics of an area have great influence on the suitability of land for different types of fisheries. The soil pH value, water quality and land type of medium low land (MLL) of different district of Bangladesh are mostly suitable for both capture and culture fisheries. The criteria and characteristics relevant for fresh water fish cultures that are shown in (Table 1.1).

Table 1.1: Land Suitability Matrix for Fresh Water Fish Culture: (According to soil nutrition status and pH)

Productivity Rating	pH Level	Nutrition Component Level (mg/kg Soil)		
		Nitrogen	Phosphorous	Carbon
High	7.5-6.5	> 50	6-12	> 1.5
Medium	6.5-5.5	25-49	3-5	0.5-1.4
Low	< 5.5	< 25	< 3	< 0.5

***Sources*:** CEGIS, 2005, DoF, 2014 [7]

Bagerhat, Khulna, Satkhira, and Cox',s Bazar districts are suitable for shrimp and fresh water prawn culture. The criteria and characteristics relevant for shrimp/prawn culture that are shown in (Table 1.2).

Table 1.2: Land Suitability Matrix for Shrimp/Prawn Culture:

Land Quality	Land Characteristics	Unit	Factor Rating			
			S1	S2	S3	S4
Water quality	Surface water salinity	ppt	Below 5to above 29	5-7	7-12	<12
Toxicity	Soil reaction	pH	6.5-7.4	5.5-6.5& 7.5-8.0	5.0-5.5& 8.0-8.5	<5-0&>8.5
Land type	Depth of inundation	Depth (cm)	90-180	30-90	0-30& above 180	Permanent water

***Sources*:** CEGIS, 2005, DoF, 2014 [7]

Impact of land zoning over fisheries in Bangladesh

Land use &Zoning is a tool, which defines the demarcation of geographic areas with specific combinations of properties or features of the soil. The kind of features, which are chosen and the interpretation of their different combinations depend on the purpose of the zoning exercise. Land use is most often used for properly maintenance of bio-diversity in the area for research and planning purposes. Regarding fisheries in Bangladesh, proper land use and zoning can help for protection of fish habitat, nursery areas, and as well as habitat restoration of the fisheries ecosystem. It does not usually address fisheries operations such as controls on harvesting (e.g., sizes, seasons, gear type etc).Land zoning can also support fisheries management, overfishing problems and multiple resources use conflicts of Bangladesh.

Hilsa Fishery Conservation and Management

There are four species of two genera of Hilsha are available in the country. They are given below:

1. *Tenualosailisha* (ilish);
2. *T. toli* (Chandanailish*);*
3. *Hilshakele*;
4. *H. kanagurta* (Gurta/kana gurta).

***Source*:** Fisheries Statistical Report of Bangladesh, July 2014 - June 2015

Fig 1.6: Hilsa fish Production in Bangladesh during Last 10 years

Among four species Hilsa (*Tenualosailisha*), is an anadromous fish commonly known as Indian shad that is honored as the national fish of Bangladesh. Hilsa originates from Northern Indian Ocean (Persian Gulf) and outspread eastern side up Myanmar, but mostly available in Bay of Bengal region. Approximately 0.45 million fishermen directly depend on Hilsa fishing

For their livelihood and 2.5 million people are indirectly dependent on Hilsa fishery value chain. More than 10% of the county's total fish production comes from Hilsa. By protecting jatka and brood Hilsa, Hilsa production increased from 1.99 lakh MT in 2003-2004 to 3.87 lakh MT in 2014-2015 (Fig: 1.6) whose market value is 15,500 crore Taka. Barisal, Noakhali, Chandpur, Patuakhali, Bhola and Barguna districts could be declared as Hilsa zone in Bangladesh. By proper management of Hilsa spawning ground and sanctuary areas we could redouble the Hilsa standing crop.

Shrimp/Prawn

Shrimp is an important foreign currency earning sector in Bangladesh. Total shrimp and prawn production including capture has been increased from 1.60 lakh MT in 2002-2003 to 2.24 lakh MT in 2014-2015(Fig: 1.7). Black tiger shrimp (*PenaeusMonodon*), Bagda grows faster and bigger in size, the species is very popular for coastal aquaculture among other species available in Bangladesh. With the increasing demand of shrimp and prawn in the international market rapid expansion of shrimp farming was observed in dyke elevated rice field (locally known as gher). By 2015 over 2, 16,468 ha of land were brought under shrimp culture. The highest production of bagda was observed in Bagerhat, Khulna, Satkhira, and Cox,s Bazar. That is why these areas could be declared as shrimp (bagda) zone. In 2014-2015, bagda production in Bangladesh was 75,274.00 MT. The Giant fresh water prawn (*Macrobrachium rosenbargii*) called as Golda in Bangladesh, were being trapped and reared with other fishes in the tidal pond and low lands.

Picture: Different types of catching fish by the fisherman

Generally, the species were harvested from the river/canals, flood plains and beels which have connectivity with rivers. At present Golda is being cultured in gher in organized way along with other aquaculture, agriculture and horticulture crops. Different culture systems such as monoculture, poly-culture along with other fish and prawn culture in paddy fields along with paddy are being practiced. Currently golda are farming in gher, pond and paddy field covering on area of about 0.63 lakh ha. In 2014-15, golda production in Bangladesh 42,053.00MT (Figure 1.7)

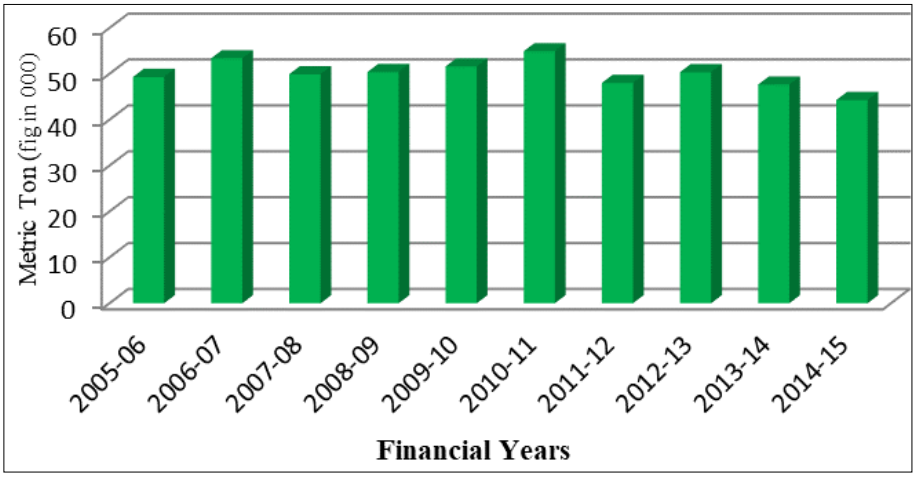


Fig 1.7: Shrimp/Prawn Production in Bangladesh during last 10 years.
(Fisheries Statistical Report of Bangladesh 2015, NLZP Field survey 2013- 2015)

Blue Economy

Blue economy is the marine- based economic activities. It conceptualizes oceans and seas as Development Spaces/ where spatial planning integrates conservation, sustainable use of living resources, oil and mineral wealth extraction, bio-prospecting, sustainable energy production and marine transport, Marine ecosystem and resources have key role in supporting food security, sustainable livelihood, economic opportunities and social inclusion of billions of people. Bangladesh has now achieved exclusive economic and territorial rights over the sea extending 200 nautical miles into the Bay of Bengal, a substantial share of outer continental shelf beyond 200 miles and 19.31 km (12 nautical miles) of territorial waters around the St. Martin Islands. Bangladesh can now establish rights over maritime resources such as oil, gas, fish and the entire aquatic wealth that lies within its territorial waters, exceeding its original claim of 1, 18,813 square km. Blue economy gives us main marine fisheries resources for animal protein. On the other hand, it earns a lot of foreign exchange from export. After liberation commercially Bangladeshi marine fisheries resources exploration and exploitation and commercial processing have been started. The unique ecosystem of our sea harbors 475 fish, 36 shrimp, 5 turtles, 5 lobsters, 19 seaweeds species that supports huge fisheries activities comprising 247 industrial trawlers and over 50 thousand motorized and non- motorized Chandi boats facilitates employment and income generating opportunities over million peoples contributing poverty reduction. If we can ensure sustainable and effective management of our marine fisheries resources we can increase production from marine waters manifold which will give a new shape to our economy and livelihood.

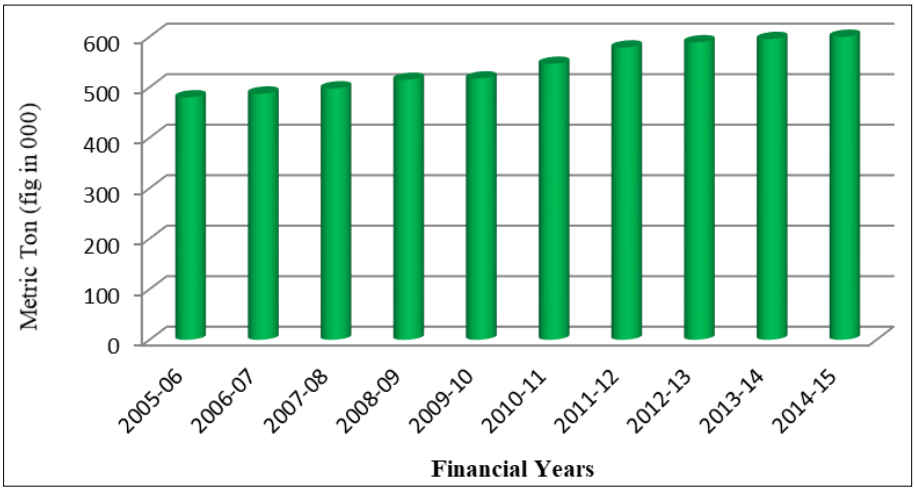


Fig 1.8: Marine Fish Production in Bangladesh during Last 10 Years (Fisheries Statistical Report of Bangladesh, July 2014 - June 2015, NLZP 2013-2015)

Haor

Haors are large saucer-shaped flood plain depressions which are enriched with various aquatic bio-diversities along with numerous fish species and wild birds' especially migratory birds which visited the wetlands annually. The extreme flashy character of the rivers and high rainfall causes frequent flash floods in the haor. Haor fisheries are crucial in providing food, income and employment for thousands of people. Typical yields from these flooded areas (haor) are between 200-300 kg/ha. Both habitat restoration and fish enhancement are important in sustaining the haor fisheries. Greater Mymensingh and greater Sylhet districts, known collectively as Haor basin in covering an area of approximately 24500 sqkm (Flood Action Plan 1993) [9]. The haor basin includes about 47 major haors and some 6300 beels of varying size, out of which about 3500 are permanent and 2800 are seasonal (Wetlands of Bangladesh, May, 1994, BCAS).

Kishoreganj, Netrakona, Brahmanbaria, Habiganj, MoulviBazar, Sunamganj, Sylhet are the districts where the majority haor basin situated in Bangladesh with an area of 228823 ha with

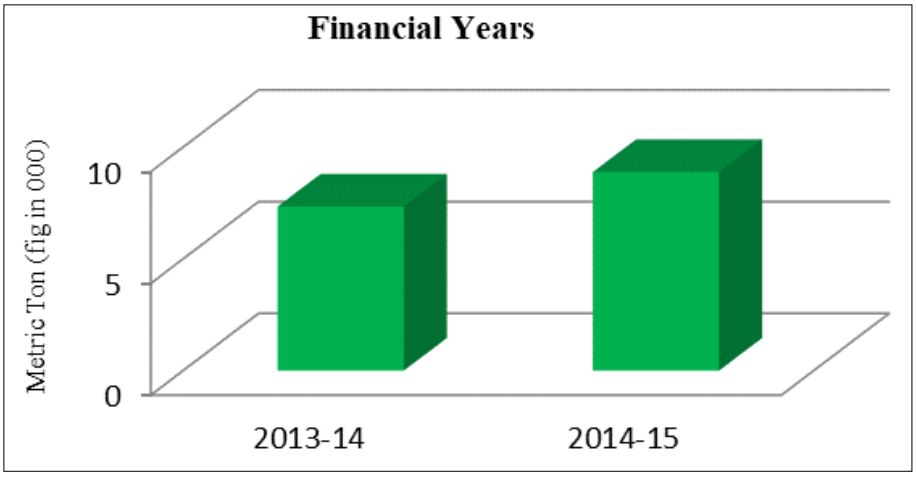


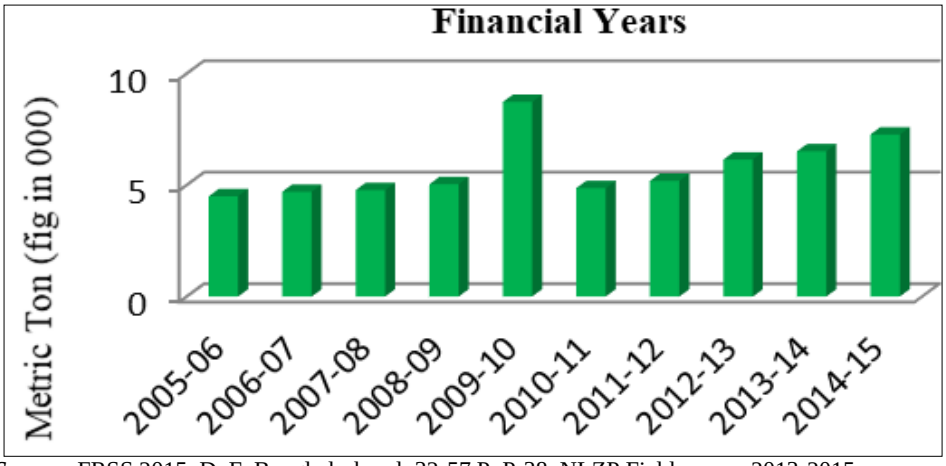
Fig 1.9: Haor Fisheries Production Last 2 Years Fisheries Statistical Report of Bangladesh, Fisheries Resource Survey System (FRSS), 2016, DoF, Bangladesh vol. 32-57 P, P-21-22, and NLZP Field Survey 2013-2015

Approximate production of 88856 MT in 2014-15 (Fig 1.9). Hail haor, Hakalukihaor, Gurmarhaor, Tanguarhaor, Kawadighihaor, and Balaihaor systems have got internationally importance in Bangladesh. That is why the above seven districts could be declared as haor zone. Besides Flood Plain area which are used for fish culture during monsoon.

Baor

An oxbow lake (Baor) is a dead section of a river, created when the river changed their course. The name oxbow lake refers to the shape, which is like a horse shoe or ox yoke. An oxbow lake is like a horse shoe or ox yoke. An oxbow lake normally is still of the flood plain of the river, to which it is connected by inlets and outlets. By screening the inlets and outlets a baor can be converted in a culture based fishery. But now days ecologically baors refer as closed water ecosystems. Baors are situated in the moribund dalta of the Ganges in greater Kushtia, greater Jessore and greater Faridpur (Wetland of Bangladesh, May, 1994, BCAS). Baors are perennial source of water. These are used for fish culture throughout the year.

Gopalganj, Madaripur, Rajbari, Faridpur, Jessore, Jhenaidah, Magura, Meherpur, Chuadanga, Kushtia, Narail, Satkhira and Khulna are the districts where the major baors situated in Bangladesh with an area of 5488 ha, with total production of 1,324 MT in 2014-15 (FRSS, 2015, Fig 1.10). That is why the above twelve districts could be declared as baor zone.



***Source*:** FRSS 2015, DoF, Bangladesh vol. 32-57 P, P-38, NLZP Field survey 2013-2015

Fig 1.10: Baor fish Production in Bangladesh during Last 10 years

Kaptai Lake (Kaptai Reservoir)

The only large artificial wetland is Kaptai reservoir formed as a consequence of a hydro-electric dam completed in 1963, and which flooded over 76,600 ha of pristine forested valleys and cultivated land in the Chittagong Hill Tracts (Akonda, 1989) [19].

Kaptai Lake is one of the most important fresh water bodies which is the largest man made fresh water resource in the South East Asia as well as Bangladesh. Though the Kaptai Lake was created primarily for hydroelectric power generation it contributes to produce significant quantity of fresh water fishes, navigation, flood control and agriculture etc. Particularly the lake is confined within the hill districts covering the upazilas of Rangamati Sadar, Kaptai, Naniarchar, Langadu, Bagaichhari, Barkal, Juraichhari and Belaichhari. Like other water bodies of Bangladesh, diversified and many fish species and some other fisheries items are found in Kaptai Lake. A study of Chakma *et al* (2007) [20] shows that 74 fresh water fish species and 2 prawn species are available in the Kaptai Lake.

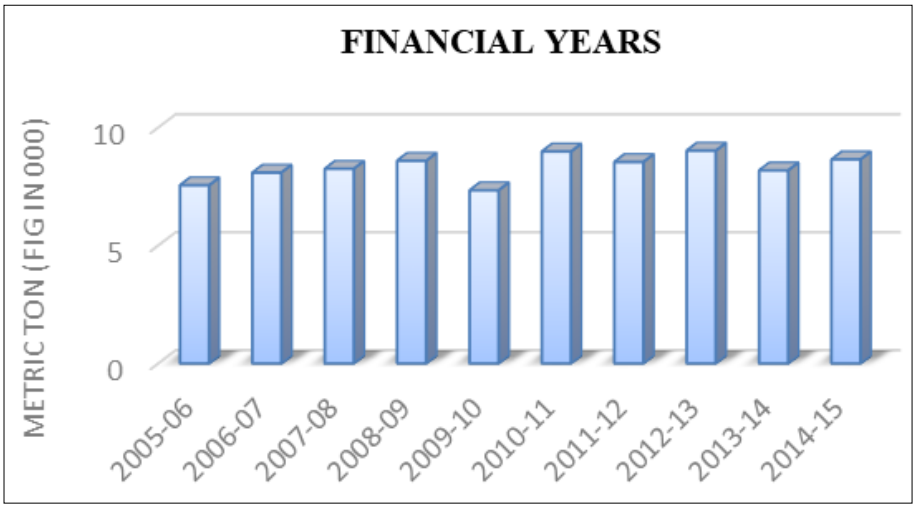


Fig 1.12: Kaptai Lake fish Production in Bangladesh during Last 10 years

(BFDC-2015, NLZP Field survey2013- 2015, BBS 2011, CEGIS 2013)

Recently a giant sucker Mouth Cat Fish (*Hypostomuspaleco stomus*) has been found in the deeper portion of Kaptai Lake. Total surface area of Kaptai Lake is 68,800 hectare and average water depth is about 9 meters with maximum depth of 32 meters. Fish production of Kaptai Lake was 8645 MT in 2014-15 (Fig 1.12) that is why Rangamati Hill District could be declared as Kaptai Lake Fishery Zone.

Conclusion and Suggestion

Fisheries sector of Bangladesh face several challenges such as over-fishing, fisheries resources degradation. A number of factor are responsible for fisheries resources degradation which construction of roads and embankments, together with drainage, flood control and natural siltation, the use of pesticides and fertilizers, pollution, upstream damming in major river systems (Islam, 2012). The massive infrastructure of roads and embankments, urbanization and housing projects has blocked many water bodies. This condition has adversely affected breeding and spawning of many indigenous fish species. Consequently many water areas, previously rich in fisheries, now fish became scanty. Main strategies to reverse these effects should be as follows: control pollution, prevent further deterioration of water flows and shrinkage of water-bodies through infrastructures, like embankment, roads, urban housing projects, and industrialization. Establish and maintain fish and wetland sanctuaries in certain eco-sensitive areas like the Sundarbans, Kaptai Lake, rivers, floodplains and coastal and marine waters. The conservation strategy could potentially include the seasonal ban, gear restriction, species

restriction.

In conclusion, the Bangladesh fisheries have ample scope of development to strengthen the national economy. To realize the potential, there is a need to adjust the existing laws and legislation of the country for integrated resource management and for conservation of the fisheries resources. Bangladeshi fishers, fish farmers, traders, processors, and general people as a whole need to understand these issues, to be involved in the formulation of management plans, and to benefit from the whole process. The management measures should include regulating fishing intensity at a sustainable level, control gear selectivity, gear type and size of fish, implementation of closed season, prohibition of destructive fishing, closed fish sanctuary, and allocation of resources (finance, manpower) for fisheries. Concerned government departments, development partners, researchers and non-government organizations can play important role in the wide-ranging advancement of the fisheries sector. This study has identified potential causes for this decline including habitat degradation due to siltation and conversion of wetland to agriculture, increasing fishing pressure, destructive fishing practices and an acute shortage of dry-season wetland habitats. The zoning and land use approach provides important information for potential developers/investors to identify suitable zones for the optimal allocation of resources and minimization of conflicts among users.

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