Program Development Office
For
Integrated Coastal Zone Management Plan
(PDO-ICZMP)

Coastal Land Uses and Indicative Land Zones

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Working Paper
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SUMMARY

Coastal land is intensively used for agriculture, settlements, forests, shrimp ghers, water bodies and fisheries, salt production, industrial and infra-structural developments and tourism. The coastal areas are also important ecologically. Hence, different policy documents of the government, especially the National Land Use Policy 2001 highlights the need for zoning in the coast. It raises the possibility of doing coastal land zoning through an inter-ministerial taskforce.

Because of PDO-ICZMP's inter-agency and inter-ministerial set-up and strong representation from the Ministry of Land, the PDO embarked on an initiative on coastal land zoning. The National Land Use Policy 2001 has been taken as the guiding basis for the initiative.

A technical discussion was held on August 2, 2004 among representatives from 16 different organizations including universities and research institutes. The overall approaches agreed are:

- A stepwise approach with clear intermediate versions of land zoning.
- Use of administrative boundary as boundary units of zoning.
- Upazila as the basis for preliminary or indicative version of land zoning. Further detailed versions using union and field blocks.
- Participation and consensus of relevant agencies are pre-requisites at different stages of the elaboration process – establishment of a technical support group
- Ground truthing and validation at field level

As per recommendation of the workshop, a technical support group with representatives from eight government and non-government organizations was formed to contribute, participate and formulate land zoning, with the Ministry of Land in supervisory role.

Data on major land uses were collected, ground-truthed and analyzed. The Technical Support Group met several times to review data and information on major land uses and others. Some of them visited fields and talked to local people. The Group debated and decided to propose 8 indicative land zones.

Proposed indicative land zones were presented at three local level workshops at Khulna, Patuakhali & Cox's Bazar for validation, specially the demarcation of zones. Finally, the Technical Support Group demarcated 147 upazilas of the coastal zone in the following 8 indicative land zones:

1. Shrimp (Brackish water) Zone (9 Upazilas)
2. Shrimp (Sweet water) Zone (7 Upazilas)
3. Salt- Shrimp Zone (5 Upazilas)
4. Forest Zone (4 Upazilas)
5. Mangrove Zone (4 Upazilas)
6. Urban and Commercial Zone (21 Upazilas/Thanas)
   (Industrial, Port, EPZs and Ship breaking Yards)
7. Tourism Zone (2 Upazilas)
8. Agriculture Zone (96 upazilas)

Indicative land zoning was presented at the 1st meeting of the Implementation Committee of the National Land Use Policy 2001 on 13 February 2005 at the Ministry of Land. The decisions of the meeting, among others were:

a) Endorsement on principle of indicative land zoning for the coastal area, as carried out under the ICZMP.

b) The Ministry of Land will undertake a separate project to carry out detailed land zoning exercises with support from the ICZMP project of the Ministry of Water Resources.

c) The Ministry of Land will undertake actions to prepare Zoning Law and Village Improvement Act. It was decided to complete within six months the drafting and their finalization through consultations at six divisional cities.

The Ministry of Land is, at present, preparing separate project proposal to initiate detailed land zoning.

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ABBREVIATIONS

AEZ	Agro-ecological Zones
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistics
BPC	Bangladesh Parjatan Corporation
BSCIC	Bangladesh Small & Cottage Industries Corporation
BSF	Bangladesh Shrimp Foundation
BWDB	Bangladesh Water Development Board
CDSP	Char Development & Settlement Project
CEGIS	Center for Environmental and Geographic Information Services
CZPo	Coastal Zone Policy
DoE	Department of Environment
DoF	Department of Fisheries
ECA	Ecologically Critical Areas
EEZ	Exclusive Economic Zone
EPZ	Export Processing Zone
FD	Forest Department
HYV	High Yielding Variety
HTWs	Hand Tube-wells
ICZMP	Integrated Coastal Zone Management Plan
IUCN	International Union for Natural Conservation
IWM	Institute of Water Modeling
LGED	Local Government Engineering Department
LV	Local Variety
MoL	Ministry of Land
MoWR	Ministry of Water Resources
NGO	Non Governmental Organization
PDO-ICZMP	Program Development Office - Integrated Coastal Zone Management Plan
PL	Post Larvae
PSO	Principal Scientific Officer
SEMP	Sustainable Environmental Management Programme
SRDI	Soil Resources Development Institute
STWs	Shallow Tube-wells
T.Aman	Transplanted Aman
UNDP	United Nations Development Program
WARPO	Water Resource Planning Organization

1 COASTAL LAND ZONING

1.1 Introduction

The coastal zone of Bangladesh has been officially defined as consisting of 19 districts[1] and the Exclusive Economic Zone (EEZ). It has total area of about 47,201 sq. km with population density 743 per sq. km. The land is intensively used for agriculture, settlements, forests, shrimp ghers, water bodies and fisheries, salt production, industrial and infra-structural developments and tourism. The coastal areas are important ecologically, as they provide a number of environmental goods and services to people. They contain critical terrestrial and aquatic habitats, such as the mangrove forests, wetlands and tidal flats. Char lands also have special use. All these have resulted into the following features:

- Demand for expansion in all land uses (urban area, settlement, shrimp etc.)
- Increasing demands for new uses (tourism, export processing zones and others)
- Conflicting land uses and demands; and
- Encroachment and conversion of land from one use to the other

The circumstances prevailing in the coastal areas call for planned management of land resources including land zoning.

1.2 Land – a declining resource

Land is the basic natural resource that provides habitat and sustenance for living organisms, as well as being a major focus of economic and livelihood activities. Bangladesh has a population of 123 million living on a land area of 147,000 sq km (PDO-ICZMP 2004b). The population is increasing and the land is being converted from directly productive purposes, such as crop cultivation, to other uses such as housing and roads and urban development. This trend is expected to continue. Some of the statistics provide an alarming picture:

- 220 ha arable land is being reduced daily due to uses like road construction, industry, houses etc. (Islam *et. al.* 2004)
- At least, 86,000 ha of land has been lost to river/estuarine erosion during 1973- 2000 (MES 2001) though this is compensated through lands generated through accretion process.
- 70% of land of Barisal and Khulna divisions is affected by different degree of salinity, which reduces agricultural productivity (Rahman & Ahsan 2001),
- 50% of coastal lands faces different degrees of inundation limiting its effective use. This situation is expected to worsen further due to climate change impacts.

In the coastal zone also, the population is expected to increase from 35.1 million in 2001 to 41.8 in 2015 to 57.9 million by 2050 (PDO-ICZMP 2004c). Present per capita agricultural land of 0.056 ha will be decreased to 0.025 ha by 2050 (PDO-ICZMP 2004c) On top of this, about 54% people of coastal Bangladesh are functionally landless and over 30% are absolutely landless. Among the landholders, 80% are small farmers, 18% are medium farmers and only 2% are large farmers (PDO-ICZMP 2004b). These have decisive impacts on major economic and livelihood activities, on utilization of land use and subsequently on quality of land.

[1] The districts are Bagerhat, Barguna, Barisal, Bhola, Chandpur, Chittagong, Cox's Bazar, Feni, Gopalganj, Jessore, Jhalokati, Khulna, Lakshmipur, Narail, Noakhali, Patuakhali, Pirojpur, Satkhira and Shariatpur. Together these districts account for 32 percent of the area and 28 percent of the population of Bangladesh.

1.3 Zoning - Policy Statements

The different policy documents of the government have highlighted the importance of land zoning for integrated planning of resource management of the country. Some of the important policy statements are mentioned below:

The National Water Policy, 1999

- *Frame rules, procedures, and guidelines for combining water-use and land-use planning*
- *Designate flood risks zones and take appropriate measures*
- *Zoning regulations will be established for location of new industries in consideration of fresh and safe water availability and effluent discharge possibilities.*
- *Brackish aquaculture will be confined to specific zones designated by the Government.*

The National Agricultural Policy, 1999

- *Land zoning program will be taken up by the Soil Resources Development Institute (SRDI) on priority basis.*

National Land Use Policy 2001

- *Land use based zoning*
- *Ensure best use of land through zoning*
- A zoning law nationally to allow local government to prepare zoning maps
- Special emphasis on coastal areas. Inter-agency taskforce to prepare outline of coastal zoning

Draft Shrimp Strategy (DoF, 2004)

One of the seven specific objectives of the regulatory framework is area developments and zonation.

- *Areas suitable for shrimp cultivation will be identified using a land zoning process which will limit brackish water shrimp aquaculture to coastal areas*
- *The objective of land zoning is to optimise land use*
- *The zoning process should therefore involve all stakeholder groups*

Coastal Zone Policy (MoWR, 2005)

- *Actions shall be initiated to develop land use planning as an instrument of control of unplanned and indiscriminate use of land resources*
- *Strategies for new chars will be developed*
- *Zoning regulations would be formulated and enforced in due course*

It can be seen that the National Land Use Policy 2001 (enclosed in **Annex A**) specially highlights the need for zoning in the coast. It describes about the need for definite guidelines and raises the possibility of doing coastal land zoning through an inter-ministerial taskforce.

1.4 An overview of Zoning activities

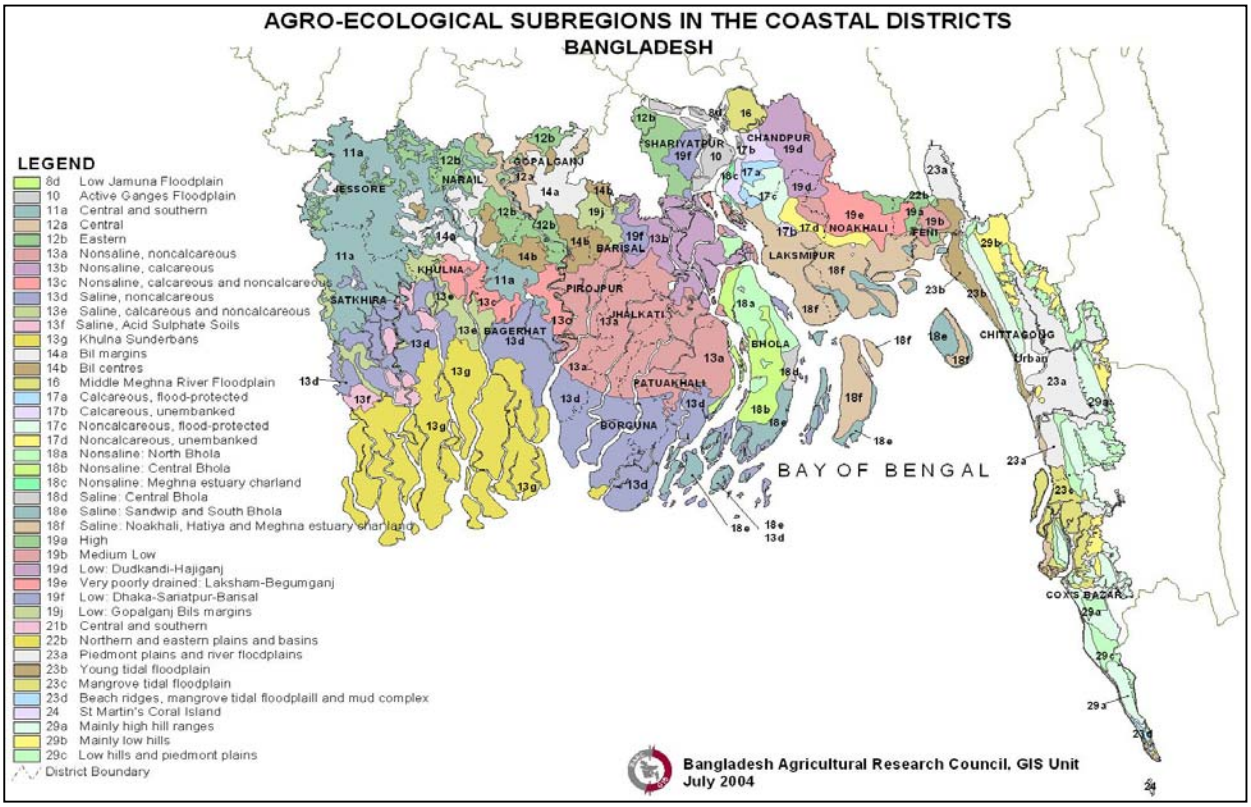
In this section an overview is given on various zoning activities, mainly sectoral. These are useful base materials for integrated zoning of the coastal areas.

The Agro-Ecological Zones: FAO initiative

This is the widely used thematic map produced by FAO in 1988, through extensive analyses and investigations. It distinguishes 31 Agro-Ecological Regions (now called Agro-Ecological Zones, AEZ)

and 88 sub-zones. The coastal zone encompasses 10 AEZs with 41 sub-zones (Fig. 1. BARC has recently digitized and geo-referenced this map.

Figure 1: Agro-Ecological Sub-regions in the Coastal Districts



Zoning and mapping: SRDI initiative

The Soil Resources Development Institute (SRDI) has produced a variety of maps, including soil maps, a map of problem soils and land use maps, all updated till late 1990s and 2000. In the last few years Thana Soils and Land Utilization Guidebooks have been completed for all the Upazilas (Thanas) in the country. They consist of a 1:50,000 soil map and explanatory notes for each Upazila and released for extension and land use planning purposes. SRDI is now using the same database to prepare Thana and District 'land zone' maps, distinguishing 6 land zones, viz. agricultural land, forestry land, water bodies, aquaculture, urban and industrialized areas. These are actually land suitability maps, except for the water bodies and the urban areas, which reflect the real situation. Some ground-truthing is done to compare the assumptions with the actual situation. Similar, land suitability maps are being prepared for major crops.

Bio-Ecological Zones of Bangladesh

The IUCN Bangladesh has prepared this document covering the bio-ecological features of the country (Nishat *et.al*. 2002). Parameters used in this zoning are physiography, soils, temperature & rainfall, floral diversity, faunal diversity and flooding depth. Bangladesh has been divided into 12 bio-ecological zones, some of which were further into sub-zones. Coastal zone comprises of at least 4 bio-eco-zones.

Coastal Land Use Zoning: initiative under SEMP

The CEGIS (2005) has carried out a study under the Sustainable Environment Management Plan project (Ministry of the Environment) in three Districts in the southwest (Khulna, Bagerhat and Satkhira) to map current land use and assess land use suitability for paddy (Aman and Boro) and shrimp

cultivation, mainly based on bio-physical parameters (CEGIS 2005). They detected some mis-match between different uses.

The Bangladesh Country Almanac

The Almanac is a GIS-based database, which can be used as a tool by non-specialists. It is the result of a joint effort by BARC, SRDI, BRRI and CIMMYT and brings together a large amount of scattered information on agriculture, social factors and environment in a (fairly) easily accessible form. Much of it is in the form of maps, produced by different institutions. Some of the maps mentioned earlier are part of the Almanac.

Agricultural Productivity Zonation (PDZ) maps: initiative under Char Development & Settlement Project (CDSP), Noakhali

The main objective of this activity is to help DAE in strengthening and facilitating extension services to improve the agricultural production mainly in the char areas (Sattar 2005). Four PDZs have been defined with different combinations of flooding depth and soil salinity which determine the land's suitability for monsoon and rabi cropping.

Most of the initiatives above relates to agricultural land use. Zoning, along sectoral lines, does not provide a basis for choices between often conflicting sectoral objectives. Karim & Stellwagen (1998) emphasized "no efforts have so far been initiated to classify the coastal land into various economic zones and develop them according to their development potential". Integrated development is the outcome of such choices and multi-sector zoning should provide a tool to arrive at the best choices for economic land use in an area, on the basis of its needs and potentials. Many agencies in Bangladesh already recognise this need for integrated zoning in support of planning for 'best possible' economic land use, while preventing land degradation and protecting the environment. DoF (2002) elaborates "coastal zoning would improve land use planning, minimize conflicts over land tenure and identify appropriate areas for shrimp farming and areas that need to be protected (for grazing of livestock, common access etc.)".

1.5 Zoning Concept

Zoning is a tool, which defines the demarcation of geographic areas with specific combinations of properties or features. The kind of features, which are chosen, and the interpretation of their different combinations depend on the purpose of the zoning exercise. Zoning is most often used for properly maintenance of bio-diversity in the area, research and for planning purposes.

Three broad kinds of zoning (Mutsaers & Mia, 2004) are considered for planning and proper maintenance of resources of an area:

- ***Descriptive zoning,*** i.e. presenting the factual information in a geographic form by mapping the actual situation in respect of some feature or combination of features, like the occurrence of current land uses, population densities etc.
- ***Analytical or predictive zoning***, which defines land classes by combinations of physical parameters, expecting that they will predict or explain an important phenomenon like crop yield or land suitability
- ***Zoning for development planning***. Zoning may be broadened into integrated multi-sector zoning by including both physical and socio-economic features. It can be used to demarcate areas according to 'best-bet' options for integrated development and then becomes a tool for planning and management. This kind of zoning for the Coastal Zone, may be termed 'D*evelopmental Zoning' or 'Zoning for Development Planning'* which could be formulated through different stages through detailed study.

The zoning will first and for all be a tool for government in stimulating, facilitating and regulating social, economic and environmental development, taking into account the interests of different groups of stakeholders and socio-economic and environmental potentials and vulnerabilities. It should allow to make informed choices for investment in human and physical resources and impose protective regulations where needed. Since the zoning at this stage is expected to be Upazila-based and result is the identification of groups of Upazilas with similar developmental characteristics it will give some sense of local level planning and to identify some development activities for each group of Upazilas. It should also stimulate government, non-governmental organisations and the private sector at the local level to rally around common goals and combine their efforts to attain local development goals. In a later stage the zoning 'resolution' may be increased up to the Union or even lower level but at the moment that is not practicable.

Finally, the ambition of zoning as a genuine development-planning tool cannot be entirely fulfilled at this time. Zoning, as a tool for area development is an ambitious goal, which can only be attained through different development stages.

2 PREPARATORY STEPS AND EMERGING APPROACH

2.1 Conducive Institutional Environment: PDO-ICZMP

Since February 2002, the Government of Bangladesh has initiated an inter-ministerial and inter-agency setup as Program Development Office for Integrated Coastal Zone Management Plan (PDO-ICZMP). This initiative is led by Ministry of Water Resources. An inter-ministerial Steering Committee guides the initiative at the policy level and an inter-ministerial Technical committee guides this initiative at technical level.

Secretary, Ministry of Land is the member of the inter-ministerial Steering Committee and Joint Secretary, Ministry of Land is the member of the Task Force on Policy & Strategy. Director General, Directorate of Land Records & Survey is the member of the inter-ministerial Technical Committee. Moreover, there are three task forces including one on Policy & Strategy and Focal Points at 34 different agencies.

The Program Development Office has embarked on many activities and six defined outputs including formulations of Coastal Zone Policy (CZPo), Coastal Development Strategy and Priority Investment Program. The Coastal Zone Policy, approved in 2005, advocated land zoning of the coast.

Because of PDO-ICZMP's inter-agency and inter-ministerial set-up and strong representation from the Ministry of Land, the PDO embarked on an initiative on coastal land zoning. The National Land Use Policy 2001 has been taken as the guiding basis for the initiative. Mr. Badiul Alam, Deputy Secretary, Ministry of Land, remained as the key focal point.

2.2 Preliminary Consultations

Considering this need for sustainable resource management of the coastal zone, the PDO held discussions with many government and non-government agencies in July 2004. All agencies expressed the need for integrated zoning in support of planning for 'best possible' economic land uses, through preventing land degradation and protecting the environment. From discussions a general consensus emerges that cross-sectoral development-oriented zoning of the coastal areas is urgently needed. The purpose would be to enable government to assess possible land use options for different areas and choose the best options on the basis of potentials and limitations of resource management. A need for a platform for discussion emerged. The PDO provided that platform.

2.3 Technical Discussion on Land Zoning

A technical discussion was held on August 2, 2004. This was attended by representatives from the Forest Department, Soil Resources Development Institute (SRDI), Dept. of Fisheries, Char Development and Settlement Project (CDSP) of BWDB, Salt Project of BSCIC, Bangladesh Shrimp Foundation, Bangladesh Agricultural Research Council (BARC), Centre for Environmental and Geographic Information Services (CEGIS), Directorate of Land Records & Surveys, Water Resources Planning Organization, Bangladesh Water Development Board, Local Government Engineering Department, Bangladesh University of Engineering & Technology, Dhaka University, Institute of Water Modeling and Bangladesh Parjatan Corporation. Mr. Badiul Alam, Deputy Secretary, Ministry of Land attended the Technical Discussion.

The conceptual proposal, based on preliminary consultations, was presented.

A proceeding of the Technical discussion has been prepared and distributed (PDO-ICZMP 2004).

2.4 Emerging Approaches

The technical discussion resulted in two major decisions: agreed approach of zoning and establishment of an inter-agency technical support group.

2.4.1 Approach to start coastal land zoning

The emerging concept (Mutsaers & Mia, 2004) is to formulate a land zoning, with administrative boundaries as the unit, in accordance with their (dominant) land use and economic activities, as well as their potentials and vulnerabilities. Hence, this zoning has to be more than just a description of the current situation and must account for major underlying ecological and socio-economic factors and processes which have led to the current situation and which may be important for future trends and hazards. The approach is therefore taken into account important ecological and socio-economic factors.

Zoning, as a tool for area development, can only be attained through different stages. The overall approaches agreed are:

- A stepwise approach with clear intermediate versions of land zoning.
- Use of administrative boundary as boundary units of zoning.
- Upazila as the basis for preliminary or indicative version of land zoning. Further detailed versions using union and later field blocks.
- Participation and consensus of relevant agencies are pre-requisites at different stages of the elaboration process – establishment of a technical support group
- Ground truthing and validation at field level
- Involvement of the Ministry of Land, as implementing agency of the Land Use Policy

2.4.2 Technical Support Group

As per recommendation of the workshop, a technical support group with representatives from the following government and non-government organizations was formed to contribute, participate and formulate land zoning, with the Ministry of Land on supervisory role:

- Directorate of Land Records & Surveys
- Department of Fisheries
- Forest Department
- Soil Resources Development Institute
- Bangladesh Agricultural Research Council
- Institute of Water Modeling
- Water Resources Planning Organization
- Bangladesh Shrimp Foundation
- Local Government Engineering Department
- Bangladesh Water Development Board

It was decided that the technical support group will play a dual role: it will provide hands-on expert support to PDO's zoning initiative and at the same time, will ensure involvements of line agencies in the process. The Technical Support Group is expected to contribute necessary data from different organizations and would participate in the ground-truthing.

2.5 Data Collection

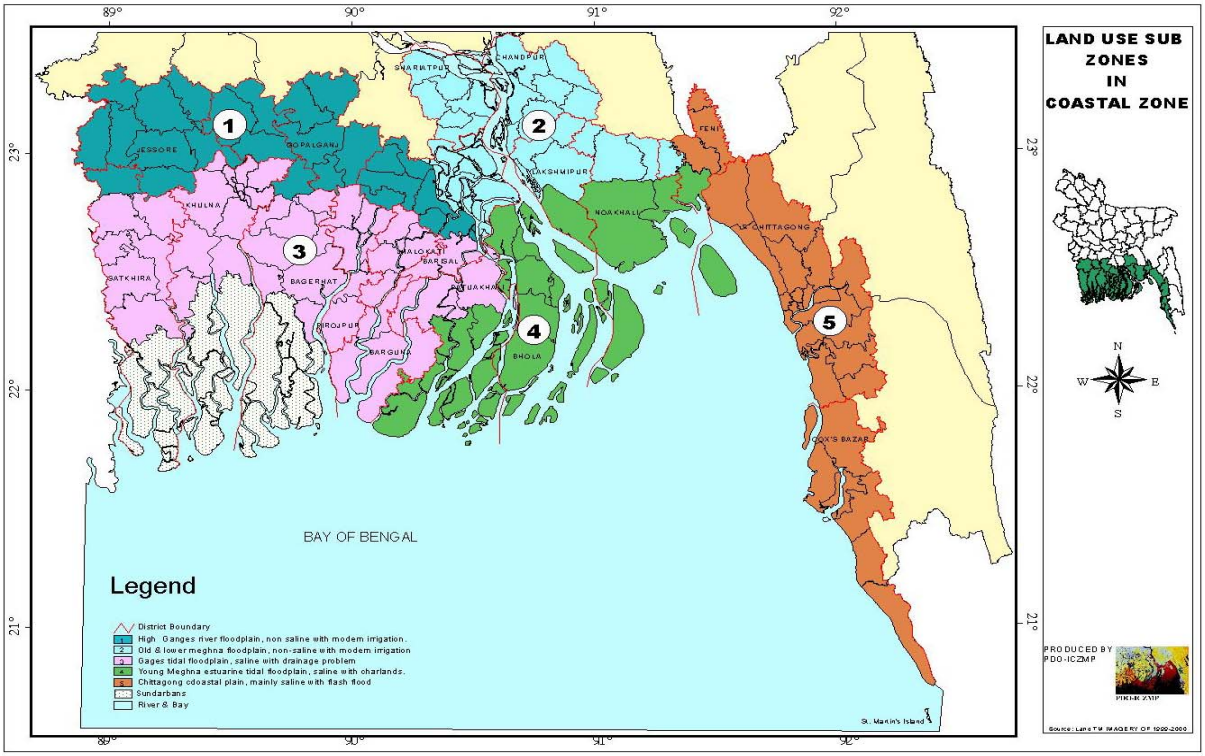
Accordingly, data on following parameters were collected from different line agencies Existing data, with supportive maps, available with different organizations were used. No efforts were taken to collect field data.

Physiography: It is the basic element in defining and delineating the agro-ecological zones of an area. The term physiography is the combination of parent materials in which particular kinds of soils have been formed and the landscape they occur. There are five physiographic units, excluding the Sundarbans, identified in the coastal area (Fig. 2):

1. High Ganges Floodplain (mainly non-saline with modern irrigation facilities)
2. Old and Lower Meghna Floodplain (mainly non-saline with modern irrigation facilities)
3. Ganges Tidal Floodplain (saline with drainage problem)
4. Young Meghna Estuarine Tidal Floodplain (saline with charlands)
5. Chittagong Coastal Plain (mainly saline with flash flood)

These physiographic units possess different characteristics in terms of potentials as well as their limitations in land uses of the coastal areas.

Figure 2: Physiographic Units and the Sundarbans



Tidal water movements: A dominating characteristic of the coastal areas is the daily water level fluctuations and the corresponding in- and outgoing water flows. These are the driving forces behind several physical processes such as: erosion and accretion, salinity intrusion and drainage congestion/ inundations, which dominate coastal agriculture, ecosystems and human activities in the coastal area. Tidal fluctuations determine agricultural practices and set the timing of the movements of river transportation and riverine commercial activities. Filling and emptying of land areas during each tidal cycle result in tidal flows that bring new influxes of water and nutrients, maintain a variety of special ecosystems, such as mangrove forests, keep rivers and channels open for navigation and draining of adjacent land areas and sometimes are used to generate energy. Data on tidal water movements were

synthesized from one year of daily water levels (high and low water levels every day) for 114 BWDB tidal water level stations and were collected from the National Water Resources Database of WARPO. This data was used in the delineation of the coastal zone.

Salinity intrusion. Three different indicators are used for soil, surface water and groundwater salinities. These data were used in the delineation of the coastal zone. Salinity intrusion is the major factor, which determines use of land mainly between agricultural, shrimp or saltpan purposes. It also hampers the normal livelihood of coastal people causing sufferings in many ways. The fluctuations of water levels and flows determine to a great extent the intrusion of saline waters; upstream river flows being the other main determining factor. Their combined effect results in a complicated situation in which the salinity contents of surface water bodies; groundwater aquifers and soils in the coastal zone vary from day to day and from season to season. This determines the availability of fresh water and suitability of land for human use and also sets the stage for special ecosystems.

Risk of cyclones and related storm surges. Bangladesh suffers from various natural hazards of which cyclones and associated storm surges are unique to the coast. High wind speeds up to 225 km/hr, but above all the consequent rise of sea water levels (surges) that can reach heights of 9 m., can create enormous damage to life, properties and ecosystems. Cyclone associated risks are high; leaving an impact that in many cases is beyond repair. The combined wind and surge effects make the coastal population extremely vulnerable, limiting them in their activities and development. A cyclone risk map, prepared by the Management Information & Monitoring (MIM) Division of the Disaster Management Bureau (DMB) in 2001, was used

Irrigation: It is the major driving force for extensive land use and other human activities, which helps the nourishment of environmental condition of an area. The upazila-wise irrigation maps of the coastal area, developed by BARC in 2001 was used.

Agriculture Data: This has been synthesized from the BBS, agriculture census data of 1996 and using Bangladesh Country Almanac, developed by BARC.

Forestry Data: The Forestry Department contributed, in November 2004, the latest forestry coverage map and data Some data available from secondary sources were also used.

Fisheries Data: Water area data is from 'Fishery Statistical Year Book of 2002-03. Upazila wise data on bagda and galda of 2003-04 were provided by the Department of Fisheries on January 01, 2005. The Shrimp Foundation has also contributed in reviewing the available data. Galda areas under Noakhali, Lakshipur and Feni have been provided by DoF's Greater Noakhali Aquaculture Extension Project in February 2005.

Salt Data: Area data (of 2003-04) provided by the Salt Project, BSCIC, Cox's Bazar and information is contained in a brochure circulated by the project.

Urban & Commercial Area Data: Area and other information are most from secondary sources, especially BBS.

Tourism Data: From secondary sources, especially BPC.

Environmentally Important Areas Data: Data used are from a PDO-ICZMP working paper published in July 2004.

2.6 Ground Truthing

Ground-truthing is an important aspect to check information and data incorporated in the zoning exercise. One such ground truthing visit was made in November 2004. Some upazilas of Southwest region of the country having complex land uses and on which existing data were nor sufficiently available were visited. The upazilas were: Tala, Shymnagar, Paikgacha of Satkhira districts, Dmuria, Batiaghata, Digholia of Khulna districts, Fakirhat, Mollahat and Chitalmari of Bagerhat district. A team of PDO-ICZMP and a member of SRDI who was also the member of Technical Support group made the visits. Prior to the field visits checklists were prepared for the issues, which need to be verified. Data were collected from the field and different upazilas though consultation with key agencies and accordingly necessary corrections were made on basis of collected data and information.

3 MAJOR LAND USES

3.1 Introduction

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 (Table 1) capturing based on broader perception of land use and recognizing seasonal variations (ASB 2003). 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.

Table 1: Land use of Bangladesh showing seasonal variations

	Classification	Area (sq.km)	
		Dry Season	Wet Season
1.	Rivers	6400	7700
	Main rivers	2860	3940
	Rivers in Sundarban	1660	1660
	Other rivers	1880	2100
2.	Standing water bodies	4245	9500
	Haors	450	3700
	Beels	177	1500
	Baors	55	60
	Ponds, tanks, ditches	3000	3500
	Kaptai Lake	563	740
3.	Forest	19610	19610
4.	Cultivated	77600	73500
	Field crops	51000	17140
	Tree crops	4900	4900
	Seasonal fallow	17000	16760
	Current fallow	4100	4100
	Seedbed only	600	600
5.	Brackish water aquaculture	1900	1900
6.	Salt beds	50	0
7.	Rural built-up	7000	7000
8.	Non-cropped village land	8400	8400
9.	Urban	7000	7000
10.	Infrastructure	2100	2100
11.	Estuarine area	8600	8600
	Total	**147570**	**147570**

Source: ASB (2003).

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). 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.

3.2 Agriculture

The land of the coastal area is mainly used for agriculture. The gross area of the coastal zone is 4.72 mha. of which the net cultivable area is 1.95 mha. Like other parts of Bangladesh coastal livelihood is also largely dependent on agricultural crops, mainly on rice crops.

The system of soil-less agriculture has a history of more than two centuries in three districts: Gopalganj, Pirojpur and Barisal. Vegetables are the main crops usually cultivated in this system.

At present, coastal regions are contributing about 16% of the total rice production of the country. In coastal districts aman is the dominant crop, covering about 70% of the total rice cropped area, aus covers 16% and boro 14%. About 60% of the paddy cropped area is planted with local varieties, adapted to poor water management (water logging, salinity). The total cropping areas of the various coastal districts and the cropping intensities are presented in Table 2. This table also shows the total area under paddy cultivation, as well as the percentage of HYVs.

Table 2: Gross cropped area, cropping intensity, and paddy production, 1996

District	Gross cropped area (ha)	Cropping intensity (%)	Total under paddy (ha)	% of paddy under HYV
Bagerhat	131,142	120	118,157	8.31
Barguna	123,714	154	103,964	12.93
Barisal	210,120	182	158,204	24.07
Bhola	208,926	209	150,294	12.88
Chandpur	142,649	198	101,085	55.67
Chittagong	238,089	182	216,389	49.38
Cox's Bazar	91,515	156	83,782	75.93
Feni	85,883	191	79,408	54.84
Gopalganj	151,532	161	107,570	22.04
Jessore	270,161	183	187,342	66.84
Jhalokati	65,548	165	55,130	11.27
Khulna	128,157	124	112,188	24.14
Lakshipur	128,430	203	101,223	24.22
Narail	100,246	183	40,349	30.04
Noakhali	218,880	169	180,687	19.12
Patuakhali	231,449	174	175,811	9.15
Pirojpur	112,935	152	97,370	15.19
Satkhira	158,283	142	125,683	76.28
Shariatpur	144,085	214	79,062	12.05
Coastal zone	**2,941,740**	**170**	**2,273,699**	**32.57**
Bangladesh	**11,585,608**	**173**	**8,891,814**	**53.00**
% of Coastal zone	**25.4**		**25.6**	**42.8**

Source: BBS 1996

Since the coastal zone comprises about 25% of the cultivable land of Bangladesh, this area produces a relatively high portion of the pulses, oil seeds, betel nuts and leaves, winter vegetables and potatoes. On the other hand, the share of the coastal zone production of cereals (including paddy), sugar crops, and jute is relatively low. Tables 3 and 4 show the other uses of land of the coastal area.

Table 3: Areas (ha.) of food crops in 1998-99

Regions	Pulses	Oil seeds	Spices and condiments	Sugar crops	Fruits	Summer vegetables	Winter vegetables	Other food
Barisal	63,120	40,238	28,046	3,600	13,263	2,969	6,483	14,498
Chittagong	7,381	3,405	10,354	2,278	10,067	3,929	10,008	21,444
Jessore	79,715	69,777	10,106	13,533	10,460	7,398	10,219	10,631
Khulna	11,208	17,144	3,892	6,175	8,746	5,552	7,696	22,146
Noakhali	33,035	18,738	17,175	2,156	7,283	2,783	8,135	9,360
Patuakhali	43,931	11,410	10,998	1,396	4,998	990	2,679	8,425
Coastal zone	**231,009**	**160,712**	**80,571**	**29,138**	**54,817**	**23,621**	**45,220**	**86,504**
Bangladesh	**562,821**	**526,688**	**258,781**	**195,077**	**191,017**	**96,333**	**152,423**	**294,379**
% of Coastal zone	**41**	**30**	**45**	**15**	**29**	**2442**	**29**	

Source: BBS, 2001b

Table 4: Areas of fibre and "drug and narcotic" crops in 1998-99

Regions	Jute	Cotton	Other fibres	Tobacco	Betel nuts	Betel leaves
Barisal	1,338	-	148	6	8.008	2,748
Chittagong	-	-	131	425	1,613	1,829
Jessore	47,650	2,548	333	667	1,485	1,246
Khulna	8,838	242	100	71	4,371	1,235
Noakhali	354	-	192	-	10,448	833
Patuakhali	775	-	54	-	1,602	377
Coastal zone	58,955	2,790	958	1,169	27,527	8,268
Bangladesh	492,079	15,235	2,288	32,600	36954	14223
% of Coastal zone	**12**	**18**	**42**	**4**	**74**	**58**

Source: BBS, 2001b

Major cropping patterns

Except some upazilas of Sathkhira, Khulna, Bagerhat and Cox's Bazar districts all other upazilas are intensively used for agriculture. In general the following broad land use patterns have been differentiated in the coastal area: In the highland area: Aus/ Jute followed by dry land rabi crops and vegetables or Boro (HYV) followed by T. Aman, In the medium highland area: Aus/ Jute followed by dry land rabi crops and vegetables or Boro (HYV) followed by T. Aman or Jute followed by T. Aman or T.Aman-fallow, in the medium low to low-lying area: Mixed Aus & Aman fallow or Boro (HYV/LV)-fallow. Some upazilas of Pirojpur, Barisal and Jessore districts are used for galda cultivation with paddy, which is insignificant in respect of total cultivated land.

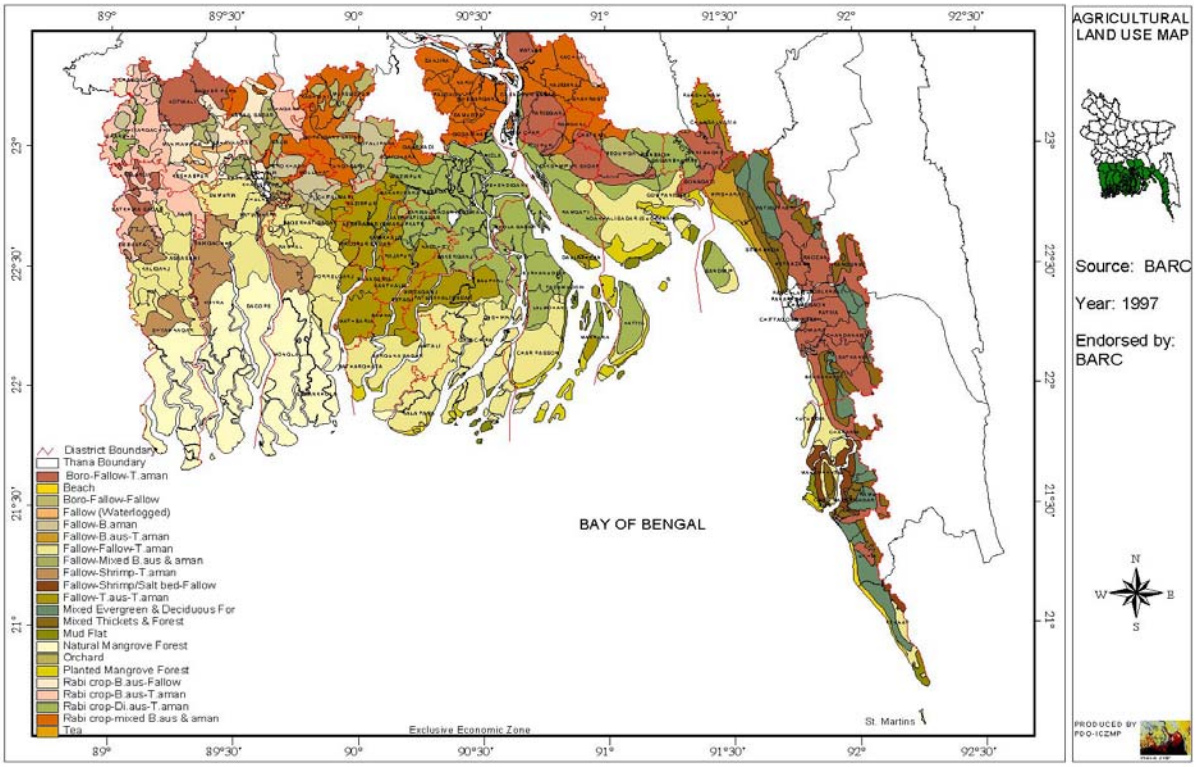
The SRDI (Soil Resources Development Institute) produces agricultural land use map for the country identifying many different types of agricultural land uses. The map (Fig. 3) shown here gives an over view of the land use situation of the coastal zone.

Development Constraints

The most common problem of the coastal area is the salinity, which restricts crop cultivation especially in dry season mainly in the exposed upazilas. Other problems are: rainfall variability especially in the pre monsoon season hampers kharif crop cultivation, drought sometimes causes damage to rabi crops

and Boro(HYV) in the matured stages and drainage congestion damage T.Aman crop in the seedling and young stages in all over the coastal areas.

Figure 3: Agricultural Land Use Map of the Coastal Zone



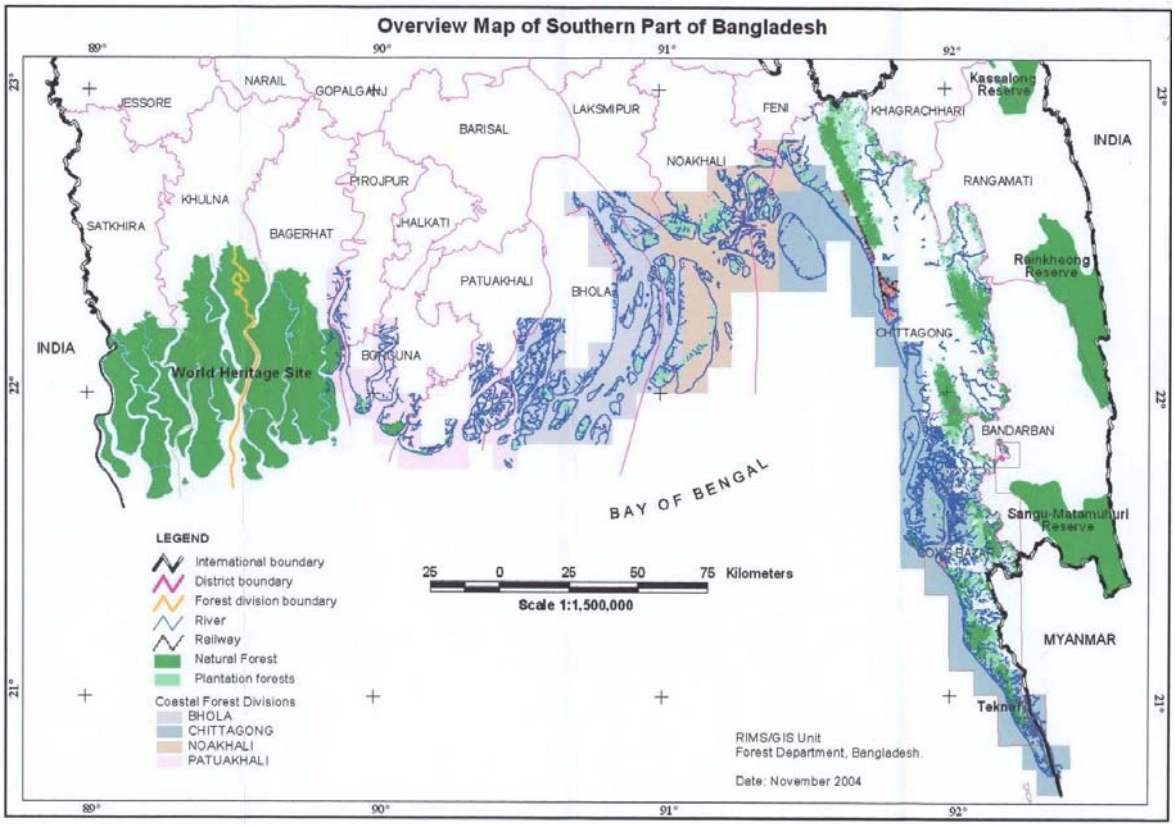
Development Possibilities

The following development potentials exist in the area through which the coastal land uses could be intensified in future: Possibility of increase of supplementary irrigation by Dug-wells, HTWs and STWs and introduction of modern farming technologies, drainage improvement through the excavation and re-excavation of silted rivers and khals, zonification of land for industry and settlements for the improvement of land degradation and improvement of extension services and participation of women in development activities.

3.3 Forestry

Nearly 50% of the forest areas of Bangladesh are in coastal zone (Figure 4). This also includes the biggest mangrove forest in the world: the Sundarban.

Figure 4: Types of Forests in the coastal zone including Divisions of the Forest Department.



Source: Forest Department, November 2004

3.3.1 Natural Forest

Table 5: Forest area in 1996-97

District	Forest area (ha)
Bagerhat	230,919
Barguna	12,451
Bhola	23,303
Chittagong	139,274
Cox's Bazar	133,731
Feni	886
Khulna	181,600
Lakshmipur	13,725
Noakhali	86,553
Patuakhali	16,682
Pirojpur	989
Satkhira	164,525
Total Coastal zone	**1,004,639**
Bangladesh	**1,154,356**

Source: BBS, 2001b

The extended forest of the Sundarban (and, to a lesser degree, the mangroves of Chakaria in the Cox's Bazar district) not only provide the country's largest supply of wood, but also of a number of other products, including honey, wax, cane, bamboo, herbs, and ornamental plants. Moreover, these mangroves play an irreplaceable role in the life cycle of economically important fish, shrimp and crab species (as breed or nursing biotope). The natural forest area also includes mixed evergreen and deciduous forest and mixed thickets and forest of Teknaf, Ramu, Cox's Bazar, Ukhiya and Fatikchhari upazilas of Cox's Bazar and Chittagong districts (Table 5).

3.3.2 Plantation forestry

From 1964, the Forest Department started afforestation in the coastal areas. At first plantation was carried out to increase the mangrove shelterbelt, in order to save lives and properties from cyclones, tidal surges and wave actions. Bangladesh has one of the large mangrove plantation program in the world.

In later years, plantation forestry mainly proceeded on stretches of government land along roads under the framework of social forestry programmes. Table 6 provides an overview of plantation forest including mangrove up to 2000.

Table 6: Areas of mangrove planted in four Coastal Afforestation Divisions (up to 2000)

Patuakhali		Chittagong		Bhola		Noakhali	
Range	**Area (ha)**	**Range**	**Area (ha)**	**Range**	**Area (ha)**	**Range**	**Area (ha)**
Galachipa	6,785	Sandwip	760	Kukri Mukri	8,565	Char Bata	9,517
Char Montaz	5,702	Urir Char	4,983	Daulatkhan	5,196	Habibia	5,665
Mohipur	1,568	Mirsarai	2,213	Manpura	10,388	Char Alauddin	3,852
Dashmina	1,529	Sitakunda	1,096	Char fesson	3,373	Jahajmara	6,682
Amtali	1,400	Head quarter	989			Nalchira	9,120
Patharghata	5,143	Banshkhali	1,070			Sagoria	2,702
		Chanua	347			Companiganj	2,709
		Kutubdia	230			Ch. Alexander	6,348
		Charandwip	321			Noakhali	118
		Gorokghata	2,580			Sonagazi	645
		Teknaf	691				
		Moheshkhali	690				
Total	**22,120**		**15,971**		**27,523**		**47,358**

Source: Canonizado, 1999; Islam, 2000a, b, c.

3.3.3 Mangrove Forest

Mangrove ecosystem is the inter-tidal or littoral forests, which grow on the protected areas in the tropical and sub-tropical regions with favorable physical and physico-chemical characteristics. Bangladesh and India together share the largest mangrove ecosystem (Sundarban). Most of the exposed coast upazilas of the coastal zone have patches of mangrove forest which are mainly planted in the tidal flooded lands.

The Sundarban is the largest single tract of mangrove ecosystem in the world. It is located in the southwest corner of Bangladesh, between latitudes 21°30' and 22° 30' N and longitudes 89° 00' E and 89° 55' E, within the Khulna administrative division and extended over parts of Khulna, Satkhira and Bagerhat districts. At present, the Sundarban covers 6,017 km^2. Several large tracts of mangrove forests are located in the coastal zone (Table 6).

Development Constraints

Deforestation is the main problem causing ecological hazard in the coastal belt. The principal cause of deforestation in the terrestrial forests is expansion of agricultural land after clear-cutting the forest areas. Growth of population and economic pressure are two prominent factors leading to large scale clearing of forests. Almost all of the mangrove forest in the vicinity of Chittagong and Cox's Bazar has already been cleared for other land uses.

The river erosion in some areas of Sundarban and over exploitation of the resources has threatened the normal ecosystem and the existence of this world largest mangrove forest.

Development Possibilities

The newly accreted land in the coastal zone is a wide field for plantation forestry. The coastal embankments, roads and charlands could be used for both social forestry as well as for mangrove plantation.

3.4 Fisheries

One of the major land uses in the coastal zone is for fisheries sector. Fishery is one of the main economic activities in the coastal zone. Innumerable network of river systems, beels, boars, flood lands, ponds provide opportunities for both capture and culture fisheries. Water area within the coastal zone cannot estimated separately. Besides, the Exclusive Economic Zone in the Bay of Bengal nurtures marine fisheries. Land use is elaborated in terms of inland fisheries and culture fisheries including ponds & boars, shrimp culture (brackish water and sweet water).

3.4.1 Inland Fisheries

Natural rivers, canals, flood land and beels cover the coastal zone. Area under rivers & estuaries are not known. The coastal zone has only 1,655ha (3% of the country) of semi-closed seasonal water bodies (flood land) and 5,488ha (5% of the country) of beel areas (Table 7).

Table 7: Water area (ha) in the coastal zone in 2002-03

District	Beels	Semi-closed seasonal waterbodies	Baor	Ponds
Bagerhat	48	-	-	2,723
Barguna	-	-	-	4,461
Barisal	41	-	-	7,351
Bhola	4	-	-	8,435
Chandpur	361	944	-	7,026
Chittagong	89	-	-	19,269
Cox's Bazar	-	-	-	8,172
Feni	-	11	-	4,180
Gopalganj	901	-	110	2,582
Jessore	2,710	-	1,127	6,355
Jhalakati	14	-	-	2,413
Khulna	271	-	225	5,379
Lakshmipur	-	352	-	6,169
Narail	864	-	290	2,398
Noakhali	3	230	-	11,647
Patuakhali	-	118	-	8,125
Pirojpur	20	-	-	4,291
Satkhira	46	-	106	2,984
Shariatpur	76	-	-	1,999
Total CZ	**5,448**	**1,655**	**1,752**	**115,959**
Bangladesh	**114,161**	**50,711**	**5,488**	**290,500**
%	**5**	**3**	**32**	**40**

Source: DoF, 2003

3.4.2 Culture Fisheries (Baors & Ponds)

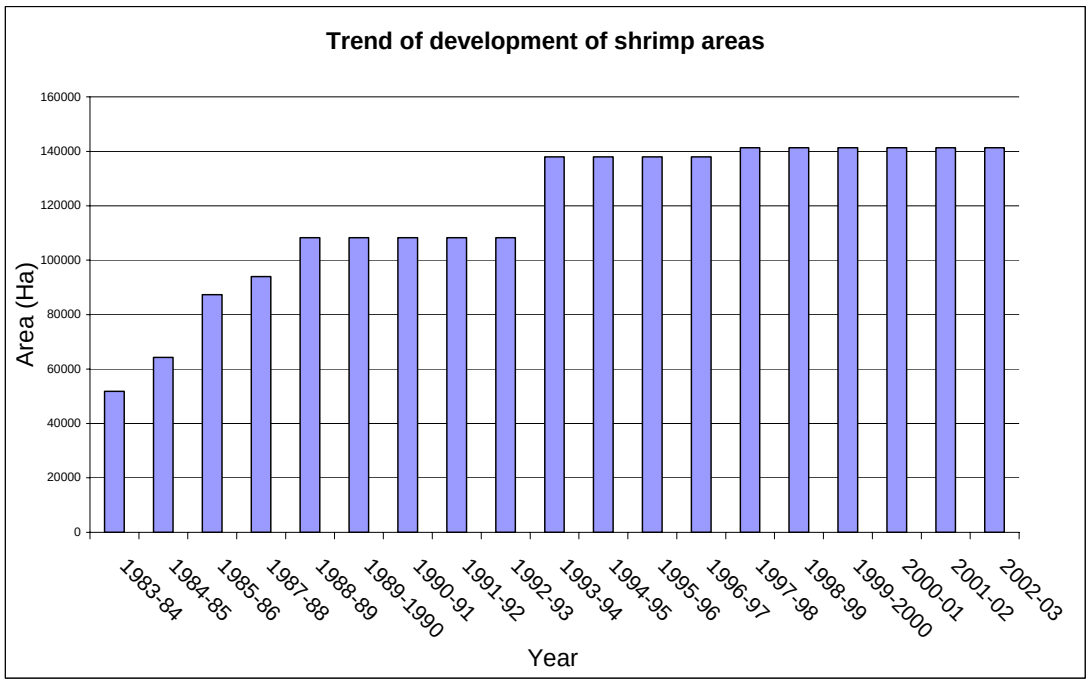
Pond aquaculture is practiced in 1,16000 ha of the coastal area (Table 7) and represents 40% of the total pond area of Bangladesh. In Bangladesh a common division is made between cultured ponds (developed for aquaculture), cultivable ponds (suitable for aquaculture, but in need of maintenance measures) and derelict ponds (in need of complete reconstruction). An important potential for additional aquaculture is rice-fish culture, as practiced more and more in some other Asian countries. Especially the combination of fish culture with traditional rice varieties, still very common in the coastal zone, is suitable, because of the relatively suitable land type.

Baors also occur in south-western districts of Jessore, Khulna, Narail, Satkhira and Gopalganj. They cover 32% of the total baor area of the country.

3.4.3 Shrimps

Since late eighties, land use for shrimp farming has increased remarkably and still continuing (Fig 5). More than 90% of these farms are located in the coastal zone. While the brackish water shrimp ("bagda") cultivated area is completely located in the coastal zone, the freshwater shrimp ("galda") production area is mainly confined in coastal area but its cultivation is gradually spreading all over the country. Galda farming can also be done in combination with paddy cultivation.

Figure 5: Trend of expansion of shrimp areas



Brackish Water Shrimp (Bagda)

The bagda shrimp farms are mostly concentrated in the districts of Khulna, Satkhira, Bagerhat and Cox's Bazar and are located within polders, which are (80%) operated by their owners. In the Khulna and Satkhira area farms largely alternate between shrimp and rice, but in Cox's Bazar it is between shrimp and salt. The average farm size has been reducing gradually with external leaseholders and small holders dividing large ponds into *ghers*. Inside polders, 93% of all shrimp farms are below 10 ha. In the whole coastal zone 52906 bagda farms with total area 1,72,833 ha are established in 49 upazilas (Table 8); the average farm size is 3.27 ha. Most shrimp farms depend on tidal saline water from adjacent rivers and canals and are thus dependent on the tides for water supply. Only a small minority of farms uses low lift pumps for water from salt canals fed by tidal waters.

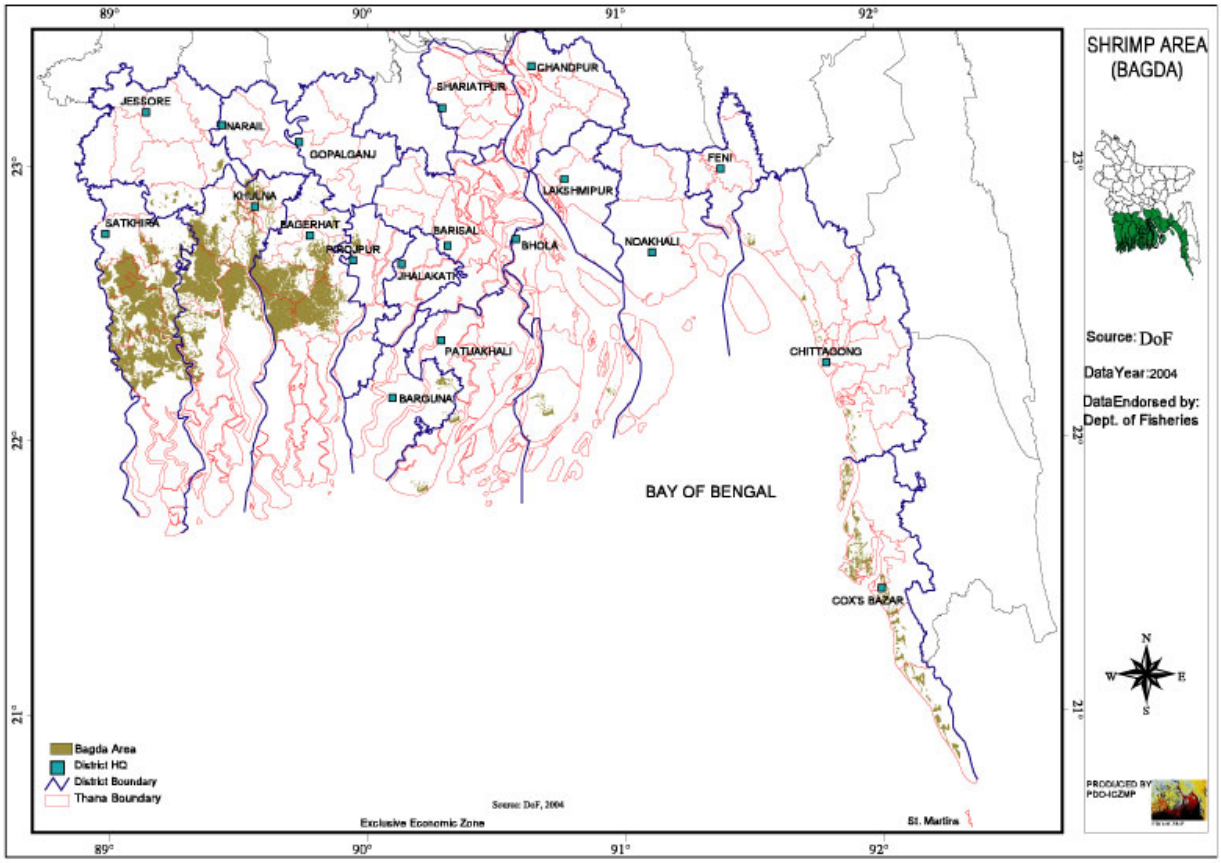
Table 8: Upazila-wise Number and Area of Bagda Shrimp Farms

District	Upazilas	No. of farms	Area in ha.
Bagerhat	Sadar	3014	7227
	Fakirhat	430	229
	Rampal	4100	13695
	Mongla	4537	9089
	mollahat	1830	896
	Chitalmari	1545	375
	Kochua	583	1489
	Morrelganj	2010	10170
	Sarankhola	8	38
		18057	**43208**
Barguna	Amtali	23	30
		23	**30**
Bhola	Charfasson	7	40
	Monpura	1	25
		8	**65**
Chittagong	Banshkhali	NA	831
	Anwara	NA	717
	Sitakundu	NA	21
	Mirsharai	NA	625
	Mahanagar	NA	417
		NA	**2611**
Cox's Bazar	Sadar	254	3317
	Ukhiya	105	1011
	Moheshkhali	309	9664
	Teknaf	354	2677
	Ramu	22	63
	Kutubdia	21	72
	Chakaria	1137	12379
	Pekua	201	2835
		2403	**32018**
Feni	Sonagazi	NA	5
			5
Jessore	Keshabpur	41	24
	Abhoynagar	16	10
		57	**34**
Jhalakati	Sadar	2	5
	Nalchiti	11	16
		13	**21**
Khulna	Paikgachha	2735	16265
	Dacope	10152	10339
	Dumuria	639	3312
	Koyra	2946	5533
	Batiaghata	702	2069
	Rupsa	14	111
		17188	**37629**
Lakshmipur	Ramgati	NA	5
			5
Noakhali	Companiganj	NA	26
	Hatia	NA	21
	Sudharam	NA	18
			65
Pirojpur	Nazirpur	525	2623
		525	**2623**
Patuakhali	Kalapara	41	166
	Galachipa	71	2821
		112	**2987**
Satkhira	Sadar	625	2586
	Tala	708	2311
	Debhata	1100	8383
	Kaliganj	5023	10778
	Assasuni	3000	13000
	Shymnagar	4064	14479
		14520	**51537**
Total	**49**	**52,906**	**1,72,833**

Source: DoF, 2004.

CEGIS (Center for Geographic Information System) produced brackish water shrimp (Bagda) map showing intensively cultivated upazilas of the coastal zone which has been updated by PDO using existing upazila wise data (2003-04) of fisheries department (Fig. 6).

Figure 6: Bagda area map



Source: DoF, 2003-2004

Sweet Water Shrimp (Galda)

Freshwater prawn (galda) farming has been increasing rapidly in recent years with 10-20% per annum. It is now being cultivated in almost all upazilas of the coastal zone where sweet water is available but intensively in the upazilas of Mollahat, Fakirhat, Chitalmari, Kochua of Bagerhat, Domuria, Phultala, Terokhada of Khulna, Monirampur, and Abhoynagar of Jessore districts. In 1995, The Department of Fisheries reported 10,700 galda farms in the Khulna region, covering an estimated area of 4,200 ha. By 2003-04, this had increased to 36,275 covering an estimated area of 14,292 in Khulna alone. In the whole coastal zone 87,442 galda farms with total area of 45,816 ha are established in 81 upazilas (Table 9). Of these, 22 upazilas have galda farm areas of 500ha or over.

Galda culture is practiced in integrated ghers or ponds. The ponds are permanently flooded by rainwater from the monsoon (and also underground water) that evaporates during the coarse of the year. Some ponds are connected to sluice gates. Integrated farming of galda with rice, fish and vegetables in a

modified rice field is spreading particularly among small-scale farmers; this system provides a year round supply of crops for family subsistence, supplemented with galda as a cash crop.

Table 9: Upazila-wise Number and Area of Galda Shrimp Farms (2003-04)

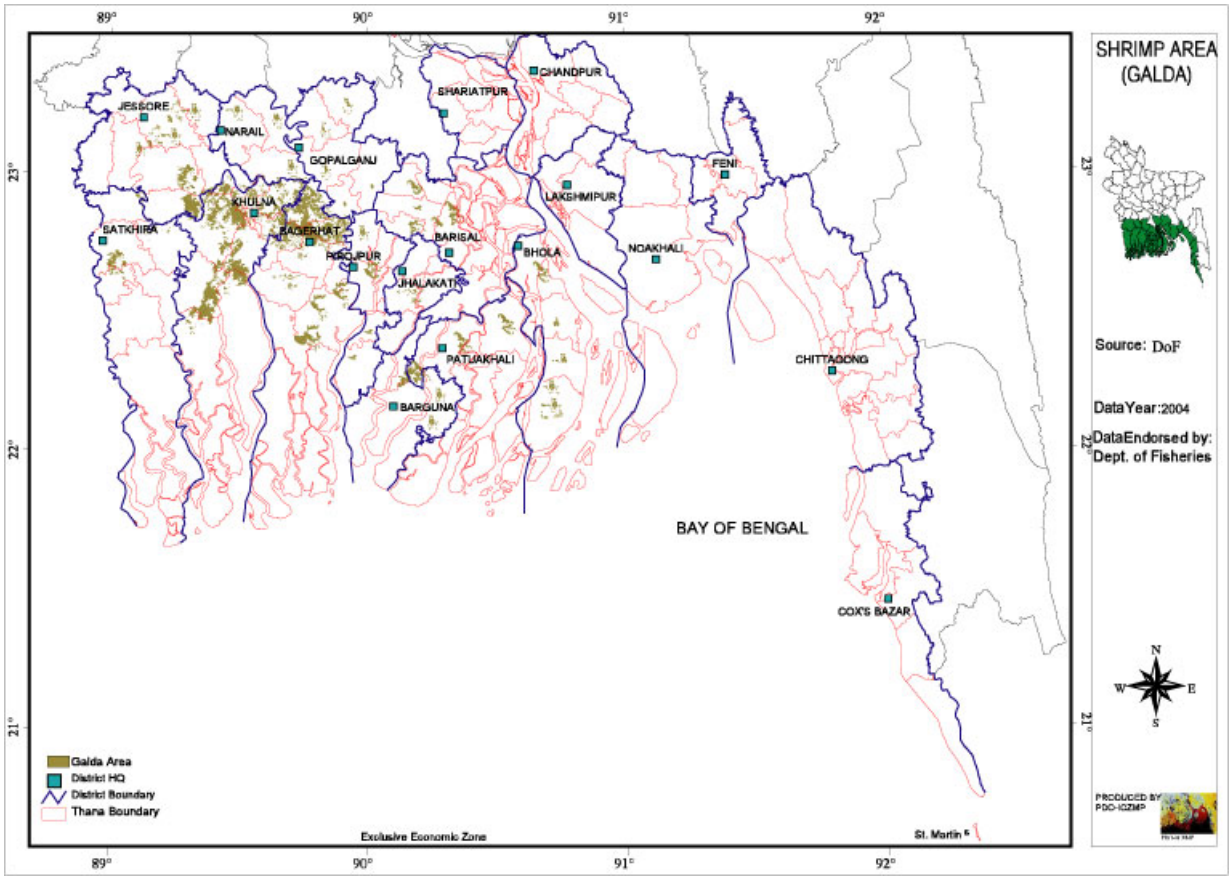
District	Upazilas	No. of farms	Area in ha.
Bagerhat	Sadar	6889	4200
	Fakirhat	7066	3005
	Rampal	550	1457
	Mollahat	9287	4453
	Chitalmari	7110	1614
	Kochua	1287	810
	Morrelganj	1385	505
	Sarankhola	687	172
		34261	**16216**
Barguna	Sadar	355	73
	Amtali	171	205
	Patharghata	52	62
	Bamna	20	11
	Betagi	38	28
		636	**379**
Barisal	Bakerganj	4	4
	Babuganj	15	13
	Aghoiljhara	33	21
	Uzirpur	53	53
	Banaripara	6	3
	Gournadi	25	30
	Mehendiganj	70	56
		206	**180**
Bhola	Lalmohan	8	10
	Charfasson	1926	1985
	Sadar	212	1128
	Monpura	6	10
	Borhanuddin	7	11
	Daulatkhan	10	6
		2169	**3149**
Feni	Chagolnaiya	NA	25
	Dagonbhuiyan	NA	24
	Feni Sadar	NA	34
	Parshuram	NA	17
	Sonagazi	NA	27
			127
Gopalganj	Sadar	NA	21
	Kasiani	NA	24
	Kotalipara	NA	31
	Muksudpur	NA	35
	Tongipara	NA	30
			141
Jessore	Sadar	31	32
	Monirampur	2909	4807
	Keshabpur	647	1034
	Abhoynagar	3250	628
	Baghapara	25	9
		6862	**6511**
Jhalakati	Sadar	2	5
	Nalchiti	11	16
		13	**21**
Khulna	Dacope	55	43
	Dumuria	17625	8500

District	Upazilas	No. of farms	Area in ha.
	Koyra	163	158
	Batiaghata	555	949
	rupsa	3531	936
	Digholia	1844	648
	Terokhada	7500	698
	Phultala	5002	2324
		36275	**14292**
Lakshmipur	Lakshmipur Sadar	NA	93
	Ramganj	NA	71
	Ramgoti	NA	54
	Raipur	NA	36
			253
Narail	Sadar	1345	544
	Kalia	1408	658
	Lohagara	110	13
		2863	**1215**
Noakhali	Begamganj	NA	158
	Chatkhil	NA	38
	Companiganj	NA	59
	Noakhali Sadar	NA	197
	Senbagh	NA	69
			521
Pirojpur	Sadar	110	189
	Kawkhali	24	4
	Nesarabad	61	12
	Bhandaria	64	42
	Mathbaria	210	108
	Nazirpur	561	1507
		1030	**1861**
Patuakhali	Sadar	15	2
	Dumki	7	1
	Kalapara	56	22
	Dashmina	538	21
	Bauphal	26	8
	Mirzaganj	1519	74
		2161	**129**
Satkhira	Sadar	218	132
	Tala	110	145
	Debhata	200	32
	Kalaroa	438	512
		966	**820**
Shariatpur	Vedarganj	NA	0.65
	Goshairhat	NA	0.77
			1.42
Total	**81**	**87,442**	**45,816**

Source: DoF, 2005. Areas under Noakhali, Lakshipur and Feni have been provided by DoF's Greater Noakhali Aquaculture Extension Project (February 2005).

CEGIS (Center for Geographic Information System) produced sweet water shrimp (Galda) map (Fig. 7) showing only intensively cultivated upazilas of the coastal zone which has been updated and modified by PDO using existing data (2003-04) of DoF.

Figure 7: Galda area map



Development Constraints

For both galda and bagda the main limitation is the lack of processing facilities outside the traditional shrimp processing area. Galda hatcheries hardly exist so far, whereas quantities of wild PL are decreasing. Import of galda PLs is possible, but relatively expensive. For bagda the situation is better: hatcheries are run by both government and the private sectors, and produces PLs in excess of the demand.

There are well-documented evidences of negative social and environmental impacts due to shrimp farming. Environmental hazards due to salt water intrusion, huge collection of snails for shrimp feeding absence of regulatory measures for proper land uses are very common for bagda cultivation.

The other problems are: exposure of the shrimp area especially the bagda area to cyclones and cyclonic storm surges, river bank erosion in some areas, conflicts of interest between shrimp and agricultural farmers. In the galda cultivated area the major problems identified are: deep and moderately deep flooding together with early flood, late and slow drainage in some areas hamper timely cultivation of Boro along with galda.

Development Possibilities

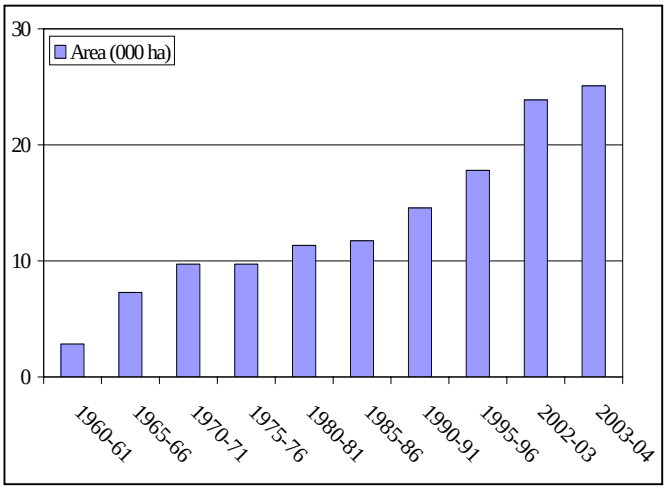
Shrimp culture still has an enormous growth potential. Much of this could be accommodated through improved culture systems; major growth in production area is also possible, but not the most effective. Virtually all management interventions need improvement, from pond construction to stocking (numbers and quality of PL). Reliable production of well-sized and healthy PL is a condition for

farmers or landowners to invest in pond improvement. Growth of the bagda production is limited to the coastal zone, but may boost the coastal economy, especially if processing activities are expanded. Growth of galda production is not restricted to the coastal zone (although hatcheries will require brackish water); galda could well be included in the present pond polyculture systems. Shrimp ponds also produce fish.

This fish production varies strongly: 368 kg/ha in the Satkhira District and 266, 184 and 93 kg/ha in the districts of Bagerhat, Cox's Bazar and Khulna, respectively which indicates that there exists scopes for improvement of shrimp production. Expansion in new lands can be restricted with higher production per unit area.

3.5 Salt -Shrimp production

Figure 8: Area under salt farming of Bangladesh



The first commercial salt production company was established in Cox's Bazar in 1947. In 1960 the Bangladesh Small and Cottage Industries Corporation (BSCIC) started to produce salt on 2,742 ha in the Chittagong and Cox's Bazar districts. Since then, the salt production rate and area is gradually increasing to meet the ever-growing demand (Figure 8).

Now-a-days the main salt production areas are mainly concentrated in Cox's Bazar sadar ; Ramu, Maheshkhali, Kutubdia, Chakaria, Teknaf upazilas of Cox's Bazar District and Bashkhali Upazila of Chittagong District (Figure 9). There are 41,000 listed salt farmers working in the coastal area. In 2003-04, salt was cultivated in 24,900ha land and 0.9 million metric ton salt was produced. Between 1990-91 and 2003-2004, the production of salt has been increased by 43%.

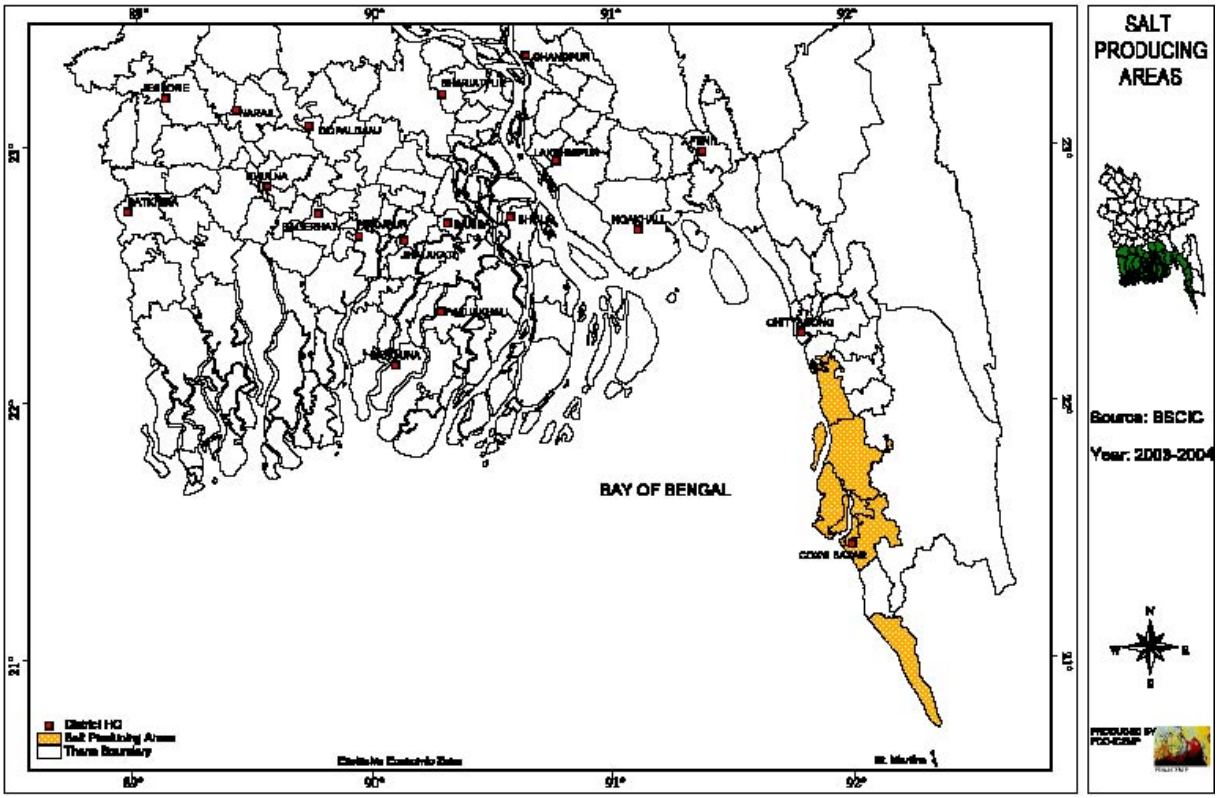
District	Upazila	Area (ha)
Chittagong	Banskhali	2,682
Cox's Bazar	Chakaria & Pakuya	7,550
	Kutubdia	2,671
	Moheshkhali	7,964
	Cox's Bazar Sadar & Ramu	2,716
	Teknaf	1,316
	Total	24,900

Source: Salt Project, 2004

3.6 Urban, Commercial/Industrial Areas

In the coastal zone of Bangladesh, urban areas include two SMAs (Chittagong and Khulna), three City Corporations (Barisal, Chittagong and Khulna), 74 *Pourashavas* in all districts and in many upazila headquarters and a host of 'other urban areas' (all other upazila headquarters). It may be mentioned that the coastal zone has the oldest (Jessore, founded in 1864) and the smallest (Tungipara in terms of area, 132 ha; Banaripara in terms of households, 1300) *Pourashava* of the country (PDO-ICZMP 2005).

Figure 9: Salt-Shrimp producing area



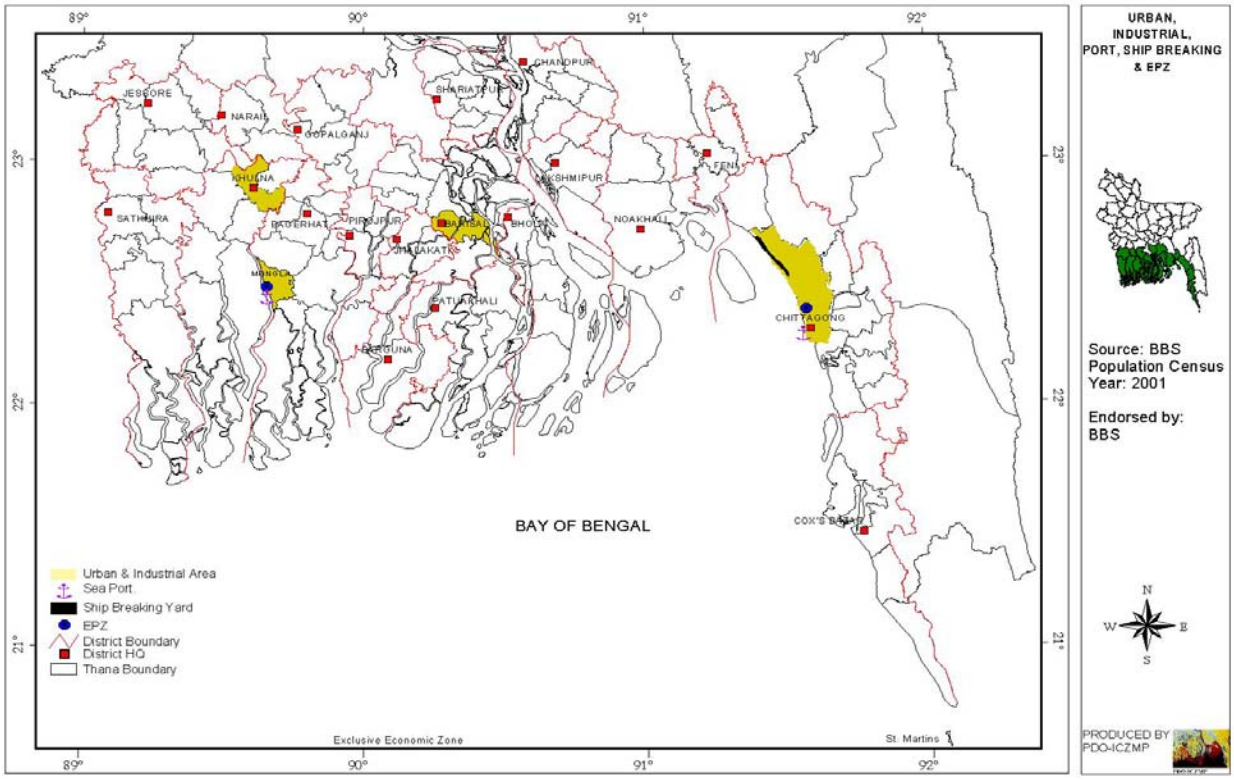
The urban expansion has occurred only in terms of population size, devoid of urban facilities, let alone urbanism. Data from 1901 indicates that three cities in the country, Dhaka, Chittagong and Barisal, have never changed their rank throughout the century. Khulna, once a small town under Jessore district, rose to prominence since the sixties.

Commercial centers and industrial areas are developed taking the urban areas as base (Fig 10). Chittagong is the second largest city of Bangladesh and is the commercial capital of the country. Chittagong city has the country's main seaport. The Chittagong Export Processing Zone (EPZ) has an area of 255 hectares and is ideally located close to the main business center, the seaport and the airport. Another EPZ will start soon in the premises of Chittagong Still Mills.

Khulna, Barisal and Jessore are the second, third and fourth large cities in the coastal zone. Mongla Port, the second largest seaport located 48 km south of Khulna city. Barisal is the hub of river transport network, which connects the millions of people of the region with Dhaka and other parts of the country. Jessore is the oldest municipality of the country established in 1864. Benapole, the largest land port of the country, is about an hour's drive from Jessore and is of great economic importance to the city in terms of business and employment.

In addition, there is approximately 50 established ship-breaking yards in the Faujdarhat coast of Sitakunda upazila in Chittagong.

Figure 10: Major Urban and Commercial areas



3.7 Tourism

Many of the tourism attractions are located in the coastal zone (Fig. 11):

a) Cox's Bazar- It is the only well developed and most frequented beach town of Bangladesh. It has both natural and cultural diversity. Cox's Bazar is well connected with other art of the country by air and road.

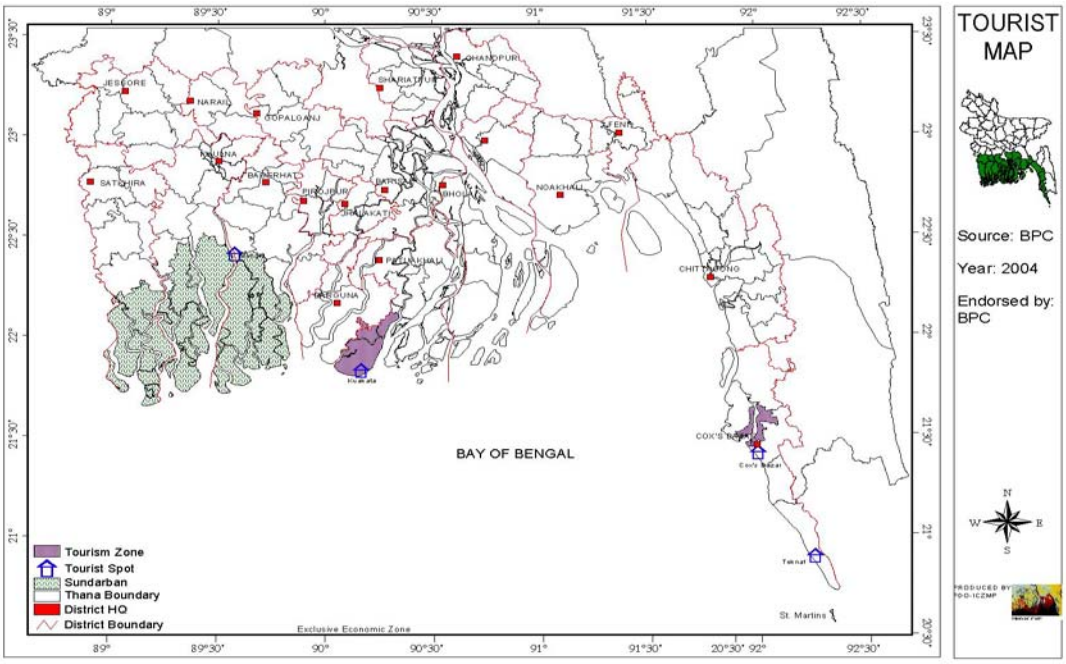
b) Teknaf- Seawater at Teknaf beach is much clear and hills at Teknaf are suitable for trekking.

c) Kuakata- Kuakata has a cultural heritage. The Rakhayne community of Mongoloid origin lives here. They have exotic social and cultural traits. Both sun rise and sun set can be viewed from the Kuakata beach.

d) Others- St. Martin's island, Sunderban are other important tourist destinations. The Government has also programmes for development of Inani beach, development of Special Tourist Zones at Sonadia Island and Kuakata beach. The Government of Bangladesh has a put a great stress on the extensive promotion of tourism in Bangladesh through public and private partnership.

The tourism industry in Bangladesh recorded increase in tourist arrivals for the 5th consecutive years since 1999-2003. Arrivals in 2003 (244,509) surpassed, the earlier peak figure of 207,246 in 2002. In terms of foreign exchange Taka 3 310.00 million was earned during the same period.

Figure 11: Important Tourist spots of Coastal Area



3.8 Environmentally Important Areas

The coastal zone also possesses several ecosystems that have important conservation values (Fig. 12). The world's largest uninterrupted stretch of mangrove ecosystem, the Sundarban, has been declared a World Heritage Site in 1997, whereas coral ecosystems are found around St Martin's Island. These ecosystems are not only biodiversity hot spots, but they also provide the ecological foundation for an important common property resource: the fisheries in the Bay of Bengal.

Recognizing the gradual depletion of the ecosystems and the ecological importance of the flora and fauna, Bangladesh has identified a number of protected areas. They are in the form of national park, game reserve, wild life sanctuary, fish sanctuary, world heritage sites, Ramsar sites, marine reserve and ecologically critical areas (Table 10 & detailed in PDO-ICZMP 2004d).

Figure 12: Environmentally Important Areas in the coastal zone

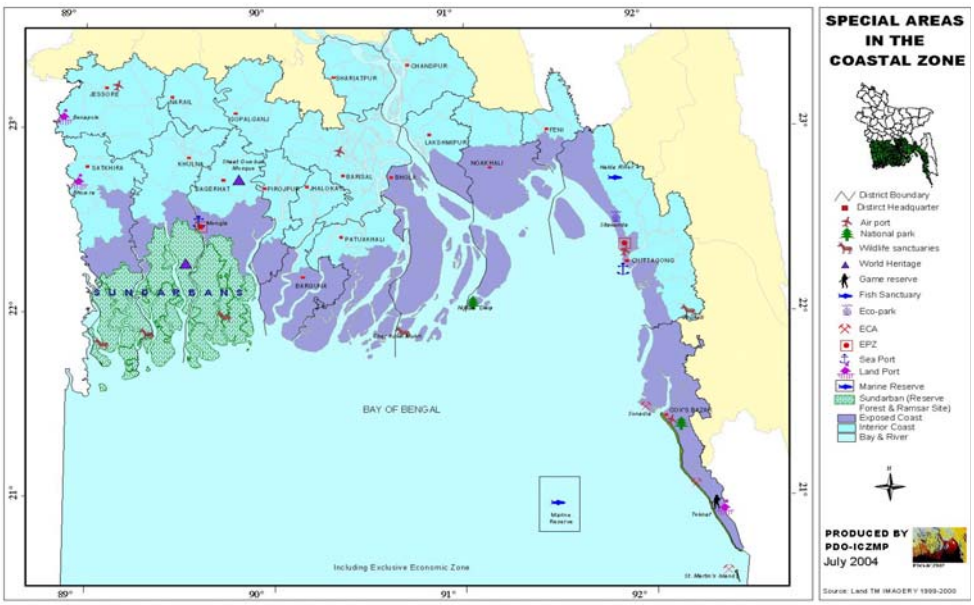


Table 10: Protected areas in the coastal zone

Sl. No.	Name	Ecosystem Type	Total area (ha)	Location	Legal status
Reserved Forest					
1.		Forest	885,043	Bagerhat, Barguna, Bhola, Chittagong, Cox's Bazar, Feni, Khulna, Lakshmipur, Noakhali, Patuakhali, Satkhira	
National Park					
2.	Himchari	Peninsula	1,729	Cox's Bazar	Gazette, 1980
3.	Nijhum Dweep	Island	4,232	Hatiya, Noakhali	Gazette, 2001
Eco-park					
4.	Sitakunda	Forest	808	Chittagong	GoB project
Wildlife Sanctuaries					
5.	Sundarban East	Mangrove	31,227	Bagerhat	Established in 1977 but expanded through Gazette, 1996
6.	Sundarban South	Mangrove	36,970	Khulna	
7.	Sundarban West	Mangrove	71,502	Satkhira	
8.	Char Kukri Mukri	Island	2,017	Bhola	Gazette, 1981
9.	Chunati	Forest	7,761	Chittagong	Gazette, 1986
Game Reserve					
11.	Teknaf	Peninsula	11,615	Cox's Bazar	Gazette, 1983
Ramsar Site					
12.	Sundarban	Mangrove	601,700	Bagerhat, Satkhira, Khulna	1992
ECAs					
13.	Sonadia	Island	4,916	Cox's Bazar	Gazette, 19 April 1999
14.	Teknaf Beach	Peninsula	10,465	Cox's Bazar	Gazette, 19 April 1999
15.	St. Martin Island	Island	590	Cox's Bazar	Gazette, 19 April 1999
World Heritage Site					
16.	Wildlife Sanctuaries of the Sundarban	Mangrove		Bagerhat, Satkhira, Khulna	1997
17.	Shaat Gombuz Mosque		0.16	Bagerhat	1985
Marine Reserve					
18.		Marine	69,800	Bay of Bengal	Gazette, 29 October 2000
Fish Sanctuaries					
19.		Lotic/Lentic	15,614	Barisal, Bagerhat, Bhola, Patuakhali, Feni, Lakshmipur, Jessore, Khulna and Narail	Proposed FS

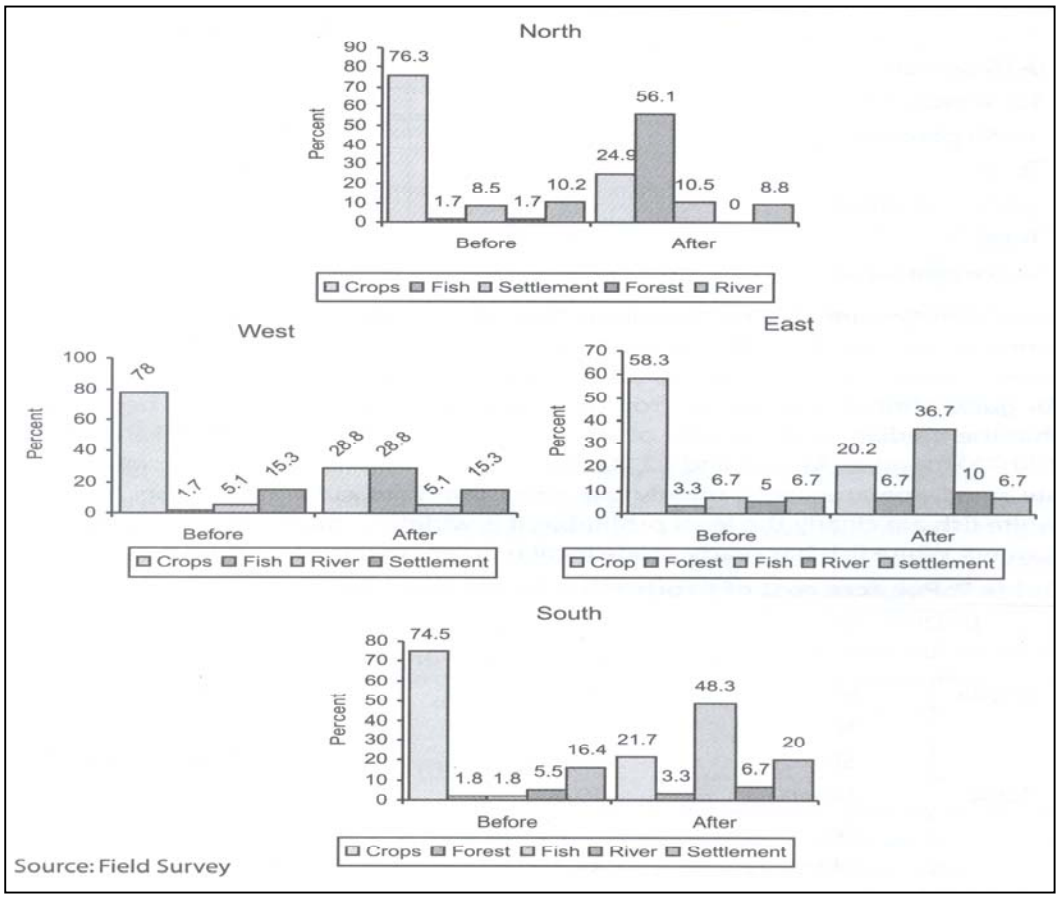
Source: FAO, 1998; BBS, 1999a; FFP, 1999; DoF, 2003;

3.9 Land Use Conflicts

Most of coastal lands are suitable for more than one use. Hence, many diverse uses of limited land created land use conflict. Many studies have highlighted these conflicts, specially between shrimp farming and other uses (Nuruzzaman 1979, Karim and Stellwagen 1998). Besides, one or the other land uses has manifold implications on the socio-environmental conditions.

The introduction of shrimp farming has gradually changed the land use patterns of the surrounding farms altering agriculture and mangrove areas into shrimp farming areas (Haque 2004). Several studies reported, due to introduction of shrimp farming, a reduction in land for cattle grazing (Maniruzzaman 1998), death of trees and other vegetation (Alauddin and Tisdell 1998), increased salinity of soil and water, and a reduction of drinking water supply. The following Fig. 13 shows how shrimp farming has affected other uses of land.

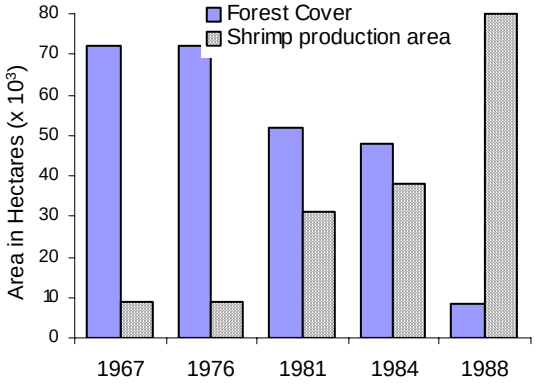
Figure 13: Changing pattern of land use around a shrimp farm



Firoze (1993), Majid and Gupta (1997) elaborated social and environmental impacts of industrial shrimp culture. As agricultural lands were turned into shrimp polders, the share-croppers and landless wage labourers found themselves losing their livelihoods, and began movements to resist the introduction of shrimp in their areas. This often resulted in violence.

Brackish water shrimp cultivation, on an industrial scale, has brought large scale environmental degradation. Shrimp polders retain saline water for months together, and the salinity seeped into adjacent farms and spread soil salinity. The loss of mangrove areas to aquaculture is a common feature, with Chakoria Sunderbans being the classic example (Chowdhury et al 1994, Brown 1997). Between 1967 and 1988, areas of Chakoria Sundarban mangroves had been reduced from 7500 ha to only 973 ha (Figure 14) (Chowdhury et al 1994).

Figure 14: Changes in the Chakoria Sundarbans over the period 1967-1988



3.10 Land suitability Analysis

A number of studies dealt comparative land suitability analyses on present land uses. Hossain & Lin (2002) analyzed remote sensing data of Landsat TM and thematic information of Cox's Bazar to identify suitable areas for mangrove afforestation, shrimp farm and salt bed development. Most of the suitable areas identified in the study actually coincided with the existing land use, which is important for appropriate zoning to optimize resource allocation and to minimize conflicts among user groups. Further, the land suitability maps for mangrove afforestation, shrimp farms and salt beds were overlaid together to distinguish the combined land suitability categories as well as land use conflicts. The land use conflicts among salt, shrimp and mangrove areas were not prominent but indicated possible conflicts mainly between mangrove and salt, as well as mangrove and shrimp. Combining the present land use map of the study area with the identified suitable land use map revealed that most areas of existing shrimp farm and salt bed were developed within the suitable area except mangrove afforestation. Similar observations were made by Shahid et al (1992), Islam et al (1997) and Alam et al (1990).

CEGIS (2005), under Sustainable Environment Management Program, prepared land suitability maps both for bagda (brackish water shrimp) and T.Aman (transplanted paddy) crop in three administrative zilas: Khulna, Bagerhat and Satkhira. The land suitability factor for both T.Aman and Bagda are more or less similar, except the soil salinity. High salinity increases the yield of Bagda, where as it reduces the yield of T.Aman crop. Based on the physical suitability, areas exclusively for Bagda could be clearly delineated. Similarly T.Aman and other agricultural crops could be separated from Bagda practices. Present land use for these two indicated mis-match areas in these three districts. Quader et al (2004) using remote sensing techniques, analysed suitability of different land use and found that Khulna-Satkhira area as more suitable for shrimp farming than Cox's Bazar.

Findings from these studies reinforces that land suitability, more or less, matches with present land uses. The exercise of land zoning will continue to use, on a broader frame, the present land use for zoning purpose.

4 INDICATIVE COASTAL LAND ZONES

The Technical Support Group met several times to review data and information presented in Chapter 3 on major land uses and others. The Group decided to propose 8 indicative land zones **(Fig. 15** and **Table 12)** after assessing the present land uses of the coastal areas. The identified land zones are:

10. Shrimp (Brackish water) Zone (9 Upazilas)
11. Shrimp (Sweet water) Zone (7 Upazilas)
12. Salt- Shrimp Zone (5 Upazilas)
13. Forest Zone (4 Upazilas)
14. Mangrove Zone (4 Upazilas)
15. Urban and Commercial Zone (21 Upazilas/Thanas)
    (Industrial, Port, EPZs and Ship breaking Yards)
16. Tourism Zone (2 Upazilas)
17. Agriculture Zone (96 upazilas)

The Group, in proposing these indicative zones using upazilas as boundaries, strongly recommended immediate start of detailed land zoning and adoption of relevant rules, law or others. It was not always easy to identify each upazila to a certain zone[2]. A more rational approach has been taken. Further, environmentally important protected areas are not identified as a separate zone as these are more or less demarcated already. A brief description of each of the land zones is furnished below:

1. Shrimp (Brackish water) Zone

The following 9 upazilas of 3 districts have been designated under this zone:

Districts	Upazilas
Khulna	Batiaghata, Paikgachha
Satkhira	Satkhira Sadar, Assasuni, Kaliganj, Debhata
Bagerhat	Bagerhat Sadar, Rampal, Morrelganj

The existing data collected from DoF reveals that these upazilas cover about 40-65% of gross land under bagda cultivation. In addition, bagda cultivation are intensive in Dacope, Koyra (Khulna) and Shayamnagar (Satkhira) upazilas, but these are more associated with the mangrove zone.

The bagda cultivation is becoming more intensive in different other coastal upazilas where saline water is available and land type is suitable for its cultivation. Bagda cultivation is done alone or with white fish or in rotation with paddy crops depending on land type classification and intensification of water salinity of the area. This zone lies under Gangetic tidal floodplain having mostly high to medium highlands and is almost flat and tidally flooded. The soils are mainly non-calcareous and saline which have severe limitations to crop cultivation especially in dry season. The zone is characterized by inter-connected tidal rivers and khals (Creeks).

In addition to bagda cultivation the upazilas are also used for agriculture (transplanted/broadcasted Aus - T. Aman- Fallow, Fallow - T. Aman- Fallow are the major cropping patterns). There are many fish processing centers and hatcheries exist in Satkhira Sadar.

[2] The Technical Support Group identified. 40 Upazilas that have more than one major land uses. The list is presented in **Annex B**.

2. Shrimp (Sweet water) Zone

The following 7 (seven) upazilas in 3 districts are designated under this zone are:

Districts	Upazilas
Khulna	Dumuria, Phultala
Bagerhat	Fakirhat, Mollahat, Chitalmari
Jessore	Monirampur, Keshabpur

Galda is now being cultivated in almost all upazilas of the coastal zone and also in other upazilas of the country. It is mostly cultivated with paddy. Existing data and information reveals that these upazilas cover about 30-60% of their gross land for galda cultivation mixed with paddy crops.

The zone lies under High Gangetic floodplain covering medium highland to low-lying areas flooded by monsoon flood. The soils are mainly non-calcareous and non-saline and are suitable for all crops. Surface and groundwater irrigation facilities are available in most of the areas of this zone which ensure timely cultivation of both paddy and shrimp.

Besides galda the land of this zone is also used for agriculture. The major land use patterns differentiated are: In the high to medium highland land area - Aus/ Jute followed by dry land rabi crops or vegetables, Boro (HYV) followed by T. Aman and Sugarcane. In the medium lowland area- mixed Aus & Aman / Jute followed by dry land rabi crops. In the low lying areas Boro (HYV)- fallow or deep water Aman- fallow.

The major problems identified are: exposure to cyclonic storm, monsoon flood, conflicts of interest between shrimp and agricultural farmers, environmental hazards due to huge collection of snails for shrimp feeding. Late post monsoon drainage hampers timely cultivation of both shrimp and boro crop.

3. Salt- Shrimp Zone

The following 5 (five) upazilas in two districts have been designated under this zone:

Districts	Upazilas
Cox's Bazar	Chakaria, Moheshkhali, Kutubdia, Pekua
Chittagong	Banshkhali

The existing data and information reveals that upazilas under this zone cover about 40-60% of gross land for salt-shrimp cultivation. Salt is mainly cultivated in rotation with shrimp or paddy crop. Cox's Bazar Sadar, although is dominated by salt-shrimp cultivation but included under tourism zone considering its acceptability as a tourist area by the government.

Besides these uses, other related opportunities exist in this zone are the shell collection, crab collection and culture etc. There is scope for increasing mangrove plantation on newly accreted land of some upazilas like Maheshkhali, Kutubdia and Chakaria,

The upazilas are tidally affected, strongly saline, erosion and accretion prone and are subject to flash flood, tidal surges and cyclonic storm. These problems cause severe damage to salt-shrimp production in almost every year.

4. Forest Zone

The following 4 (four) upazilas in two districts have been designated under this zone.

Districts	Upazilas
Chittagong	Fatikchhari,
Cox's Bazar	Ramu, Teknaf, Ukhiya

The existing data of Upazila Land utilization Guide of SRDI reveals that these upazilas cover about 50-65% of total land under forest. The natural forest zone includes mixed evergreen and deciduous forest and mixed thickets. The area is above normal flood level. The upazilas are also used for agriculture and horticulture. Shrimp (Bagda) is also cultivated in some areas of Ukhiya and Teknaf upazilas.

Deforestation is the main problem causing ecological hazard in the coastal belt. The principal cause of deforestation in the terrestrial forests is expansion of agricultural land and uses for dwelling houses after clear-cutting the forest areas. Growth of population and economic pressure are two prominent factors leading to large scale clearing of forests.

5. Mangrove Zone

The following 4 (four) upazilas in three districts, covering the Sunderban, have been designated under this zone. In addition, patches of mangrove forest located in other coastal upazilas are also designated within zone.

Districts	Upazilas
Khulna	**Sundarban:** Dacope, Koyra
Bagerhat	Sarankhola
Satkhira	Shymnagar
	Additional Patches in: Barguna Sadar, Patharghata (Barguna), Char Fassion, Daulatkhan, Monpura (Bhola), Galachipa (Patuakhali), Sonagazi (Feni), Mirsharai (Chittagong), Noakhali Sadar, Hatiya (Noakhali)

The zone covers both planted and natural mangrove forest. Most of the upazilas of the exposed coast have patches of mangrove forest mainly located in the tidal affected lands.

Sundarban, the largest natural mangrove forest in the world, covers about 6017 kms of land in 5 upazilas: Dacope, Koyra, Shyamnagar, Mongla, and Sarankhola. However, considering the commercial importance of Mongla, it has been designated as commercial upazila.

6. Urban and Commercial Zone (Industrial, Ports, EPZs and ship breaking yards)

The following 21 (twenty one) upazilas/thanas in 4 districts have been designated under this zone. The upazilas of statistical metropolitan cities like Ctittagong, Khulna and two other important towns such as Barisal and Mongla are these 21 upazilas.

Districts	Upazilas
Chittagong	Chittagong Port, Double Mooring, Hathazari, Pahartali, Bakalia, Panchlaish, Patenga, Halisahar, Kotwali, Boijid Bostami, Sitakunda, Karnaphuli
Khulna	Khulna Sadar (Kotwali), Rupsa, Dighalia, Khalishpur, Sonadanga, Daulatpur, Khanjahan Ali
Barisal	Barisal Sadar (Kotwali)
Bagerhat	Mongla

Important commercial and industrial areas like ship breaking yards, sea- ports, EPZs have been included under this zone.

7. Tourism Zone

The following 2 (two) upazilas/thanas in two districts have been designated under this zone.

Districts	Upazilas
Cox's Bazar	Cox's Bazar Sadar
Patuakhali	Kalapara (Kuakata)

Cox's Bazar and Kuakata are generally identified as major tourism attractions of the coastal zone. Besides, zoning these upazilas, declaration of special set back distances is being considered to restrict construction on the beaches.

Cox's Bazar- It is the only well developed and most frequented beach town of Bangladesh. It has both natural and cultural diversity. Almost entire length of the beach, which spreads towards south, has a range of low hills with evergreen vegetation and springs. This scenic beauty is a great attraction to the tourists. Cox's Bazar is well connected with other art of the country by air and road.

Besides these uses Cox's Bazar has huge number of shrimp hatcheries, dry fish area and shrimp-salt fields. Deciduous and evergreen forests cover the northern part of this upazila. Agricultural practices are also common in this upazila where paddy (Boro, T. Aman) and vegetables are grown in a considerable area.

Kuakata- The beach is one of the unique in the world that allows a glimpse of full view of the rising and setting of crimson sun. The beach is not far away from the Sundarbans. It has picturesque coconut grove in the background. It is also a sanctuary of migratory birds. Kuakata has a cultural heritage. The Rakhayne community of Mongoloid origin lives here. They have exotic social and cultural traits.

The upazila is mainly used for agriculture but considering its cultural heritage, social demands as well as its significance in national economy this has been designated as tourism upazila. Other related opportunities exist in this zone is the shell collection, crab collection and culture, natural and artificial pearl culture.

Erosion, cyclonic storm and storm surges, deterioration of law and order situation are the major problems causing threat to this industry. The existence of Kuakata beach is now in peril owing to the erosion by the sea. Immediately action is needed to safe this unique beach.

8. Agriculture Zone

The following 96 upazilas in 18 districts have been designated under this zone.

Districts	Upazilas
Jessore	Chaugachha, Bagerpara, Jhikargachha, Jessore Sadar, Sharsa, Abhoynagar
Khulna	Terokhada
Satkhira	Tala, Kalaroa
Bagerhat	Kochura
Narail	Narail Sadar, Narigati, Lohagara, Kalia
Sharaiatpur	Goshairhat, Damudya, Bhedarganj, Palong, Naria, Zanjira
Pirojpur	Pirojpur Sadar, Nazirpur, Kawkhali, Nesarabad (Swarupkati), Bhandaria, Mathbaria

Districts	Upazilas
Barisal	Gaurnadi, Agailjhara, Mehendiganj, Muladi, Hizla, Banaripara, Wazirpur, Babuganj, Bakerganj
Patuakhali	Patuakhali Sadar, Bauphal, Galachipa, Dashmina, Rangabali, Mirjaganj,
Gopalganj	Gopalganj Sadar, Kashiani, Muksudpur, Kotalipara, Tongipara,
Jhalakati	Jhalokati Sadar, Rajapur, Nalchiti, Kanthalia,
Barguna	Barguna Sadar, Betagi, Bamna, Amtali, Patharghata
Bhola	Bhola Sadar, Lalmohan, Char Fassion, Daulatkhan, Tazumoddin, Burhanuddin, Monpura,
Chandpur	Chandpur sadar, Faridganj, Shahrasti, Hajiganj, Matlab, Kachua, Haimchar,
Feni	Feni Sadar, Chhagalnaiya, Sonagazi, Parshuram, Daganbhuiya
Lakshmipur	Lakshmipur Sadar, Raipur, Ramganj, Ramgati,
Noakhali	Noakhali Sadar, Senbagh, Begumganj, Chatkhil, Companiganj, Hatiya,
Chittagong	Mirsharai, Chandgaon, Boalkhali, Lohagara, Kulshi, Rangunia, Patiya, Anowara, Chandanaish, Satkania, Raozan, Sandwip

The existing data of Upazila Land Resources Guide of SRDI reveals that the upazilas under this zone are intensively (50-60%) used for agriculture.

In addition to agriculture some of the upazilas are used for shrimp cultivation which is minor in area consideration. The upazilas of Chittagong cover forest land where horticulture practices are also going on. Mangrove plantation is going on in almost all the exposed upazilas of this zone.

Most of the upazilas under this zone are flooded by monsoon flood except the upazilas of southern part, which are flooded by silty tidal water. In the dry season some of the upazilas of the northern part of this zone are irrigated by groundwater due to shortage of surface water in the nearby rivers and depressions. Groundwater of most of the upazilas of the southern part of this zone is saline, which cannot be used for dry season irrigation. At present, the irrigation coverage in the coastal zone is only 30% of the net cropped area, compared to 50% in the country. In general, irrigation coverage is low (<15%) in the districts of Bagerhat, Barguna, Jhalakathi, Khulna, Patuakhali and Pirojpur.

Both water and soil salinity are the major problem restricting crop cultivation in the region. The high land area is well drained but drainage in medium and the low-lying areas is congested because of silting of old river channels, khals and unplanned construction of village roads. Rainfall variability and drought especially restrict aus and aman cultivation in almost every year. In the low-lying areas flood is a major problem causes damage to crops.

Figure 15: Indicative Coastal Land Zones

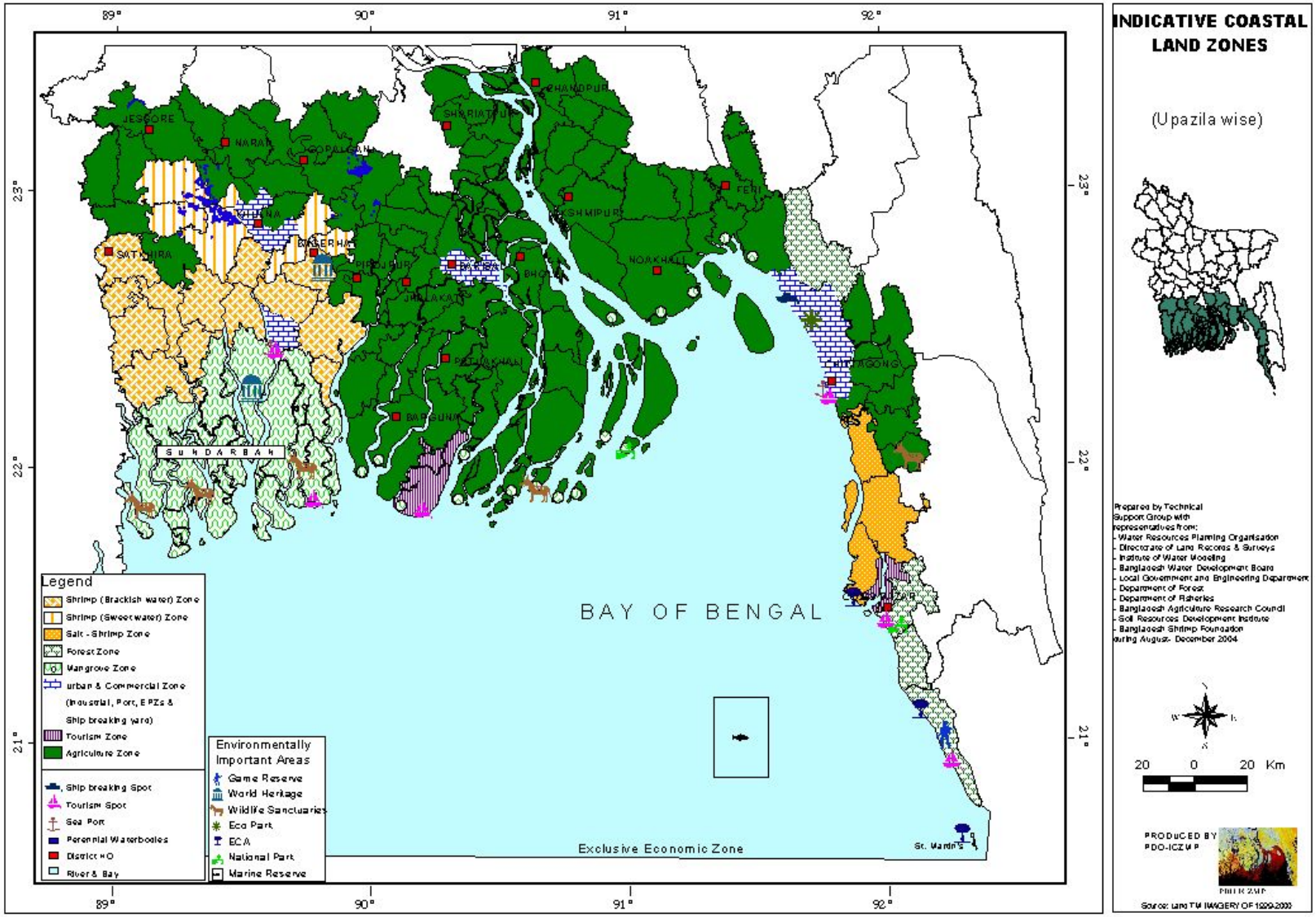


Table 11: Indicative Land Zones with Districts, Upazilas/Thanas

Zones	Districts	Upazilas/Thanas	Number of Upazilas/Thanas
1. Shrimp (Brakish water) Zone	Khulna	Batiaghata, Paikgachha	9
	Satkhira	Satkhira Sadar, Assasuni, Kaliganj, Debhata	
	Bagerhat	Bagerhat Sadar, Rampal, Morrelganj	
2. Shrimp (Sweet water) Zone	Khulna	Dumuria, Phultala	7
	Bagerhat	Fakirhat, Mollahat, Chitalmari	
	Jessore	Monirampur, Keshabpur	
3. Salt- Shrimp Zone	Cox's Bazar	Chakaria, Moheshkhali, Kutubdia, Pekua*	5
	Chittagong	Banshkhali	
4. Forest Zone	Chittagong	Fatikchhari,	4
	Cox's Bazar	Ramu, Teknaf, Ukhiya	
5. Mangrove Zone including Sundarban	Khulna	**Sundarban :** Dacope, Koyra	4
	Bagerhat	Sarankhola	
	Satkhira	Shyamnagar	
		Additional Patches in: Barguna Sadar, Patharghata (Barguna), Char Fassion, Daulatkhan, Monpura (Bhola), Galachipa (Patuakhali), Sonagazi (Feni), Mirsharai (Chittagong), Noakhali Sadar, Hatiya (Noakhali)	
6. Urban and Commercial Zone (Cities, Industry, Port, EPZs and ship breaking yard)	Chittagong	Chittagong Port, Double Mooring, Hathazari, Pahartali, Bakalia, Panchlaish, Patenga, Halisahar, Kotwali, Boijid Bostami, Sitakunda, Karnaphuli	21
	Khulna	Khulna Sadar (Kotwali), Rupsa, Dighalia, Khalishpur, Sonadanga, Daulatpur, Khanjahan Ali	
	Barisal	Barisal Sadar (Kotwali)	
	Bagerhat	Mongla	
7.Tourism Zone	Cox's Bazar	Cox's Bazar Sadar	2
	Patuakhali	Kalapara (Kuakata)	
8. Agriculture Zone	Jessore	Chaugachha, Bagerpara, Jhikargachha, Jessore Sadar, Sharsa, Abhoynagar	96
	Khulna	Terokhada	
	Satkhira	Tala, Kalaroa	
	Bagerhat	Kochua	
	Narail	Narail Sadar, Narigati, Lohagara, Kalia	
	Sharaiatpur	Goshairhat, Damudya, Bhedarganj, Palong, Naria, Zanjira	

* Not included in 147 Upazilas

Zones	Districts	Upazilas/Thanas	Number of Upazilas/Thanas
	Pirojpur	Pirojpur Sadar, Nazirpur, Kawkhali, Nesarabad (Swarupkati), Bhandaria, Mathbaria	
	Barisal	Gaurnadi, Agailjhara, Mehendiganj, Muladi, Hizla, Banaripara, Wazirpur, Babuganj, Bakerganj	
	Patuakhali	Patuakhali Sadar, Bauphal, Galachipa, Dashmina, Rangabali, Mirjaganj,	
	Gopalganj	Gopalganj Sadar, Kashiani, Muksudpur, Kotalipara, Tongipara,	
	Jhalakati	Jhalokati Sadar, Rajapur, Nalchiti, Kanthalia,	
	Barguna	Barguna Sadar, Betagi, Bamna, Amtali, Patharghata	
	Bhola	Bhola Sadar, Lalmohan, Char Fassion, Daulatkhan, Tazumoddin, Burhanuddin, Monpura,	
	Chandpur	Chandpur sadar, Faridganj, Shahrasti, Hajiganj, Matlab, Kachua, Haimchar,	
	Feni	Feni Sadar, Chhagalnaiya, Sonagazi, Parshuram, Daganbhuiya	
	Lakshmipur	Lakshmipur Sadar, Raipur, Ramganj, Ramgati,	
	Noakhali	Noakhali Sadar, Senbagh, Begumganj, Chatkhil, Companiganj, Hatiya,	
	Chittagong	Mirsharai, Chandgaon, Boalkhali, Lohagara, Kulshi, Rangunia, Patiya, Anowara, Chandanaish, Satkania, Raozan, Sandwip	
Total	**19**		**147**

5 VALIDATION OF PROPOSED ZONES

Three workshops were arranged for presenting the Indicative Coastal Land zones to the local level stakeholders for their opinions and suggestions to validate the proposed zones.

District	Date	No. of participants	Presided
Patuakhali	January 15, 2005	60	Mr. Proshanta Bhoshan Barua, Deputy Commissioner, Patuakhali
Khulna	January 18, 2005	50	Mr. Md. Mahbubur Rahman, Deputy Commission, Khulna
Cox's Bazar	March 5, 2005	51	Mr. Md. Habibur Rahman, Deputy Commissioner, Cox's Bazar

Representatives of DoF, FD, DAE, BWDB, Mongla Port Authority, local administration, NGOs and mass media participated.

Each of these workshops was organized in five sessions:

- ◊ Inaugural speech
- ◊ Presentation of Indicative Coastal land Zones
- ◊ Open discussion
- ◊ Conclusion/Recommendation
- ◊ Thanks and Closing.

Presentation of Coastal Land Zones: Mr. Abdul Halim Mia, Land Zoning Specialist of PDO-ICZMP presented in detailed the Indicative Coastal Land Zones giving special importance on the land zones. In his power point presentation he presented the following main features of land zoning: Need of land zoning, Policy statements of the governments, Initiatives and Modalities of present land zoning exercise, Objectives of land zoning, the 8 formulated land zones and Ways forward for detailed plan of zoning exercise in future.

5.1 Workshop at Patuakhali

Inaugural speech: Mr. Proshanta Bhoshan Barua, Deputy Commissioner, Patuakhali welcomed the participants and delivered a brief speech on different issues, problems and potentials of different upazilas of Patuakhali district. DC in his speech requested the PDO-ICZMP team to suggest some measures in the ensuing plan for the development of Fish landing and dry-fish areas of Patuakhali district. He put special importance on controlling degradation of land due to salinity increase and its improper uses. He believed that land zoning will ensure best uses of land. Lastly, he requested PDO-ICZMP for detailed land zoning to solve conflicts of interest of resource uses and formulate specific program for the development of coastal area.

Conclusion/ Recommendation: The participants including DC Patuakhali suggested for detailed land zoning up to at least union level which will help to designate land properly and to formulate proper zoning of lands for integrated planning. Arsenic affected areas could be marked as separate zones and their mitigatory measures could be suggested in the zoning report. DC assured that his administration would give full support to this exercise of detailed land zoning. They endorsed the indicative zoning.

5.2 Workshop at Khulna

Inaugural speech: Mr. Md. Mahbubur Rahman, Deputy Commissioner, Khulna welcomed the participants. DC in his speech requested the PDO-ICZMP team to think for software based land zoning which he has seen to use in the Netherlands. DC mentioned that land of Khulna is used for different purposes. It is creating conflicts among the stakeholders. Proper land zoning is important to solve these

emerging problems. DC suggested measures in the ensuing plan for the development of Fish hatcheries and landing places at Khulna district. Lastly, he mentioned that PDO-ICZMP will think for detailed land zoning to solve conflicts of interest of resource uses especially uses of land for shrimp and agriculture and formulate specific programs for the development of Khulna district.

Conclusion/ Recommendations: Participants gave these opinions that detailed Land Zoning up to union or even village level is needed. Otherwise more conflicting situation regarding land uses may be created in future. DC, Khulna specially suggested "Software based Land Zoning" study might be considered by WARPO-PDO-ICZMP, which has been practiced in Netherlands. For proper planning of resources specially land resources there is no alternative of detailed land zoning considering their criteria. They endorsed the indicative zoning.

As per suggestions, the Upazilas Monirampur, Abhayanagr of Jessore district and Kochua of Bagerhat district were considered to include under galda zone.

5.3 Workshop at Cox's Bazar

Inaugural speech: Mr. Md. Habibur Rahman, Deputy Commissioner, Cox's Bazar welcomed the participants and mentioned that the Land Zoning initiative for coastal area as taken by the PDO-ICZMP is a timely approach, which will ensure proper planning of land resources and help to protect natural ecosystem, wild lives and other resources of the area. He gave much importance on the restoration of the Chokaria Sundarban which has been damaged by local people for their own uses and save the St. Martin island through zoning activity. DC also mentioned that Land Zoning is for demarcating the land for specific uses considering its characteristics. He mentioned that there is no integration in salt cultivation, shrimp culture, forestry and agriculture. So he mentioned "Farmers have idea for land use but modern idea of land use may be given to them to optimize use of land.

Conclusions/Recommendation: Participant gave following opinions:

- They endorsed the indicative zoning.
- Cox's Bazar is a multi-resourceful district in terms of tourism, salt cultivation, marine fisheries, forestry and hatchery. So, all economic resources should be considered in Land Zoning.
- Detail Land Zoning up to union or village level is needed.
- Social and environmental impact assessment during the zoning study in Cox's Bazar district.
- Not only Cox's Bazar upazila to be considered as a tourism area. Teknaf, Maheshkhali, St. Martin and Sonadia may be considered also as tourism area. Chokoria and Pekua should be considered as mangrove forest area.
- Marine fishing area should be specified and considered in Land Zoning.

6 PRESENTATION AT NATIONAL LEVEL

Indicative land zoning was presented, by Dr. M Rafiqul Islam, Team Leader of ICZMP project, at the 1st meeting of the Committee for monitoring of the implementation of the National Land Use Policy 2001 on 13 February 2005 at the Ministry of Land.

The meeting was attended by Hon'ble Mr. Tariqul Islam, Minister for Environment & Forests; Hon'ble Barrister Nazmul Huda, Minister for Communications; Hon'ble Mr. MA Kabir Talukder, State Minister for Finance & Planning and Hon'ble Advocate Ruhul Quddus Talukder (Dulu), Deputy Minister for Land. The meeting was chaired by Hon'ble Ukil Abdus Satter, State Minister for Land. Among others, Secretaries and high officials of several ministries attended.

In the discussion, emphasis was laid on zoning of land. The decisions of the meeting (Minutes, Annex A), among others were:

d) Endorsement on principle of indicative land zoning for the coastal area, as carried out under the ICZMP.

e) The Ministry of Land will undertake a separate project to carry out detailed land zoning exercises with support from the ICZMP project of the Ministry of Water Resources.

f) The Ministry of Land will undertake actions to prepare Zoning Law and Village Improvement Act. It was decided to complete within six months the drafting and their finalization through consultations at six divisional cities.

The minutes of the meeting (**Annex C**) was circulated on April 20, 2005.

7 CONCLUSION

Through this exercise, a start has been made for land zoning of the country, as elaborated in the Land Use Policy (MoL, 2001). The present exercise of land zoning has brought relevant agencies together on an institutional platform, which could be used further to carry out detailed land zoning in future.

The Ministry of Land has taken further steps to prepare separate 5-year project proposal to start detailed land zoning in the coastal zone. The plan is to carry out zoning in all 147 Upazilas in three phases.

Detailed zoning exercise will benefit from continued research on land utilization, specially from on-going initiatives under SEMP (Sustainable Environment Management Plan), Productivity Development Zones under the Char Development & Settlement Project and at the Soil Resources Development Institute and the Bangladesh Agricultural Research Council.

Drafting and adoption of 'Zoning Law' will facilitate zoning and will support optimum, sustainable and environment friendly land uses and subsequently modern management of land uses.

However, in this document, two issues have not received attention but planned to be addressed in further discussions on land zoning:

a) Chars & Islands: The Land Use Policy 2001 emphasizes on special attention and needed policy frameworks for development of char lands. The Coastal Zone Policy (2005) specifies 'Settled isolated chars and islands will be brought under special rural development programs' and 'Strategies for new chars will be developed'. An 'Offshore Islands Development Board' was functional during 1977-82. An inventory of islands and chars was prepared, for the first time, located in the coastal zone (PDO-ICZMP 2002). This is being updated and a structured MIS is now being developed. The issue for discussion is the need to demarcate and declare char lands and islands as separate zones. In India, islands specially coastal islands have already been given a separate zoning status.

b) Establishment of setback distances along the coastline. This restricts certain uses, such as construction of residential blocks and/or hotels within a specified distance. In the absence of set back distances, hotels and other infrastructures are being built on beaches of Cox's Bazar, St.Martin's island and other places. Benefits of establishing set back zones along the coast are well recognized and practiced around the globe. Following specific benefits worth mentioning;

    - avoidance of risks arising due to cyclone, storm surges, erosion, flooding and tsunami
    - sufficient space for the functioning of the coast
    - protection of critical ecosystems and shoreline
    - conservation, protection and enhance of biodiversity through allowing safe spawning and nursing

    There are different ranges of set back zones in different countries (8 – 3000m) and again within one country, there are various setback zones (20 – 1000m) for various purposes. Among countries in the region, India has adopted a 500m setback zone.

    For Bangladesh coast, a setback distance of 50 meters in general, 100m for non-polluting industries and 200m for polluting industries can be considered.

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ANNEX A: LAND USE POLICY 2001

ANNEX B: UPAZILAS/THANAS WITH DIFFICULTY IN ASSIGNING DESIGNATED ZONE

Districts	Upazilas/Thanas	Designated Zones	Other Land Uses
Bagerhat	Rampal, Morrelganj	Shrimp (Brackish water)	Shrimp (Galda), Agriculture
	Kachua	Agriculture	Shrimp (Galda)
Barguna	Patharghata, Bamna	Agriculture	Shrimp (Galda) and Mangrove
Barisal	Banaripara	Agriculture	Shrimp (Galda)
Bhola	Monpura, Daulatkhan	Agriculture	Mangrove and Shrimp (Galda)
Chittagong	Banshkhali	Salt-Shrimp	Forest and Agriculture
	Patiya, Rangunia, Raozan	Agriculture	Forest and Horticulture
	Chittagong Port, Hathazari, Sitakunda	Urban and Commercial (Industry, Port, EPZs and Ship breaking yard)	Agriculture
Cox's Bazar	Cox's Bazar Sadar	Tourism	Forest, Salt, Shrimp (Bagda), Hatcheries and Agriculture
	Chakaria, Moheshkhali, Kutubdia, Pekua*	Salt-Shrimp	Forest, Hatcheries and Agriculture
	Ramu, Teknaf, Ukiya	Forest	Salt, Shrimp (Bagda), Tourism, Agriculture
Feni	Sonagazi	Agriculture	Mangrove
Gopalganj	Gopalganj Sadar, Tungipara	Agriculture	Shrimp (Bagda & Galda)
Jessore	Bagherpara, Sharsha, Abhayanagar	Agriculture	Shrimp (Galda)
	Monirampur, Keshabpur	Shrimp (Sweet water)	Agriculture
Khulna	Batiaghata, Paikgachha	Shrimp (Brackish water)	Shrimp (Galda), Agriculture
	Phultala	Shrimp (Sweet water)	Agriculture
	Terokhada	Agriculture	Shrimp (Galda)
	Dacope, Koyra	Mangrove	Agriculture, Shrimp (Bagda & Galda)
Lakshmipur	Ramganj	Agriculture	Shrimp (Bagda), Mangrove
Narail	Kalia	Agriculture	Shrimp (Galda)
Noakhali	Noakhali Sadar, Hatiya	Agriculture	Mangrove, Shrimp (Bagda)
Patuakhali	Galachipa, Bauphal	Agriculture	Mangrove, Shrimp (Bagda)
	Kalapara	Tourism	Agriculture, Mangrove
Pirojpur	Mathbaria, Nazirpur, Bhandaria	Agriculture	Shrimp (Galda and Bagda)
Satkhira	Assasuni, Kaliganj, Debhata	Shrimp (Brackish water)	Shrimp (Galda), Agriculture
	Tala, Kalaroa	Agriculture	Shrimp (Bagda & Galda)
Districts=16	**Upazilas/Thanas=52**		

* Not included in 147 Upazilas

ANNEX C: MINUTES OF THE MEETING AT THE MINISTRY OF LAND ON 13/2/2005