

**CHAPTER 3:
REVIEW OF RELATED POLICIES,
LAWS AND FUTURE PLANS**

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3.1 National Development

National planning efforts started in Bangladesh in 1973 with the First Five Year Plan covering the period 1973 to 1978. During that phase of national development, the country had to struggle with economic rehabilitation and reconstruction. Almost four years were needed for the economy to reach in 1977 again its original 1970 base year. The Second Five Year Plan (1980 to 1985) aimed at establishing systematic planning in Bangladesh. However, these efforts did not succeed, firstly due to the effects caused by the two oil price hikes and, secondly, because the plan's basic needs orientation required social mobilisation. Bangladesh's institutions, political and administrative processes were not yet adequately geared for such mobilisation.

National Development during the Third Five Year Plan (1985 to 1990) made considerable progress in infrastructure development, agriculture as well as structural adjustment. It was, however, realised by Bangladeshi policy makers in the second half of the third plan that structural adjustment may be a necessary but not a sufficient condition for economic growth, which is accompanied by equitable distribution.

The current Fourth Five Year Plan (1990 to 1995) has been formulated as part of Bangladesh's twenty year Perspective Plan, which covers the period 1990 to 2010. This perspective plan aims, in principle, at:

- Greater investment into the programs for human resource development (HRD)
- Integration of the structural adjustment program with the poor and disadvantaged so that they move from the periphery to the centre of the development process
- Building up a policy and institutional support network for accelerating economic growth
- Promoting technological upgrading
- Building up of a policy and institutional network that brings women, particularly the poorer women, to the main stream of development
- Increasing the effectiveness of public sector program, and
- Removal of existing imbalances in capacity utilisation.

The multiple aims of the Perspective Plan have been consolidated into three critical objectives. They are :

- Growth in national income
- Alleviation of poverty and generation of employment opportunities through HRD, and
- Increased self-reliance.

I was expected by Bangladesh's policy makers that the Fourth Five Year Plan would set the stage for overcoming major constraints to economic growth and that GDP growth rates between 6% to 8% would be achieved in the years as of 1996.

3.2 Industrial Development

Bangladesh's development plans had more or less similar industrial development objectives. All of the plans aimed at, firstly, accelerating industrial growth mainly through productivity and capacity utilisation of existing industries and, secondly, they aimed at establishing new and dynamic industries. However, as has been discussed in Section 2.6 already, production levels, real growth rates and the manufacturing sector's share in GDP have remained low. Capacity rates in some industries, for example, have been below 50% of installed capacity (jute goods and steel ingots) or only between 50% to 70% (such as in cotton yarn, sugar and fertiliser). Bangladesh's industrial policy makers have identified the following major reasons for such poor past performance:

- Demand constraints
- A cost price squeeze
- Poor maintenance
- Input constraints (working capital, raw materials, spare parts and machinery)
- Low labour productivity, and
- Inadequate R&D activities.

Industrial development objectives in the Fourth Five Year Plan have been:

- Maximisation of the contribution of the industrial sector to GDP growth
- An average annual growth rate of 9.1% of industrial value-added over the planning period
- Maximisation of the industrial sector to total employment generation, and
- Development of a sound technology base through research and adaptation.

The main strategies for the realisation of the above objectives have been:

- Development of export oriented industries for accelerating industrial growth and strengthening self-reliance
- Improvement in productivity and capacity utilisation
- Privatisation and other policy interventions
- Reformation of industrial policy and incentives
- Promotion of small, cottage and rural industries
- Promotion of linkage industries
- Development of industrial zones and estates
- Development of trained manpower
- Development of national technological capabilities
- Participation of women in industrial development, and
- Environmental Protection.

3.3 Export Promotion

As has been observed in the previous section, development of export-oriented industries is one of Bangladesh's main strategies to accelerate industrial growth and strengthen self-reliance. Development of export industries on a primary basis does not preclude development of import substituting industries. Quite to the contrary, it is expected that import substituting industries would eventually achieve a level of quality and efficiency so as to ultimately also become export industries.

The policy agenda for the development of export industries comprises the following major elements:

- Product diversification, horizontal market expansion and upgrading of export unit values
- Rationalisation of monetary and fiscal incentives (such as reduced interest rates and tariff and non-tariff measures) and easy access to imported inputs through bonded warehouses, tax holidays and so on
- Removal of the anti-export bias through proper export and import and exchange rate policies
- Adoption of measures for improving the backward linkages of export oriented industries
- Development of EPZ's and appropriate incentives for FDI and joint-ventures

- Strengthening of the Export Promotion Bureau
- Training of exporters in effective communication, and
- Aggressive salesmanship abroad.

Bangladeshi planners have identified the following major product groups of having export potential, import substituting potential and good investment prospects:

- In the textile and garment subsector : 1.) cotton textile fabrics; 2.) specialised textile fabrics : household linen; 3.) cotton and other knitwear fabrics (cotton vests and underwear, nylon socks); 4.) readymade garments not affected by quotas; 5.) high value garments in quota affected categories; 6.) cotton yarn of low counts; 7.) silk fabrics woven with imported silk; 8.) miscellaneous textile products such umbrella cloth, canvas cloth and tarpaulin; 9.) silk & art silk
- In the agro-industry subsector : 1.) frozen shrimp, fish and froglegs; 2.) fruit juices; 3.) spices and dehydrated vegetables; 4.) fish meal and other fish products; 5.) tea, especially packet tea; 6.) mushrooms for canning; 7.) cassava starch
- In the leather and leather products subsector : 1.) wet blue leather, crust and finished leather; 2.) footwear, that is initially shoe uppers; 3.) other leather products
- In the engineering subsector : 1.) electronic components; 2.) electric goods and accessories; 3.) electric motors; 4.) telephone cables; 5.) hand and cutting tools; 6.) heating equipment
- Other miscellaneous products are : 1.) ceramic tableware; 2.) stainless steel cutlery & crockeries; 3.) plastic products such as PVC pipes, tubes and footwear; 4.) medical pharmaceutical products; 5.) handicraft; 6.) wood products; 7.) iron casting; 8.) paint & varnishes; 9.) boot polish; 10.) articles of pulp and paper; 11.) acid & alkalides; 12.) glass; 13.) disinfectants; 14.) cigarettes for export; 15.) perfumes & cosmetic soap; 16.) rubber footwear.

3.4 Man power Development

A major problem in the area of skill development in the past has been the lack of a comprehensive national skill development policy, which should have been based on an

objective assessment of the skill requirements in different sectors of the economy. Objectives of the Fourth Five Year Plan have been as follows:

- To formulate a comprehensive national skill development policy on the basis of an objective assessment of man power requirements in various economic sectors
- To strengthen and consolidate the craftsmen level skill training system for ensuring better capacity utilisation and to expand the network where necessary
- To broaden the scope of in-plant and apprenticeship training as a major media of skill development
- To bring all institutional training of the public and private sector under a central testing and certification procedure
- To augment employment generation activities including self-employment of the landless farmers, small farmers, rural and urban informal and disadvantaged women groups
- To reinforce the institutional support for the promotion of man power export, re absorption of returnee migrants with some training if necessary
- To ensure industrial safety and occupational hygiene and to make arrangements for training in the areas of occupational health analysis and accident prevention
- To ensure higher productivity by improving industrial relations through more effective motivation, workers education and training on labour management relations, and
- To undertake action research on various issues in the areas of manpower and employment situation.

3.5 Research & Development

Bangladesh's problems and weaknesses in research and technology development in the past have been identified as :

- Organisational weaknesses
- Unplanned and unco-ordinated R&D work
- Absence of R&D in private enterprises, and
- Lack of comprehensive policies and other policy support.

The Fourth Five Year Plan has allocated 76.00 crore Taka for science, research and technology projects. These funds have been earmarked for projects in science and technology, the Bangladesh Atomic Energy Centre, the Bangladesh Centre for Science and Industrial Research and other R&D facilities and institutions.

**CHAPTER 4:
ENVIRONMENTAL CONSERVATION AND
PROTECTION**

CHAPTER 4 ENVIRONMENTAL CONSERVATION AND PROTECTION

4.1 Present Environmental Administration, Policy and Law

The purpose of environmental conservation is to ensure that sensitive cultural heritage and natural environment are not disrupted unnecessarily in the location of industrial parks, roads and harbour and that the activities of industrial parks, roads and harbour are managed in a manner so that environmental impacts are minimised.

The environmental administrative organisations in Bangladesh are:

- Ministry of Environment and Forest (Department of Environment, Department of Forest). This Ministry was created in August 1989 as a main organ of environmental preservation. The Department of Environment controls discharge from industries and vehicles and performs monitoring, while the Department of Forest preserves forests and the ecosystem. The Department of Environment is responsible for the examination of the environmental impact assessment
- Ministry of Local Government, Rural Development, and Co-operatives. This Ministry is responsible for the law, administration and function of local government. The local governments execute the policies related to water supply, sanitary facilities, environmental sanitation, irrigation, flood control, forest and others
- Environmental Pollution Control Board. This Board gives advice on the formulation and execution of effective policy for environmental pollution control.

4.1.1 Environmental Policy

Bangladesh established an environmental policy in 1992 with the Environmental Action Plan for national environmental management. The "Environmental Policy 1992" provides the basic plan of the Government to preserve the environment and the "Environmental Guidelines for Industries" have been formulated in preparation for the industrialisation of the country.

4.1.2 Environmental Law

As a basic law to preserve the environment, the Bangladesh Environment Preservation Ordinance was modified in 1989. This ordinance defines the permission standards for projects, the procedure and the range of the environmental impact assessment. They are applied to the projects on dams, lakes' and marshes' development, power plants, road, railway and uncultivated areas.

For industrial development, the Bangladesh Environmental Preservation Ordinance defines the kind and scale of the projects, which need an environmental impact assessment.

In Bangladesh, the projects which have already been subjected to an environmental impact assessment are:

- The third stage of the water supply and drainage in Chittagong (World Bank)
- Karnaphuli fertiliser factory
- Bara Pukuria coal mining project, and
- Dhaka Flood Protection project.

Environmental quality standards were created in July 1991. They define the standards of air pollution, water pollution, noise, offensive odour and soil. These standard values are reflected in Table 4.1 (ambient air), Table 4.2 (water), Table 4.3 (noise) and Table 4.4 (odour).

The national environmental conventions, which Bangladesh has initiated are:

- Convention on International Trade In Endangered Species of Wild Fauna and Flora (February 1982)
- The Biological Diversity Convention (June 1992)
- Convention for the Protection of the World Cultural and Natural Heritage (November 1983) :
 - a) Paharpur - the largest Buddhist Monastery, Rajshahi
 - b) Sixty-domed Mosque, Bagerhat, Khulna

Table 4.1 Bangladesh Standard Values for Ambient Air

		Concentration micrograms per meter cube			
Area	Category	SPM	SO ₂	CO	NO _x
A.	Industrial and mixed-use	500	120	5,000	100
B.	Commercial and mixed-use	400	100	5,000	100
C.	Residential and Rural	200	80	2,000	80
D.	Sensitive	100	30	1,000	30

Source:DOE, 1991

Table 4.3 Bangladesh Standard Values for Noise

Area Category	Unit	Standard Value	
		Day time	Night time
A	dBa	45	35
B	dBa	50	40
C	dBa	60	50
D	dBa	70	60
E	dBa	75	70

Note : A— Areas where quiet is specially required such as where there is a concentration of convalescent facilities hospitals, educational institutions.

B— Areas Which are used mainly for residential purposes.

C— Areas Which are used considerably for residential purposes and which are also for commercial and industrial purposes.

D— Commercial area.

E— Industrial area.

Source:DOE, 1991

Table 4.4 Bangladesh Standard Values for Odor

Parameters/ Determinants	Unit	Standard Value
Acetaldehyde	ppm	0.5 — 5
Ammonia	ppm	1 — 5
Hydrogen sulfide	ppm	0.02 — 0.2
Methyl Disulfide	ppm	0.009 — 0.1
Methyl mercaptan	ppm	0.02 — 0.2
Methyl sulfide	ppm	0.01 — 0.2
Styrene	ppm	0.4 — 2
Trimethylamine	ppm	0.005 — 0.07

Source:DOE, 1991

Table 4.2(1) Bangladesh Standard Values for Water

Parameters/determinants	Unit	Standard value						
		Drinking water	Recreational water	Fishing water	Industrial water	Irrigation water	Livestock water	Coastal water
Acidity	mg/L	NYS	NYS	Less than 20	NYS	NYS	NYS	NYS
Alkalinity (total)	mg/L	NYS	NYS	70-100	NYS	NYS	NYS	NYS
Aluminum	mg/L	0.2	NYS	NYS	NYS	1	NYS	NYS
Ammonia (NH ₃)	mg/L	0.5	2	0.025	NYS	3	NYS	NYS
Ammonical Nitrogen(as N)	mg/L	NYS	NYS	1.2	NYS	15	NYS	60
Arsenic	mg/L	0.05	0.2	NYS	NYS	1	1	1
Barium	mg/L	0.5	NYS	NYS	NYS	NYS	NYS	NYS
Benzene	mg/L	0.01	NYS	NYS	NYS	NYS	NYS	NYS
Bicarbonate	mg/L	NYS	NYS	NYS	NYS	NYS	500	NYS
B.O.D	mg/L	0.2	3	6	10	10	NYS	NYS
Boron	mg/L	1	NYS	NYS	NYS	² Not less than 1	NYS	NYS
Cadmium	mg/L	0.005	NYS	NYS	NYS	0.01	0.5	0.3
Calcium	mg/L	75	NYS	NYS	NYS	NYS	700	NYS
Carbon dioxide(CO ₂) (dissolved)	mg/L	NYS	NYS	6	NYS	NYS	NYS	NYS
Chloride(as Cl)	mg/L	150-600 * ¹	600	600	NYS	600	2000	NYS
Chlorinated alkanes								
- Carbon tetrachloride	mg/L	0.01	NYS	NYS	NYS	NYS	NYS	NYS
- 1.1 dichloroethylene	mg/L	0.001	NYS	NYS	NYS	NYS	NYS	NYS
- 1.2 dichloroethylene	mg/L	0.03	NYS	NYS	NYS	NYS	NYS	NYS
- Tetrachloroethylene	mg/L	0.03	NYS	NYS	NYS	NYS	NYS	NYS
- Trichloroethylene	mg/L	0.09	NYS	NYS	NYS	NYS	NYS	NYS
Chlorinated phenols								
- Pentachlorophenol	mg/L	0.03	NYS	NYS	NYS	NYS	NYS	NYS
2,4,6 Trichlorophenol	mg/L	0.03	NYS	NYS	NYS	NYS	NYS	NYS
Chlorine(residual)	mg/L	0.2	0.3	<0.01	NYS	NYS	NYS	2
Chloroform	mg/L	0.09	NYS	NYS	NYS	NYS	NYS	NYS
Chromium(hexavalent)as Cr ₆	mg/L	0.05	0.05	NYS	0.5	NYS	NYS	NYS
Chromium(Total)	mg/L	0.05	NYS	0.05	NYS	NYS	NYS	NYS
COD	mg/L	4	4	NYS	3-10 * ³	NYS	NYS	8
Coliforms(faecal)	n/100ml	0	NYS	NYS	NYS	10	NYS	NYS
Coliforms(Total)	n/100ml	2* ²	200	5000	NYS	1000	100	1000
Colour	Hazen	15	clear	Normal	Normal	Normal	Normal	Normal

*1 For Coastal area 1000 and in Extreme situation in coastal area 1500.*2 per 100 cl.in two consecutive samples or in more than 100% of the samples examined,for drinking water.
Source:DOE,1991

Table 4.2(2) Bangladesh Standard Values for Water

Parameters/determinants	Unit	Standard values						
		Drinking water	Recreational water	Fishing water	Industrial water	Irrigation water	Livestock water	Coastal water
Copper	mg/L	1	NYS	<0.4	NYS	0.2	NYS	0.3
Cyanide(as CN)	mg/L	0.1	0.1	NYS	NYS	NYS	NYS	0.2
Detergents	mg/L	0.2	NYS	NYS	NYS	NYS	NYS	NYS
DO	mg/L	6 ^{*9}	4-5	4-6	5	5	4-6	6
EC	mhoms/cm		500	800-1000	NYS	750	NYS	NYS
Fluoride(as F)	mg/L	1	1.5	NYS	NYS	NYS	4	NYS
Formaldehyde	mg/L	NYS	NYS	NYS	NYS	NYS	NYS	NYS
Hardness(as CaCO ₃)	mg/L	200-500	NYS	80-120	250 ^{*4}	NYS	NYS	NYS
Hydrogen sulfide (H ₂ S)	mg/L				1-5 ^{*5}			NYS
Iodine	mg/L	NYS	NYS	NYS	NYS	NYS	NYS	NYS
Iron	mg/L	0.3-1 ^{*7}	NYS	NYS	0.5 ^{*6}	NYS	NYS	NYS
Kjeldahl Nitrogen(total) (as N)	mg/L	1	1	1	NYS	NYS	NYS	NYS
Lead	mg/L	0.05	NYS	0.05	0.01	0.1	0.05	0.2
Magnesium	mg/L	30-50	NYS	NYS	NYS	NYS	250	NYS
Manganese	mg/L	0.1	NYS	NYS	0.1-1 ^{*8}	2	NYS	NYS
Mercury	mg/L	0.001	NYS	0.001	NYS	NYS	NYS	NYS
Nickel	mg/L	0.1	NYS	NYS	NYS	0.5	NYS	0.2
Nitrate(as N)	mg/L	10	NYS	NYS	NYS	NYS	250	NYS
Nitrate(as NO ₂)	mg/L	<1	NYS	0.03	NYS	NYS	None	NYS
Odour		Odour less	Unobjection-able	Normal	Normal	Normal	Normal	Normal
oil and grease	mg/L	0.01	0.1	0.01	NYS	NYS	NYS	NYS
Organo Phosphorous compounds	mg/L	0	0	NYS	NYS	NYS	NYS	NYS
Organo chlorine compounds	mg/L							
— Aldrin & dieldrin	mg/L	0	0	NYS	NYS	NYS	NYS	NYS
— Chlordane	mg/L	0	0	NYS	NYS	NYS	NYS	NYS
— DDT	mg/L	0	0	NYS	NYS	NYS	NYS	NYS
— Hexachlorobenzene	mg/L	0	0	NYS	NYS	NYS	NYS	NYS
— Heptachlor and heptachlorepoide	mg/L	0	0	NYS	NYS	NYS	NYS	NYS
— Lindane(HCH)	mg/L	0.003	NYS	NYS	NYS	NYS	NYS	NYS
— Methoxychlor	mg/L	0.03	NYS	NYS	NYS	NYS	NYS	NYS
— 2.4D	mg/L	0.1	NYS	NYS	NYS	NYS	NYS	NYS

*3 For boiler feed water, depending on boiler pressure. *4 For boiler feed water 2-40 depending on boiler pressure, tanning 50-130. *5 For cooling water-5, for air conditioning water-1. *6 Textile dyeing-0.25, tanning-0.2. *7 2 In some areas the maximum tolerable limit may be up to 5mg/L in absence of better source, for drinking water. *8 For air conditioning water-0.5, for textile dyeing-0.2, Tanning-0.2. *9 Desirable limit for drinking water.

Source: DOE, 1991

Table 4.2(3) Bangladesh Standard Values for Water

Parameters/determinants	Unit	Standard values						
		Drinking water	Recreational water	Fishing water	Industrial water	Irrigation water	Livestock water	Coastal water
Percent Sodium	%	-	-	-	-	60	-	-
PH	mg/L	6.5-8.5	6-9.5	6.5-8.5	6-9.5	6.0-8.5	5.5-9	6-9
Phenolic compounds (as C ₆ C ₅ OH)	mg/L	0.002	0.001	NYS	NYS	NYS	NYS	1
Phosphate (as PO ₄)	mg/L	6	6	10	NYS	10	NYS	NYS
Phosphrous	mg/L	0	NYS	1.0	NYS	NYS	NYS	NYS
Potassium	mg/L	12	NYS	NYS	NYS	NYS	NYS	NYS
*10 Radioactive materials — Gross Alpha activity	Bq/L	0.01	NYS	NYS	NYS	NYS	NYS	NYS
Gross Beta Gamma activity	Br/L	0.1	NYS	NYS	NYS	NYS	NYS	NYS
Selenium	mg/L	0.01	0.05	NYS	NYS	0.05	NYS	NYS
Silica	mg/L	NYS	NYS	NYS	NYS	NYS	NYS	NYS
Silver	mg/L	0.02	NYS	NYS	NSY	NYS	NYS	0.05
Sodium	mg/L	200	NYS	NYS	NYS	NYS	1000	NYS
Sodium absorption ratio						8-16		
Sodium carbonate (NaCO ₃) (residual)	mg/L	NYS	NYS	NYS	NYS	NYS	NYS	NYS
Sodium chloride	mg/L	NYS	NYS	NYS	NYS	NYS	2860-12000	NYS
S.S	mg/L	10	20	25	75	NYS	NYS	75
Sulfide (as S)	mg/L	0	NYS	NYS	NYS	NYS	NYS	NYS
Sulphate (as So ₄)	mg/L	400	NYS	NYS	NYS	1000	NYS	NYS
Tar	mg/L	0	0	0	NYS	NYS	NYS	NYS
Taste		Not offensive	Normal	Normal	Normal	Normal	Not offensive	Normal
T.D.S	mg/L	1000	NYS	NYS	1500*11	2000	5000	NYS
Temperature	°C	20-30	20-30	20-30	20-30	20-30	20-30	30
Tin	mg/L	2	NYS	NYS	NYS	NYS	NYS	NYS
Turbidity	J.T.U	10	10	NYS	50	NYS	NYS	75
Zinc	mg/L	5	NYS	10	NYS	5	NYS	NYS

*10 These values are Indicative. Detailed values on radio nuclides basis will be set up by the Bangladesh Atomic Energy Commission in due course. *11 For boiler feed water 50-500 depending on boiler pressure. °C

Source:DOE,1991

- Convention of wetlands of international importance (May 1992) :
 - a) Sunderbans, Khulna, 59,600 ha
- United Nations Convention on the Law of the Sea (December 1982), and
- Vienna Convention for the Protection of the Ozone Layer (May 1990).

4.2 The Environmental Concern in Chittagong

The main areas of environmental concern in Chittagong are as follows :

- **Water Pollution in Chittagong City.** The Karnaphuli River is polluted by industrial waste water, domestic waste water, sewerage from Chittagong City and the suburbs and by the oil spilled from the ships in the Chittagong port. There is some concern that water pollution by sewerage may cause health hazards
- **Air Pollution in Chittagong City.** Air pollution is becoming more serious due to the smoke discharged from the industries and the vehicles in Chittagong City. The extent of the pollution is still lower than in the cities in other developing countries
- **Forest destruction by shifting cultivation in the Chittagong Hill Tracts.** In this area the minorities have performed shifting cultivation and it is said that almost all the trees of the 0.73 million ha of Unclassified State Forests (USF) have been exploited. As a result, the top soil is being removed by rain, and agricultural production is decreasing. The top soil flows into the Kaptai reservoir and the Karnaphuli River and the problem caused by soil accumulation is becoming more serious
- **Forest destruction in the Sitakunda Hill Tract.** The top soil has been lost by the forest destruction in the Sitakunda Hill Tract and agricultural productivity has deteriorated
- **Destruction of the natural mangrove forest in Chakaria Sunderban by shrimp farming.** Over 43 % of 7,500 ha of mangrove forest in Chakaria Sunderban has been converted to shrimp farming. As the area for shrimp farming has increased, shrimp production has decreased. It seems that the destruction of the ecosystem has caused this

- **Forest Destruction in Cox's Bazar Hill Tract.** There have been tropical moist forests with various biodiversity in the Cox's Bazar Hill Tract. However, they have been destroyed by the conversion to plantations because of the growing population and other reasons. The agricultural productivity has deteriorated due to the loss of the top soil. There is also fear of a flash flood hazard.

4.3 Present Environmental Situation in the Study Area

4.3.1 Natural Environment

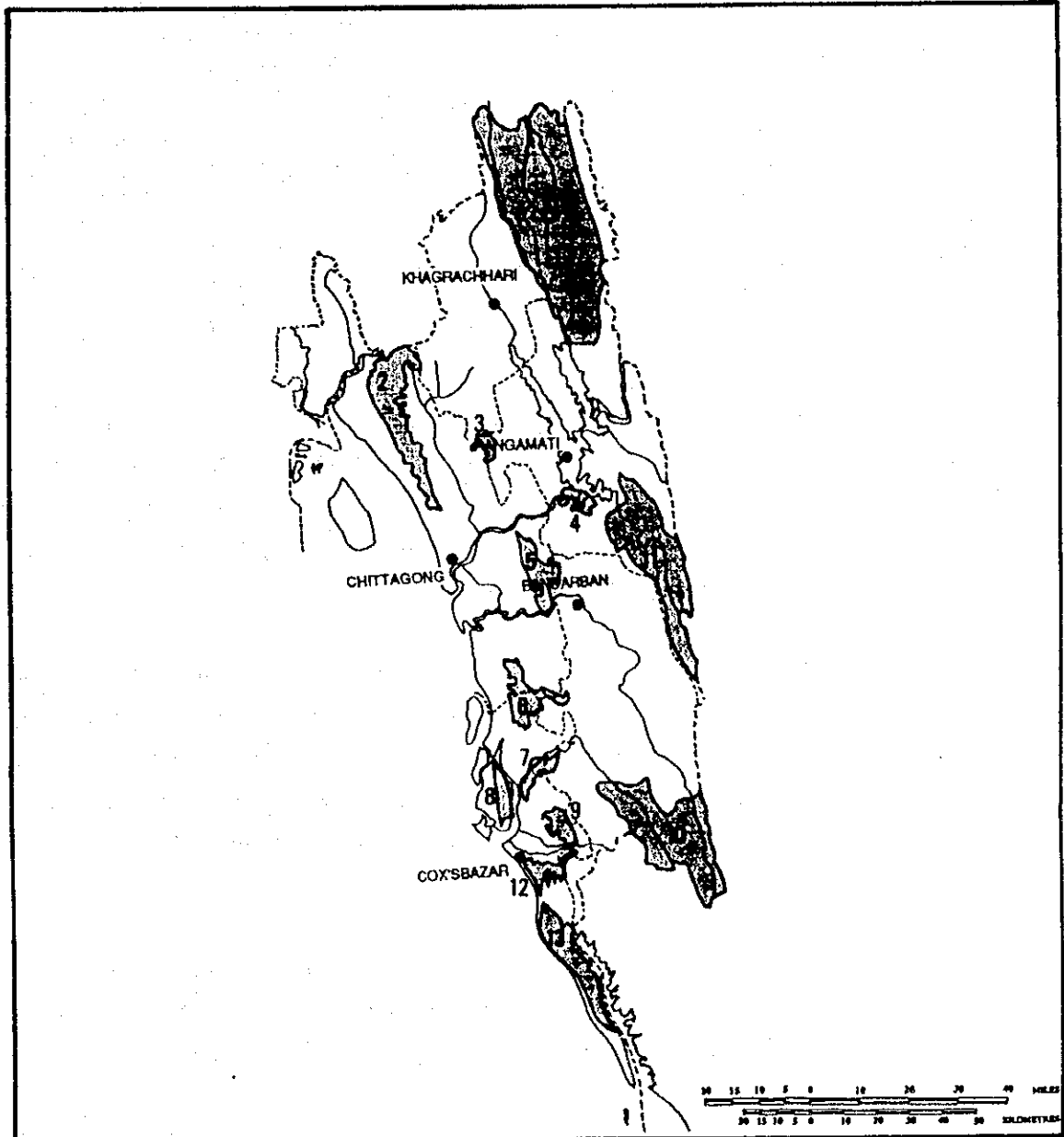
The forest area of Bangladesh is about 2.5 million ha and covers some 17% of the whole country. The forest area is divided into 1.46 million ha of Reserved Forest, 0.27 million ha of Village Homestead and 0.73 million ha of Unclassified State Forests. But the area which is really covered with trees is very small and estimated at 6.5 % of the land. The location of the forest areas in the Chittagong region are shown in Figure 4.1.

District wise forest land in the Chittagong region controlled by the Government is listed in Table 4.5. It covers 45% of the whole forest area.

In Chittagong region forests have been destroyed by shifting cultivation and plantations. The reserved forests of the Chittagong Hill Tracts has been depleted from 23.80 million m³ in 1964/65 to less than 19.83 million m³ in 1983. About 0.73 million ha of Unclassified State Forests (USF) have been destroyed by shifting cultivation and plantations.

The growing stock in the USF has dwindled from 3.43 million m³ in 1964 to almost nothing at present. As a result, the top soil is being removed and severe soil erosion is taking place in the hilly land and the steep slopes. Furthermore, the Kaptai reservoir is being silted up and the life of the only hydroelectric dam is shortened.

FIGURE 4.1 : LOCATION OF FOREST AREA IN THE CHITTAGONG REGION



LEGEND:

- | | |
|-------------------------|----------------------|
| 1. Kasalang | 10. Matamuhari-Sangu |
| 2. Ramgarh-Sitakund | 11. Rankhiang |
| 3. Khiram | 12. Reju Cox's Bazar |
| 4. Sitapahar | 13. Reju Teknaf |
| 5. Patia | |
| 6. Jaldi-Harbang | |
| 7. Chakaria Sundarbans | |
| 8. Moheskhali | |
| 9. Garjania Khuntakhali | |

Figure2.1: Location Of Forest Area In Chittagong Region

Table 4.5 District wise Forest Land Controlled by the Forest Department

District	Reserved Forest	Protected Forest	Acquired Forest	Unclassified State Forest	Total Forest Land
Chittagong	216,001.8	63,642.5	36,145.67	-	315,610.08
Cox's Bazar	196,366.6	34,763.0	16,350.05	-	247,480.53
Bandarban	184,933.9	-	20.14	67,025.82	251,979.88
Rangamati	579,499.6	-	-	58,512.82	638,012.51
Khargrachhari	57,206.6	-	-	31,281.98	88,488.65
Total	1,234,008.7	98,405.5	52,515.86	56,820.62	1,541,750.76

Source: Report of the Task Forces on Bangladesh 1991

At Chakoria Sunderban in Cox's Bazar over 43% of 7,500 ha of mangrove forests have been destroyed due to shrimp farming since the late 70s, indiscriminate cutting and buffalo grazing. As the shrimp farms have spread, the production of shrimp has decreased, so the ecosystem seems to have been influenced to some extent. The soil has extremely acidified (pH 1.8) and cannot be used for agriculture during the dry season.

Coastal plantations of mangrove (such as Keora, Baen) have been established in the coastal belt, stretching from Teknaf in Cox's Bazar to Patuakhali, covering an area of 0.12 million ha, a pace of 8,000 ha annually. The present growing stock is estimated at 0.67 million m³. The object of this program is to provide environmental protection against cyclones and tidal bores, to stabilise the soil and to make the newly accreted land suitable for agriculture besides meeting the fuel-wood and pulpwood requirements.

Table 4.6 lists the 18 threatened species in Chittagong region and the 5 endemic species, which are *Mantisia spathulata* Schutt., *Rotalasimpliciuscula* (S.kurz)Kuhne, *Semecarpus subpanduriformis* Wall., *Spatholobus listeri* Prain and *Typhonium listeru* Prain.

Knema bengalesis De Wilde (common name Duhazara) in Cox's Bazar is the type of locality of this species described as a new taxon only recently. Acute degeneration of the forest stands in this area makes the survival of this species doubtful.

Apart from jute and cotton, there are many wild resources of fibre in Chittagong, Cox's Bazar and the Chittagong Hill Tracts. 85 species of orchids have been recorded, showing luxuriant growth also in the rain forests of Chittagong, but over exploitation and the habitat destruction pose a great threat to wild orchids.

Table 4.6 List of Vascular Plants Threatened in the Chittagong Region

Scientific Name	Distribution
<i>Tectaria chattagramica</i>	Chittagong
<i>Debregeasia dentata</i> Hook.f.	Chittagong
<i>Hippocratea macrantha</i> Korth.	Chittagong
<i>Homalium schlichtii</i> Kurz	Chittagong
<i>Justicia oreophlia</i> Clarke	Chittagong
<i>Knema bengalesis</i> De Wilde (endemic)	Cox's Bazar
<i>Mantisia spathulata</i> Schutt. (endemic)	Chittagong
<i>Ophiorrhiza villosa</i> Roxb.	Chittagong
<i>Phrynium imbricatum</i> Roxb.	Chittagong
<i>Quercus acuminata</i> Roxb.	Chittagong
<i>Rotala simpliciuscula</i> (S.kurz)Kuhne(endemic)	Chittagong
<i>Semecarpus subpanduriformis</i> Wall.(endemic)	Chittagong
<i>Sonneratia griffithii</i> Kurz	Chakaria Sunderban
<i>Spatholobus listeri</i> Prain(endemic)	Chittagong
<i>Tournefortia roxburghii</i> Clarke	Chittagong
<i>Typhonium listeru</i> Prain	Chittagong
<i>Vatica scaphula</i> Dyer(endemic)	Chittagong
<i>Vernonia thomsoni</i> Hook.f.	Chittagong

Source: Environment and Development in Bangladesh, vol2, 1994

Two species of horseshoe crabs, regarded as living fossils, occur in the sandy beach of Cox's Bazar. In the Kaptai reservoir the main catches are the major carps, minor carps, a clupeid chaplia (*Gadusia chapra*) and other fishes.

Endemic and threatened species in the Chittagong Region are given in Table 4.7. They comprise 29 animal species, amphibia and reptile, 28 species of birds, and 16 species of mammals.

The 8 species registered to the appendix of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES-I) are Bostami turtle, White winged Wood Duck, Burmese Peafowl, Leopard, Marbled Cat, Golden Cat, Asian Elephant and Serow. The 6 species registered to the appendix of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES-II) are Burmese Brown Turtle, Elongated Turtle, Assamese Macaque, Stump tailed Macaque, Phayeis Leaf Monkey and Wild Dog.

The 7 species registered to the Red Data Book (RDB-E) are Bostami Turtle, Whitewinged Wood Duck, Peregrine Falcon, Burmese Peafowl, Wild Dog, Leopard and the Asian Elephant.

Bostami turtle is endemic at Baizid Bostami Mazar (Bostami pond). About 250-300 turtles are now living there, but most of them are suffering from skin diseases and lack of breeding facilities.

The White winged Wood Duck is very much endangered due to destruction of their habitat after the establishment of new settlements in the Chittagong Hill Tracts. Only 40 have been seen in the Kassalong Reserve.

Assamese Macaque and Stump tailed Macaque were once very common, but now the population is declining. There are 350-400 wild Asian Elephants in Chittagong and Teknaf forests. Due to encroachment of evergreen forest and poaching for tusks, the population is threatened with extinction.

There is 1 national park in the Chittagong Region that has national recreation as objective, one game reserve, in which it is allowed to hunt and there are 2 wild sanctuaries established and 7 sanctuaries are proposed (Figure 4.2 and Table 4.8 refer).

Table 4.8 List of Notified and Proposed Protected Areas

Name of Area	Area(ha)	Year
National Park		
1. Himchari NP	1,729	1980
Wildlife Sanctuaries		
2. Pablakhali WS	42,087	1981
3. Chunati WS	7,761	1986
Game Reserves		
4. Teknaf GR	11,615	1981
Proposed Wildlife Sanctuaries		
5. Hazarikhil WS	(2,903)	
6. Rampahar-Sitaphar WS	(3,026)	
7. Bogakine Lake(Rinkheong)		
8. Chimbuk		
9. Sangu-Matamuhari		
10. Naaf River		
11. Jinjiradwip(St.Martin's Island) and jinjira Reefs		

Source: Bangladesh Environment and Natural Resource Assessment

Table 4.7(1) A List of Threatened Species

Scientific Name	Common Name	Status, Distribution
<i>Cairina scutulata</i>	Whitewinged Wood Duck	rare CHT CITES- I RDB-E
<i>Microhierax melanoleucos</i>	Whitelegged Falconet	rare Ctg, CHT
<i>Falco biarmicus jugger</i>	Laggar Falcon	rare CB Teknaf
<i>Falco peregrinus</i>	Peregrine Falcon	rare CHT RDB-E
<i>Falco chicquera</i>	Redheaded Merlin	uncommon Ctg
<i>Francolinus gularis</i>	Swamp Partridge	rare Ctg
<i>Arborophila rufogularis</i>	Rufousthroated Hill Partridge	rare Ctg, CHT
<i>Arborophila atrogularis</i>	Whitechecked Hill Partridge	rare Ctg
<i>Pavo muticus</i>	Burmese Peafowl	rare Ctg, CHT CITES- I ,RDB-E
<i>Grus antigone</i>	Sarus Crane	rare Ctg
<i>Amauromis akool</i>	Brown Crake	rare CHT
<i>Charadrius hiaticula</i>	Ringed Plover	rare CB
<i>Surniculus lugubris</i>	Drongo-Cuckoo	uncommon CHT
<i>Apus melba</i>	Alpine Swift	uncommon Kaptai Lake
<i>Picus canus</i>	Blacknaped Green Woodpecker	rare CHT
<i>Hypopicus hyperythrus</i>	Rufousbellied Woodpecker	rare CHT
<i>Hemicircus canente</i>	Heartspotted Woodpecker	rare CHT
<i>Dicrurus annectans</i>	Crowbilled Drongo	rare CB Teknaf
<i>Saroglossa spiloptera</i>	Spottedwinged Stare	rare CB
<i>Acridotheres javanicus</i>	Orangebilled Jungle Myna	rare CHT
<i>Tephrodornis virgatus</i>	Large Woodshrike	rare once seen at CHT
<i>Hypsipetes madagascariensis</i>	Black Bulbul	rare CHT
<i>Stachyris chrysaea</i>	Goldheaded Babbler	rare Ctg, CHT
<i>Alcippe rufogularis</i>	Redthroated Tit-Babbler	rare CHT
<i>Phylloscopus cantator</i>	Blackbrowd Leaf Warbler	rare Ctg
<i>Passer montanus</i>	Tree Sparrow	rare CHT
<i>Caprodacus erythrinus</i>	Common Rosefinch	rare CHT
<i>Melophus lathami</i>	Crested Bunting	uncommon CHT

Legends: CB=Cox's Bazar CHT=Chittagon Hill Tract Ctg=Cittagong District
Source : Wildlife of Bangladesh 1982

Table 4.7(2) A List of Threatened Species (Amphibia/Reptila)

Scientific Name	Common Name	Status, Distribution
<i>Curora amboinensis</i>	Malayan Box Turtle	rare CB Teknaf
<i>Geochelone emys</i>	Burmese Brown Tortoise	rare CHT CITES- II
<i>Geochelone elongata</i>	Elongated Tortoise	uncommon CHT CITES- II
<i>Trionyx nigricans</i>	Bostami Turtle	rare Bostami pond only at Ctg CITES- I RDB-E
<i>Draco sp.</i>	Flying Lizard	saw & shot one at Ctg
<i>Boiga ochracea</i>	Tawny Cat Snake	rare first collection from CHT
<i>Callophis melanurus</i>	Slendar Coral Snake	rare Ctg

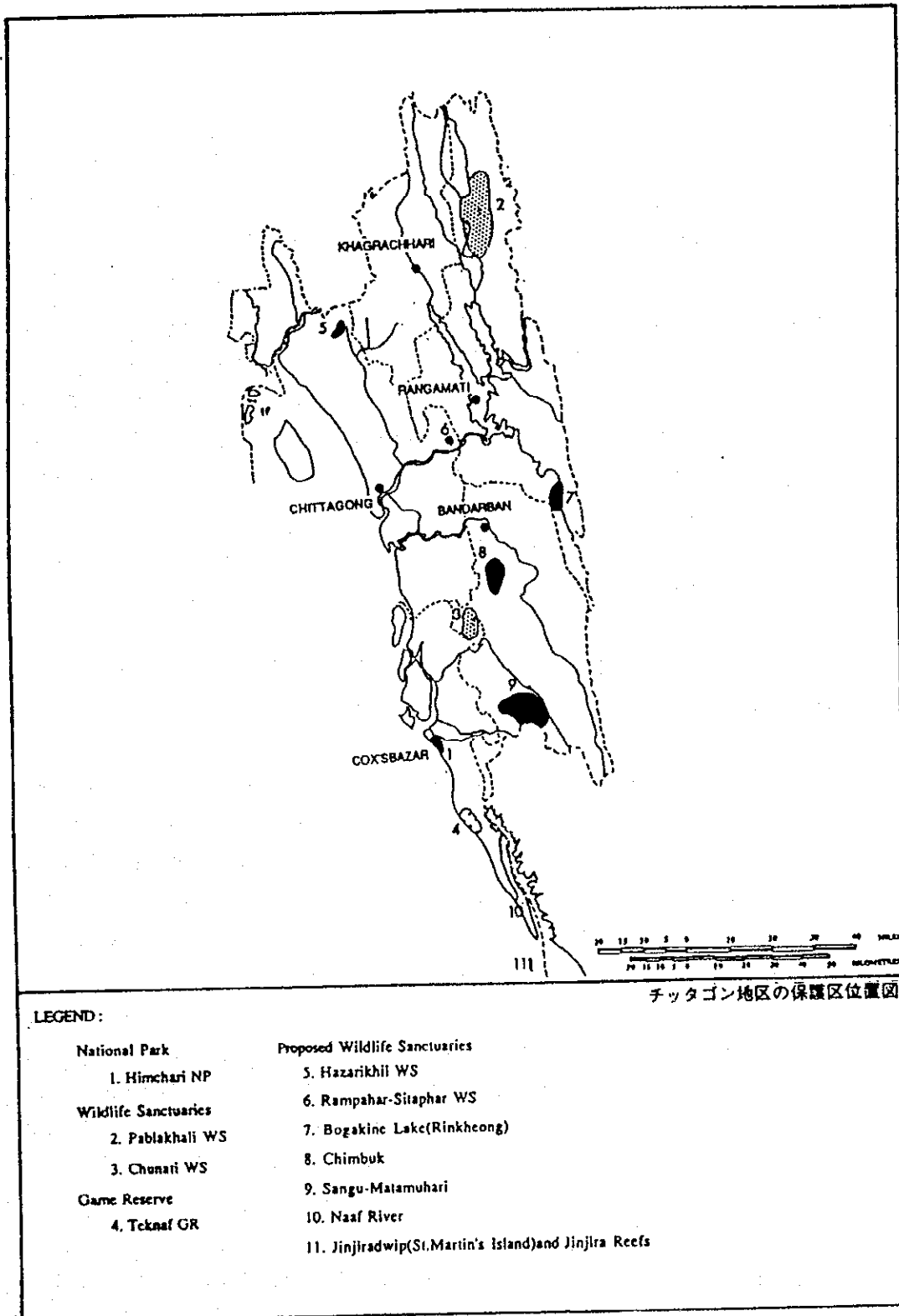
Legends: CB=Cox's Bazar CHT=Chittagon Hill Tract Ctg=Cittagong District
Source : Wildlife of Bangladesh 1982

Table 4.7(3) A List of Threatened Species (Mammalia)

Scientific Name	Common Name	Status, Distribution
<i>Nycticebus coucang</i>	Slow Loris	uncommon Ctg
<i>Macaca nemestrina</i>	Pigtailed Macaque	rare Ctg, CB, CHT
<i>Macaca fascicularis</i>	Crabeating, Longtailed Macaque	rare CB
<i>Macaca assamensis</i>	Assamese Macaque	rare CHT CITES- II
<i>Macaca arctoides</i>	Stumptailed Macaque	rare CB, CHT CITES- II
<i>Presbytis phayrei</i>	Phayei Leaf Monkey	uncommon Ctg CITES- II
<i>Hylobates hoolock</i>	Hoolock Gibbon	uncommon Ctg, CB, CHT
<i>Cuon alpinus</i>	Wild dog, Dhole	rare Ctg, CHT CITES- II RDB-E
<i>Herpestes urva</i>	Crabeating Mongoose	rare Ctg
<i>Panthera pardus</i>	Leopard, Panther	uncommon Ctg, CHT CITES- I RDB-E
<i>Felis marmorata</i>	Marbled Cat	rare no recent sightings CHT CITES- I
<i>Felis temmincki</i>	Golden Cat	rare CITES- I collected one skin from CHT
<i>Elephas maximus</i>	Asian Elephant	uncommon Ctg, CHT CITES- I RDB-E
<i>Bos banteng</i>	Banteng	possibly extinct CHT
<i>Capricornis sumatraensis</i>	Serow	rare on the brink of extinction Ctg, CHT CITES- I
<i>Petaurista magnificus</i>	Hodgson's Flying Squirrel	rare Ctg, CHT

Legends: CB=Cox's Bazar CHT=Chittagon Hill Tract Ctg=Cittagong District
Source : Wildlife of Bangladesh 1982

Figure 4.2 Notified and Proposed Protected Areas in Chittagong Region



There are no wetlands in the Chittagong Region, which are registered to the Ramsar Convention (Convention of wetlands of international importance) (Figure 4.3 refers).

4.3.2 Social Environment

Bangladesh has not been able to solve the massive problems of housing and community facilities for accommodating the great influx of poor migrants, and as a result large urban slum areas are common in urban centres.

In Chittagong, as the number of the urban poor increase, so do their health problems, such as high death rates and the infectious diseases. Overcrowding of premises of shanty towns puts enormous pressure on water supply and waste disposal facilities. Malnutrition and the other diseases burden the medical services. There are also social problems like overcrowded schools, juvenile delinquency, unstable employment opportunities and so on. A significant portion of the poor have no shelter at all, but sleep on the streets in Chittagong. According to research undertaken in March 1993, the slum dwellers in Chittagong City have totalled about 2,619 families, equivalent to 15,971 people.

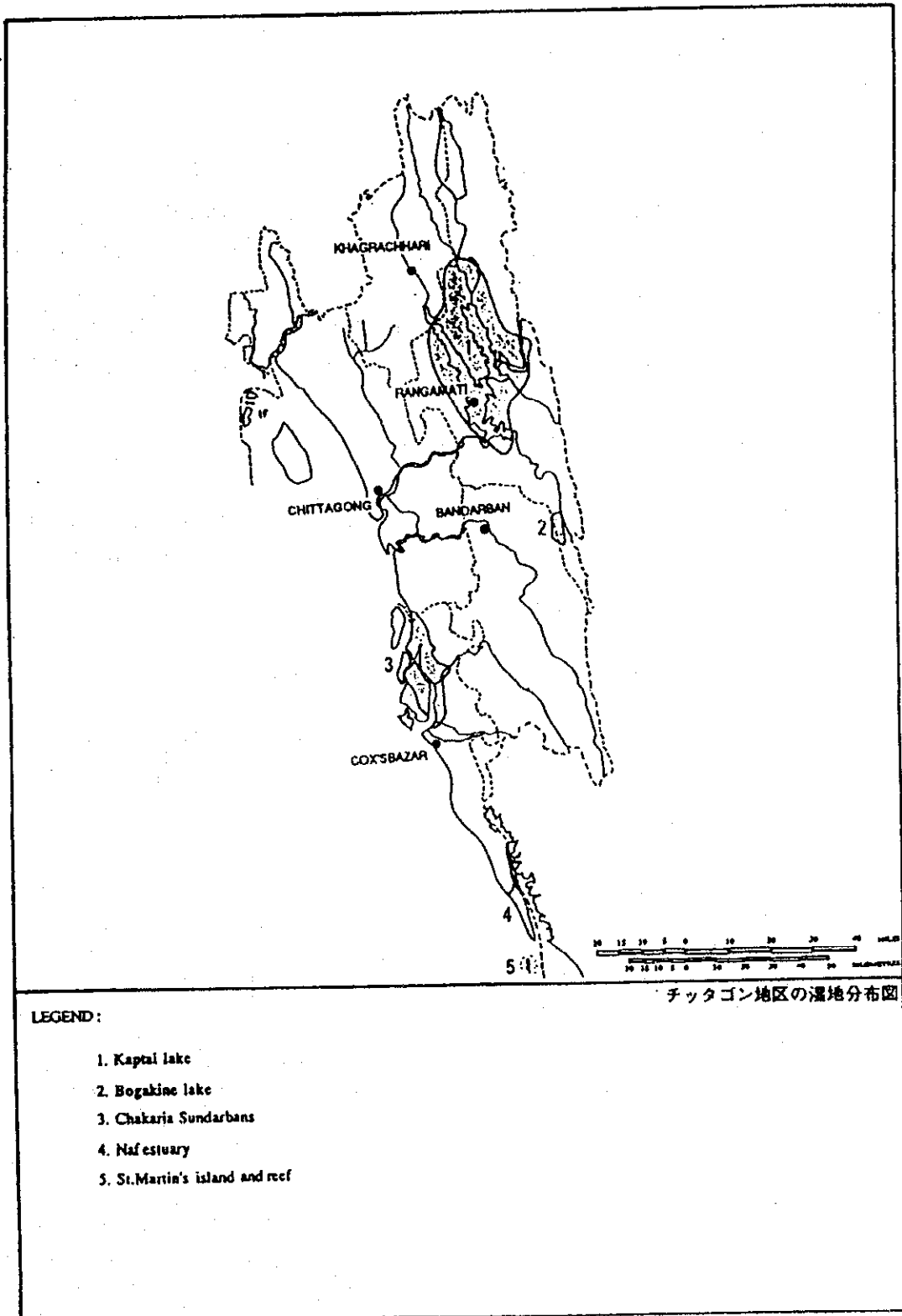
Since the Chittagong Water Supply and Sewerage Authority (CWASA) was created in 1963, the originally two isolated distribution systems have been integrated.

With regard to the present situation of the distribution system, the network of 330 km pipeline covers only a part of the municipal area and the service level decreases with increasing distance from the city centre. Supply to wards 1 to 10 in Kotwali Thana is complete, while Double Mooring has about 80 % coverage and other wards have only partial supplies. One third of Chittagong's population obtains officially its water from CWASA. About 360,000 inhabitants have a house connection and some 180,000 are served by street hydrants.

The installed production capacity amounts to 40 IMGD (Imperial Million Gallons per Day), although the actual production is recorded at 29 IMGD. The estimated consumption is 15.6 IMGD, of which 60% is supplied via house connections. About 15 % is for both, institutions and industry.

The constraint of the distribution system is that the amount of lost water is excessively high (46 %). It seems due to wastage, leakage and unauthorised connections. And some 15 % of produced water is not billed, which raises the unaccounted for water to 60 % of the produced amount of water.

Figure 4.3 Major Wetland in Chittagong Region



The present distribution system is depicted in Figure 4.4 and the main components are :

- 4 ground water recovery wells (5 IMGD) - spatially distributed over the Municipal area
- Kalurghat Iron Removal Plant (15 IMGD) - operates from well fields with 17 deep tubewells
- Mohara water treatment plant (20 IMGD) operating from the Turbid Halda River
- 2 clear wells of 2 IMGD capacity at Kalurghat and 2.5 IMGD capacity at Mohara
- Main conveyance pipeline for transmission from Kalurghat and Mohara to the distribution facilities
- 2 main hill top reservoirs, 3 IMGD on Batali Hill and 1 IMGD on ADC hill
- 2 booster stations at Patenga Peninsula and alongside the Dhaka Trunk Road, and
- Distribution network for a total of 330 km.

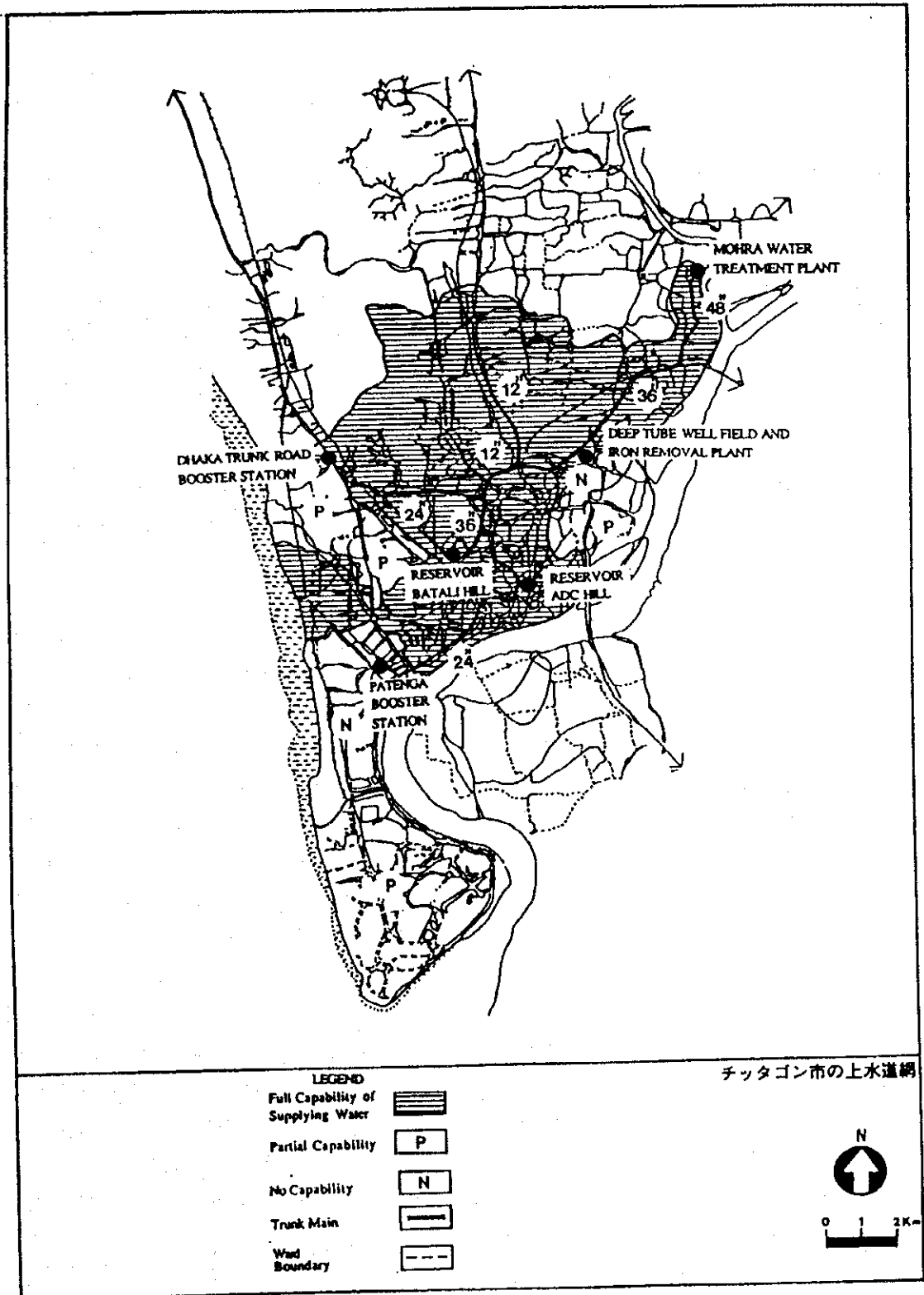
The service level of each disposal system in Chittagong is given in Table 4.9. Septic tanks serve most people and cover 48% of the total, next is pour flash latrines with 19% and pit latrines are 11%. No facilities cover 4 % of the population.

Table 4.9 Present Sanitary Situation

Disposal system	Service level(%)	Population served(000)
No facilities	4	63
Communal facilities	10	157
Pit latrine	11	172
Bucket latrine	8	125
Pour flush latrine	19	298
Cistern,septic tank with soak pit	7	110
Cistern,septic tank without soak pit	41	642
Total	100	1,567

Source: Chittagong Stormwater Drainage and Flood Control Master Plan vol III a

Figure 4.4 Water Supply within Chittagong City



The excreta from septic tanks and communal latrines are collected by the municipal staff and stored in large septic tanks for 2 months. They are then discharged into the canals or the rivers. The other systems have direct connection with drains.

The most utilised system, septic tanks, are sanitary when they are proper tanks with soak away. However, many tanks are over-loaded and ineffective. There are presently 92 communal latrines in the metropolitan area. Due to lack of cleaning and maintenance almost all facilities are unsanitary.

Sanitary drainage is one of the most ignored and least studied aspect in the sanitation section. The dimensions of the drains and khals are based on the storm flow without considering the hydraulic requirement of much smaller sullage flow. Severe siltation results during dry weather discharge.

The present problems with micro-drainage in the city are ponding of sullage in depressions caused by drain, blockage by garbage, heavy siltation of the main drainage canals due to upstream erosion and so on.

The 215 km micro-drainage system in the city is made of pucca (brick or concrete) construction, though some parts are in deplorable condition and prevent proper discharge.

In 1989, 1.2 million inhabitants had some type of solid waste collection. Only the city centre benefit from road sweeping, drain cleaning, solid waste collection and night soil collection service on a regular basis. The coverage of conservancy work is shown in Figure 4.5. Out of 41 wards in the City, 16 wards receive regular service, that is collection on three days or more per week. Another eight wards are provided with partial collection, that is two days or less per week. The remaining 17 wards receive a service performed only upon request.

The Conservancy Department has been responsible for the collection and disposal of solid waste generated in the City. At present 10 trucks belonging to the City Corporation transport 62 tons, 5 trucks belonging to the private sector transport 30 tons, that is a total of 92 tons per day to the disposal sites. There are two filling sites, one at Hali Shahar belonging to the City Corporation, and the other at Feringi Bazar belonging to a private party. However, poor performance of solid waste collection is a major constraint to the proper functioning of the city's micro-drainage system.

There are no studies of domestic solid waste characteristics in Chittagong. But taking an average per capita generation of 350 grms per day on the basis of the data from Dhaka, volumes of domestic solid waste have been calculated for each ward as summarised in Table 4.10.

Table 4.10 Total Domestic Solid Waste Generation (1991)

Name of Thana	Solid Waste (In Metric Tons/day)
Kotwali	87.3
Double Mooring	102.7
Panchlaish	102.7
Pahartali	41.6
Chandgaon	110.8
Bandar(Port)	78.3
Total	523.4

Source: Chittagong Stormwater Drainage and Flood Control Master Plan vol III a

The calculation shows that the largest amount of the domestic solid waste is 110.8 tons/day in Chandgaon and the total of the City is about 523.4 tons/day.

Most of the industrial solid waste is removed by third parties for reuse or burned. A figure of 5 % of domestic solid waste has been added to cover solid waste from industry, which enter the "city waste system".

For the institutional solid waste produced by offices, commercial establishments and other institutions, an allowance of 5 % of domestic solid waste, and for the solid waste from markets containing a fair amount of vegetable matter, an allowance of 10 % has been taken for estimating purposes.

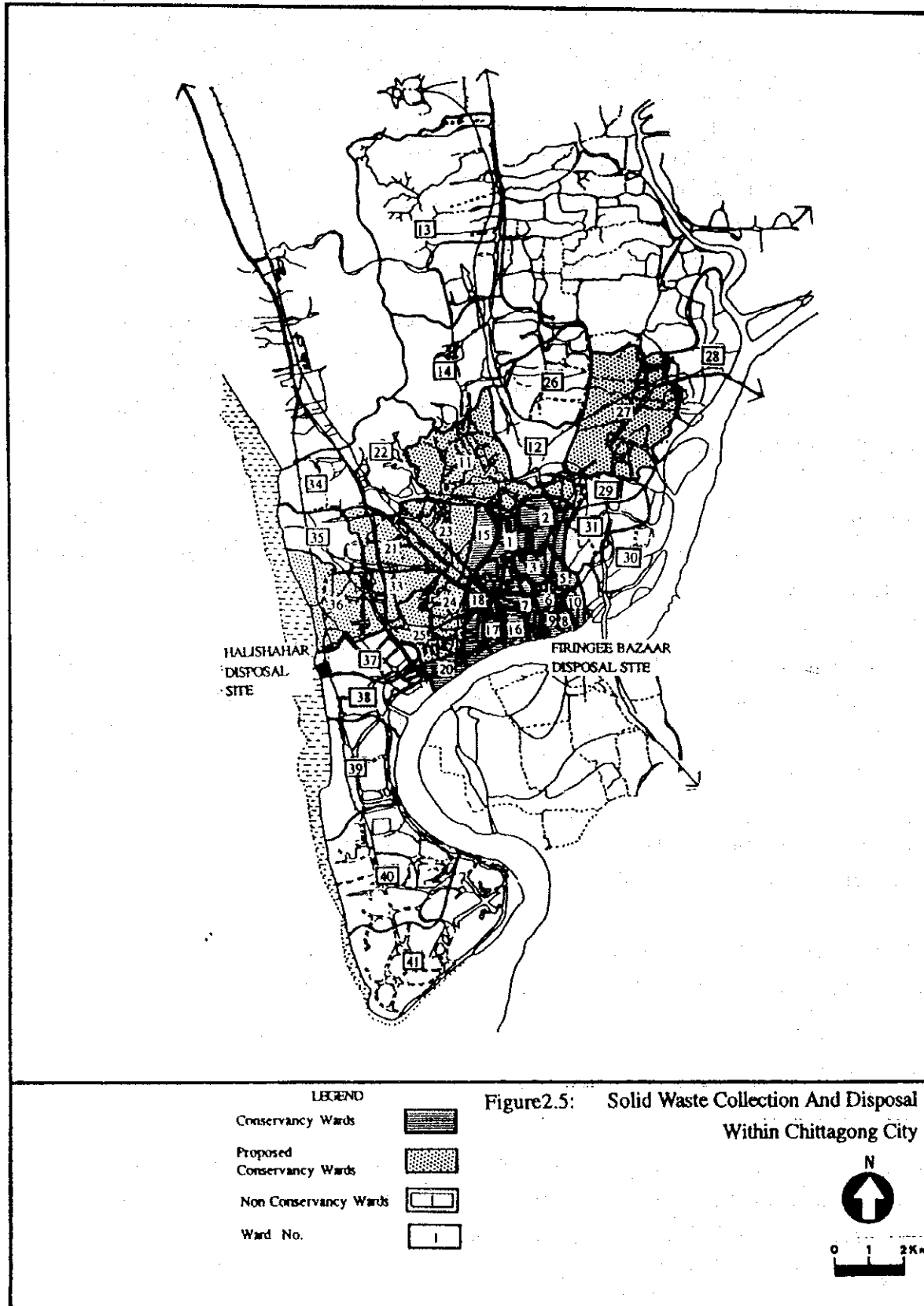
There are about ten hospitals. Hospital waste is collected by the city system as normal waste, but a truck is specially allocated for the purposes.

The analysis of Dhaka refuse composition has shown that typical street sweepings in Bangladesh tend to increase the sand and soil content of solid waste by about 25 %.

4.3.3 Cultural Heritage

Like the river Nile in Egypt, the Karnaphuli River has also a vital role in the history of the civilisation of Chittagong. Usually increased fertile capacity on both of the banks of a river helps in the development of any cultural heritage.

Figure 4.5 Solid Waste Collection and Disposal within Chittagong City



The Eastern bank of Karnaphuli River, especially the areas including Anwara, the Marine Academy, Dakhin Schamirpur, Fazalkhaner Hat, Kaikhain, Rudura and Damuria, are also archaeologically important.

History also says that there was a Buddhist monastery named Paudit Bihar in this area. More than 100 Buddha's images, one copper plate of 11th century AD, more than 40 coins of 8th to 13th century AD and a few scattered brick pillars were found in this area. In 1933 British investigators found more than 64 Buddha's images in this area.

But due to the lack of financial support and logistic (man power) support, the Bangladesh Government has no archaeological survey report from this area. And natural disaster, diversion of the way of the river, storm and so on also changes the size and shape of any civilisation. Therefore, nobody can exactly locate where this Paudit Bihar was situated.

Moreover the Bangladesh Government has not declared this area as a protected zone. (This information has been collected from the Ethnological Museum of Chittagong.)

In the Chittagong Region, there is no cultural heritage cited in the World Heritage Convention (Convention for the Protection of the World Cultural and Natural Heritage).

4.4 Pollution

4.4.1 Air Pollution

Air pollution has become more serious due to the smoke discharged from the industries and the vehicles in Chittagong City. Especially the pollution from vehicles is becoming worse as the number of vehicle ownership and usage increases. The extent of the pollution is still lower than in the cities in other developing countries.

The Department of Environment (DOE) monitored the quality of ambient air in January 1994 on 2 points of the industrial area, one point of the residential area and one point of the commercial area. The results of the chemical analysis of ambient air by DOE is given in Table 4.11.

Table 4.11 Result of Chemical Analysis of Ambient Air

Date	Location of Sampling Point		S.P.M ($\mu\text{g}/\text{Nm}^3$)	SOx ($\mu\text{g}/\text{Nm}^3$)	NOx ($\mu\text{g}/\text{Nm}^3$)	Remark
22.1.94	1	Roof of one storeyed building, DOE Lab., Sirajudowllah Road	450	2.52	5.65	Residential cum commercial area
23.1.94			540	2.21	4.34	
24.1.94			470	2.48	6.26	
25.1.94			460	2.20	5.35	
26.1.94			520	2.08	4.92	
Standard Values(Residential)			200	80	80	
22.1.94	2	Roof of one storeyed building, Jamma oil Company Ltd. Guptakhal, Patenga	9750	18.42	14.75	Industrial area
23.1.94			8400	14.78	12.65	
24.1.94			10240	16.80	14.58	
25.1.94			12600	19.35	15.32	
26.1.94			12150	18.92	15.48	
Standard Values(Industrial)			500	120	100	
22.1.94	3	Roof of one storeyed building, Oxygen turning point, Hathazari Road	1260	16.52	22.40	Industrial area
23.1.94			940	15.25	19.60	
24.1.94			1035	17.40	21.24	
25.1.94			1185	16.85	20.36	
26.1.94			1160	14.56	18.62	
Standard Values(Industrial)			500	120	100	
22.1.94	4	Roof of one storeyed building, Bahddarhat	560	14.65	22.38	Commercial area with heavy traffic
23.1.94			510	15.26	23.42	
24.1.94			490	16.21	25.38	
25.1.94			540	15.68	24.76	
26.1.94			620	17.50	26.20	
Standard Values(Commercial)			400	100	100	

Source : DOE, 1994

The S.P.M (Suspended Particle Matter) value in the industrial area is between 2 to 20 times as much as the value in the residential area and the commercial area. The S.P.M value of 4 sampling points is higher than Bangladesh air standard quality. This shows that the pollution caused by the smokes discharged from the industrial facilities is becoming serious.

The SO_x (Sulphur Oxides) and NO_x (Nitrogen Oxides) value in the industrial area is between 3 to 8 times as much as the value in the residential area, but the value in the industrial area is at equal level to that in the commercial area. This shows that the pollution in the industrial and commercial area is caused by the exhaust gas from vehicles. The SO_x and NO_x value of 4 sampling points is lower than Bangladesh air standard quality.

4.4.2 Water Pollution

With remarkable industrialisation and urbanisation in the recent years, discharge of huge quantities of untreated effluents, which is due to the lack of a sewerage and a pollution control system, has resulted in water pollution in the canals in Chittagong and in the Karnaphuli River.

The sources of the pollution in the canals and the Karnaphuli are divided into 3, that is domestic waste water, industrial waste and other waste water.

Chittagong has no underground sewerage pipe line and neither has the City any sewage treatment plant. Therefore, the domestic waste water such as sewage or human excreta, are collected into the 5 canals through drains and then discharged into the Karnaphuli River. As a result, pollution due to human excreta, for example E.Coli, is caused in the canals and the Karnaphuli.

There are 5 industrial areas in Chittagong, that is Kalurgat, Sholashahar-Nasirbad, Fouzderhat, Patenga and the CEPZ situated on the bank of the Karnaphuli and along the coast of the Bay of Bengal. The main industries are tanneries, textile, oil refinery, TSP, urea, chemical, fish processing, jute, steel, paper, rayon and others. Few of these industries have somewhat effective pollution control systems and discharge their untreated wastes directly into the drains or the River. The tanneries are important sources of pollution and the pollution caused by chromium is especially serious.

In addition to the domestic and the industrial waste water, ship repair at Chittagong port also adds considerable pollution loads particularly in terms of oil and rust. The water from the 2 disposal sites in the City is also a pollution source, especially during the rainy season.

The Department of Environment (DOE) regularly monitors the quality of water in the Rivers Karnaphuli and Halda and also in some canals. The results of water quality testing of the canals by DOE is given in Table 4.12. In all the canals the BOD level is higher than environmental standard 6 mg/l (Fishing Water) and the quantity of E.Coli is uncountable. The water of almost all the canals is very black and with virtually no oxygen. This result indicates the serious pollution of the canals caused by human excreta.

The results of water quality testing of the Karnaphuli and Halda Rivers is given in Table 4.13. In the Karnaphuli, the levels of E.C., chloride, total alkalinity and D.O. are higher than the environmental quality standard value (fishing water) at all the points except that near T.S.P. This applies to the Halda. The S.S. level is between 22 mg/l and 272 mg/l and indicates the influence caused by the flow of soil and sand from the area along the rivers. At the point near T.S.P in Patenga, the levels of E.C, chloride and total alkalinity are higher than the environmental quality standard value (fishing water) at low tide. This indicates the heavy pollution load caused by T.S.P. At high tide the levels of the above-mentioned items are lower than the environmental quality standard value. This can be explained as follows. The Karnaphuli is under such influence of tide that the pollutants from Chittagong city are mixed with and thinned by sea water, as a result the extent of the pollution of the river is lightened.

Figure 4.6 identifies the sampling points of ambient air and river water checks.

4.5 Environmental Effects

4.5.1 General Consideration

With the implementation of the industrial development plan, there are some activities which may have one impact on the environment.

Table 4.12 Water Quality of Canals in Chittagong City

Sample Location	PH F/lab	E.C micro/cm	DO mg/l	BOD mg/l	Coli colonies /100ml	Remarks
Chaktai khal New bridge(last) North side before falls to riverer	6.8	180	4.6	31	Innumerable	
Karnaphuli river in front of Chaktai khal(Low tide)	6.7	160	4.5	27	Innumerable	
Chaktai khal near Chawkbazar	6.8	800	0	180	Innumerable	Black in colour
Firingi Bazar khal at outfall to river Karnaphuli	6.4	450	3	24	Innumerable	
Firingi Bazar khal(up stream)	6.5	1,300	0	264	Innumerable	Black in colour
Monoharkhali Khal (Low tide) near east of Sadarghat	6.5	350	1.1	184	Innumerable	
Monoharkhali Khal at outfall to near Karnaphuli	6.4	700	4.3	30	Innumerable	
Mamuna Bazar Khal	6.6	1,600	0	32	Innumerable	Black in colour
Mamuna Bazar at outfall to riverer (Karnaphuli)	6.7	1,580	0.2	16	Innumerable	Black in colour
Majirghat main drain	6.6	1,600	0	280	Innumerable	Black in colour
Majirghat at outfall to Karnaphuli	6.7	1,500	0	60	Innumerable	Black in colour
Fishing Water Standard Value	6.5 - 8.5	800 - 1,000	4 - 6	6	5,000	

Source : DOE

Table 4.13(1) Water Quality Data of the Karnaphuly River

Sample Location	pH	E.C. whoms/cm	Chloride mg/l	T. Alkalinity mg/l	S.S. mg/l	Turbidity J.T.U	D.O. mg/l	B.O.D. mg/l	C.O.D. mg/l
1 150 meters ahead from discharge point of Kalurghat industrial waste to the river Karnaphuly (High Tide)	6.4 - 7.5	125 - 180	5 - 28	38 - 58	30 - 45	150 - 280	4.9 - 6.1	1.2 - 3.2	16 - 22
	7.4 - 7.6	238	13	40 - 49	105 - 108	92	6.3	1.0 - 1.3	58 - 59
	6.6 - 7.4	130 - 170	6 - 26	40 - 60	28 - 54	135 - 280	4.8 - 6.2	1.2 - 3.0	14 - 34
	7.2 - 7.3	299 - 301	15	43 - 45	80 - 104	112	6.1 - 6.2	1.2	63
	7.3	310 - 321	15	43	120 - 159	122 - 123	5.5 - 5.6	1.2 - 1.3	36
2 Karnaphuly river, 200 meters ahead from Chaktai khal (High Tide)	6.0 - 7.1	160 - 300	16 - 29	44 - 90	37 - 48	90 - 280	4.2 - 5.5	1.4 - 1.6	14 - 24
	7.1 - 7.2	310 - 321	15	44	269 - 272	140 - 142	5.5	1.4 - 1.5	43 - 44
	5.8 - 7.2	160 - 280	18 - 26	60 - 78	32 - 50	100 - 270	4.0 - 5.6	1.5 - 1.8	16 - 28
3 Side point of the river Karnaphuly near Firangi Bazar, Motshiyaghat	7.2	190	15	42	56	60	5.8	1.2	12
	7.3	200	15	48	60	70	5.9	1.1	14
Fishing Water Standard Value	6.5 - 8.5	800 - 1,000	600	70 - 100	25	NYS	4 - 6	6	NYS

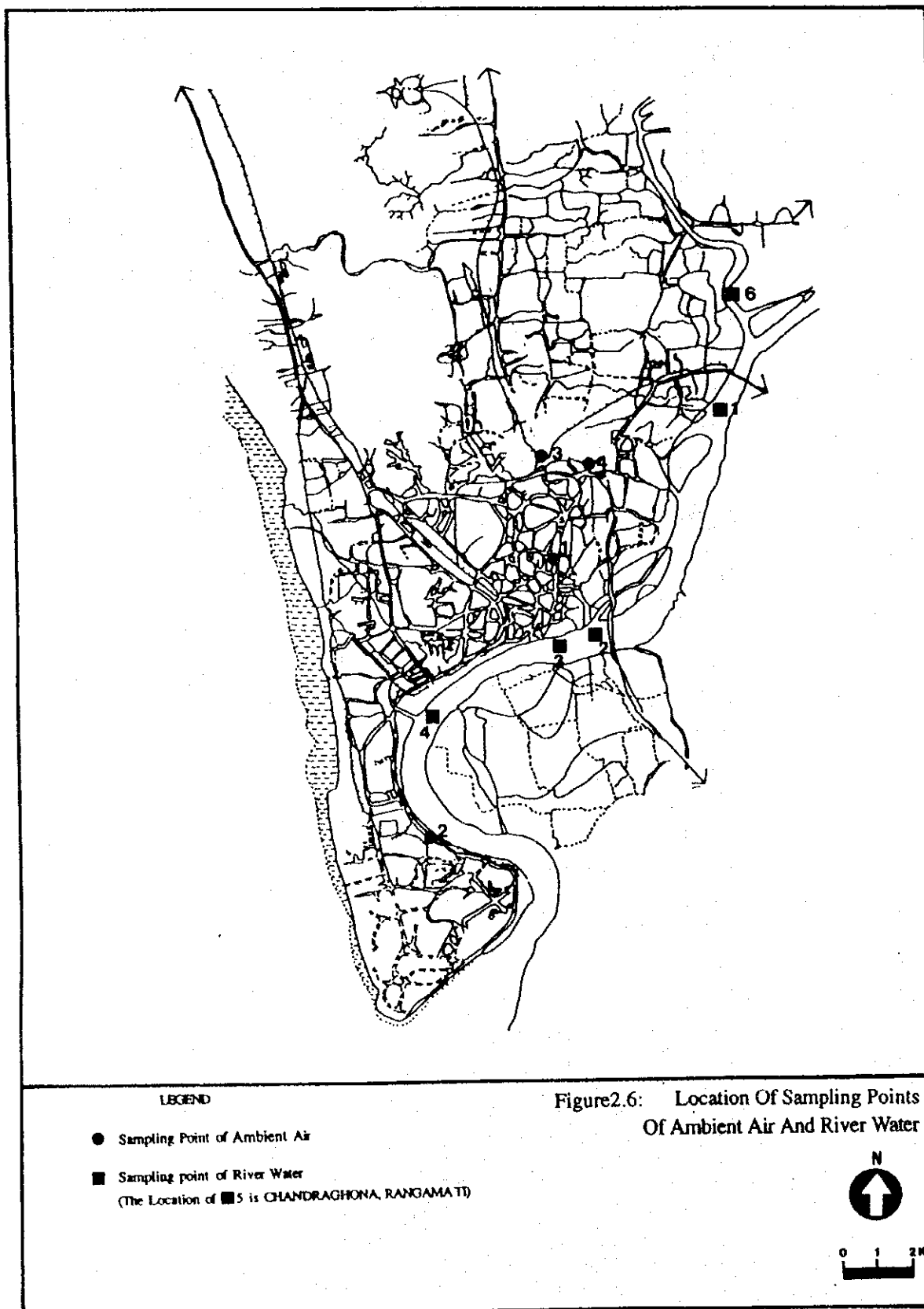
Source:DOE,1991

Table 4.13(2) Water Quality Data of the Karnaphuli River

Sample Location	pH	E.C. whoms/cm	Chloride mg/l	T. Alkalinity mg/l	S.S. mg/l	Turbidity J.T.U	D.O. mg/l	B.O.D. mg/l	C.O.D. mg/l
4 Side point of the river Karnafuly near T.S.P. Patenga (Low Tide)	7.1	4,000-4,002	2,600-2,602	193 - 196	257 - 260	381 - 382	6.8 - 6.9	1.2 - 1.3	180 - 190
Side point of the river Karnafuly near T.S.P. Patenga (High Tide)	7.2 - 7.3	410 - 450	28 - 115	54 - 58	50 - 60	90 - 290	5.8 - 7.0	1.2 - 2.0	22 - 54
5 Side point of the river Karnafuly near Dovashi Bazar, Chandraghona, Rangamati (Low Tide)	7.1 - 7.8	160 - 210	5 - 45	42 - 84	30 - 82	40 - 70	4.4 - 6.4	1.2 - 2.6	21 - 95
Middle point of the river Karnafuly near Dovashi Bazar, Chandraghona, Rangamati (Low Tide)	7.2 - 7.5	125 - 152	7 - 25	40 - 52	22 - 54	40 - 62	5.8 - 6.6	1.3 - 2.1	21 - 25
Middle point of the river Karnafuly near Bambooghata, Chandraghona, Rangamati (Low Tide)	7.2 - 7.3	100 - 142	5 - 6	41 - 56	40 - 58	40 - 73	6.4 - 6.7	1.6 - 2.2	36 - 40
6 Side point of the river Halda near Ctg. WASA intake point, Mohara, Ctg	6.8 - 7.5	120 - 260	5 - 12	48 - 66	38 - 68	46 - 240	6.1 - 6.8	1.3 - 2.4	12 - 20
Side point of the river Halda near Ctg. WASA intake point, Mohara, Ctg	7.0 - 7.6	125 - 280	3 - 14	50 - 69	40 - 62	46 - 260	6.2 - 6.9	1.4 - 2.5	10 - 22
Fishing Water Standard Value	6.5 - 8.5	800-1,000	600	70 - 100	25	NYS	4 - 6	6	NYS

Source:DOE,1991

Figure 4.6 Sampling Points of Ambient Air and River Water



The activities before operation are deforestation, reclamation and landfill in the coastal zone for facility and road construction, and those during operation are the existence of facility and road after operation.

These activities lead to the destruction of the habitats of animals and plants, such as forest and wetland and the cultural heritage by spatial occupancy. Therefore, at the stage when all project sites are proposed, it is very important to confirm the existence of the habitats of animals and plants such as forest and wetland and the cultural heritage which should be preserved.

The result of screening of the objects of preservation such as the cultural heritage, the habitats of species animals and plants, the environmentally vulnerable areas and the protected areas is given in Table 4.14. The areas that should be preserved are depicted in Figure 4.7.

It is not necessary to change the project location. The environmental effects to the cultural heritage, the habitats of species animals and plants, the environmentally vulnerable areas caused by spatial occupancy will be held at a minimum by the measures of preservation listed below.

4.5.2 The East Bank Area of the Karnaphuli River

If the areas including the hill near the Marine Academy, Guopanchak and Bhingral villages are selected as the project site, it is necessary to excavate the deposited cultural heritage of Buddhist in the site.

As a result of excavation, in the case that this heritage is considered to be a valuable asset of national level, one would have to change the project location. But after excavation and examination of this heritage, it is possible to construct facilities and roads. The facility and road should be located so as not to cause the resettlement of the village and Islamic mosque.

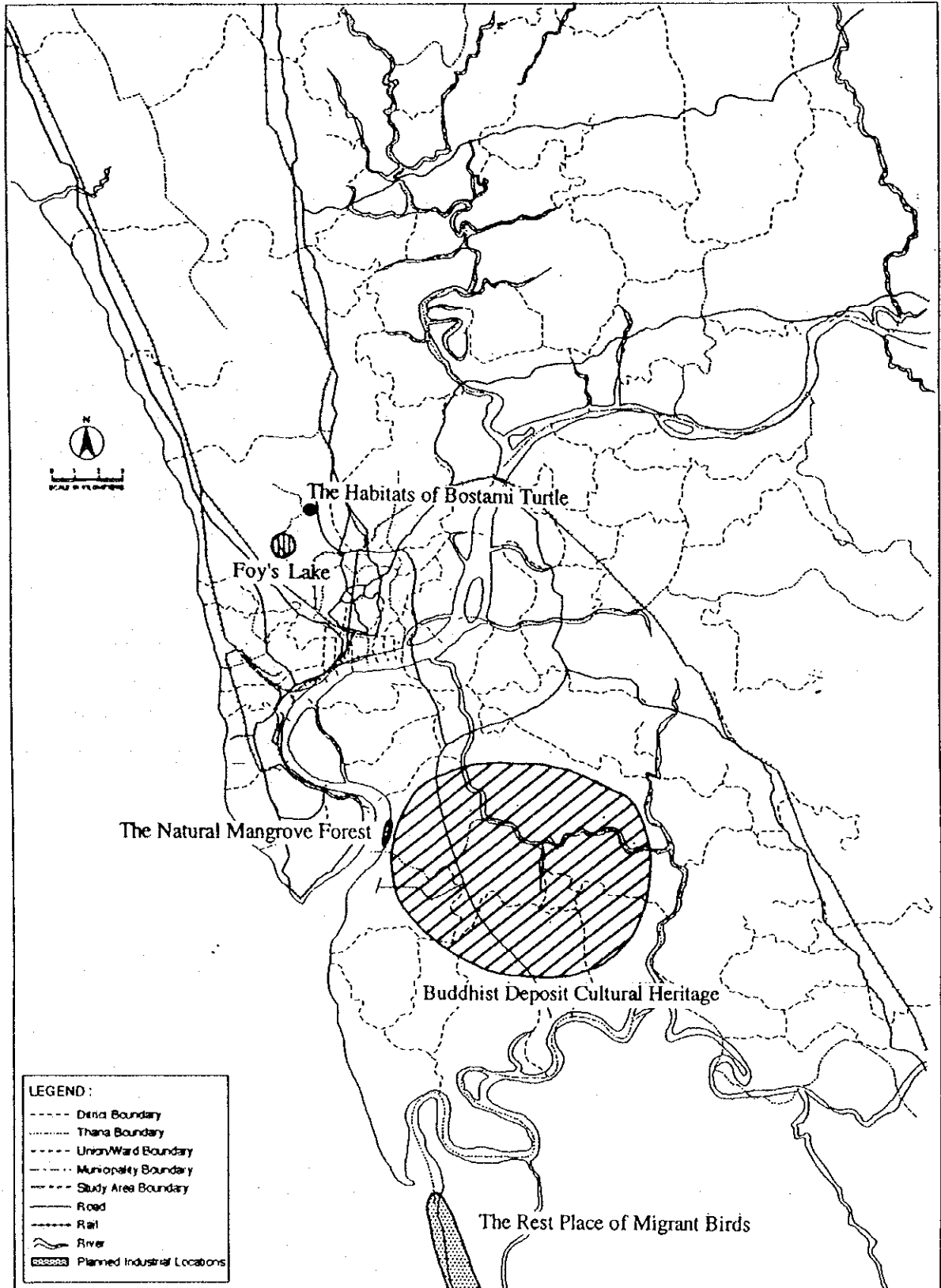
There are big trees, which have 50 - 120 cm diameter in the forest surrounding the villages or along the roads. If deforestation is necessary, one would have to preserve them by transplantation.

Table 4.14 Results of Screening og East and West Banks of Karnaphuli River

Environmental Items	Description	Evaluation	Reason
1.Cultural Heritage	Existence of historic monuments,etc	Yes	In Anwara area, there is a Buddhist deposit cultural heritage of 8th century AD. There is a Islamic Mosque in the village,which was built over 100 years ago.
2.Precious Animals, Plants	Existence of habitats of precious species,original animals and plants, Large Trees	Yes	There is no habitats of precious species, original animals and plants. There are large trees which have 50 - 120 cm diameter in the forest surrounding village and road. This large trees are man-planted tree, but to preserve them is necessary.
3.Environmentally Vulnerable Areas	Existence of forests	No	There is no natural forest. There is rice field and man-planted forest around village and road.
	Existence of mangroves,coral reeves,wetland	Yes	There is small natural mangrove forest area along Karnaphuli River near Marine Academy. There is the rest place of migrant in the estuary of Sangu River and on the south side coastal zone of river.
4.Protected Areas	Existence of national park,wildlife sanctuaries,game reserve	No	There is no national park,wildlife sanctuaries, game reserve

Environmental Items	Description	Evaluation	Reason
1.Cultural Heritage	Existence of historic monuments,etc	Yes	There is a Islamic Mosque in the village.
2.Precious Animals, Plants	Existence of habitats of precious species,original animals and plants, Large Trees	Yes	There is Baizid Bostami Mazar(Bostami pond) on Wazirabad area in northern part of Chittagong city, in which Bostami turtle cited in CITES- 1 and RDB-E inhabits. There are large trees which have 50 - 120 cm diameter in the forest surrounding village and road. This large trees are man-planted tree, but to preserve them is necessary.
3.Environmentally Vulnerable Areas	Existence of forests	No	There is no natural forest. There is rice field and man-planted forest around village and road. There is the hill which is linked to SITAKUND forest in the northern part of Chittagong City. This area is private forest area,but almost trees have been cut.
	Existence of mangroves,coral reeves,wetland	Yes	There is a beautiful lake called Foy's Lake.
4.Protected Areas	Existence of national park,wildlife sanctuaries,game reserve	No	There is no national park,wildlife sanctuaries, game reserve

Figure 4.7 Areas that should be Preserved in Project Areas



There is a small natural mangrove forest area along the Karnaphuli River and it is necessary to preserve it as the natural observation forest in the Karnaphuli River Park Plan.

There are the rest places of migrants in the estuary of Sangu River and the South coast of the estuary. This place is not cited in the bird sanctuary, but we have to preserve this place.

4.5.3 The West Bank Area of the Karnaphuli River

The facility and road should be located so as not to cause the resettlement of villages and Islamic mosque.

There is Baizid Bostami Mazar (Bostami pond) in the Wazirabad area in the Northern part of Chittagong City, in which Bostami turtles cited in CITES-I and RDB-E have their inhabit. The Bostami pond is located in the site of Sultan Bayazid Bostami Mosque built 1200 years ago and both, the pond and the Mosque are religious objects, so the facility and road cannot be located there. And it is also necessary to conserve the water quality of Bostami pond.

There are big trees which have 50 - 120 cm diameter in the forest surrounding the villages or along the roads. If deforestation is necessary, they have to be preserved by transplantation.

There is the hill, which is linked to Sitakund forest in the Northern part of Chittagong City. On this hill the forest was destroyed and topsoil exposure following the vegetation removal has occurred. Hence, this area has to be positively developed by afforestation.

Foy's Lake in Chittagong City has to be preserved as a park.

**CHAPTER 5:
REVIEW OF
THE CHITTAGONG DISTRICT ECONOMY**

CHAPTER 5 REVIEW OF THE CHITTAGONG DISTRICT ECONOMY

5.1 Basic Socio-economic Features

5.1.1 Population

According to the data enumerated in the 1981 and 1991 population censuses, Chittagong District was inhabited in 1981 by 4.465 million and 5.296 million people in 1991 as shown in Table 5.1. The district has two municipalities, namely Chittagong City and Patiya. Chittagong City comprises seven Thanas. They are Chandagaon, Chittagong Port, Double Mooring, Kotwali, Pahartali, Panchlaish and a part of Hathazari (ward 13). Chittagong City's population was recorded at 1.026 million and 1.393 million in 1981 and 1991, respectively. After adjustment for under-enumeration of the census population in the CDA's structure plan, the respective population sizes of both, the District and Chittagong City were determined at 5.730 million and 1.525 million people in 1991, respectively.

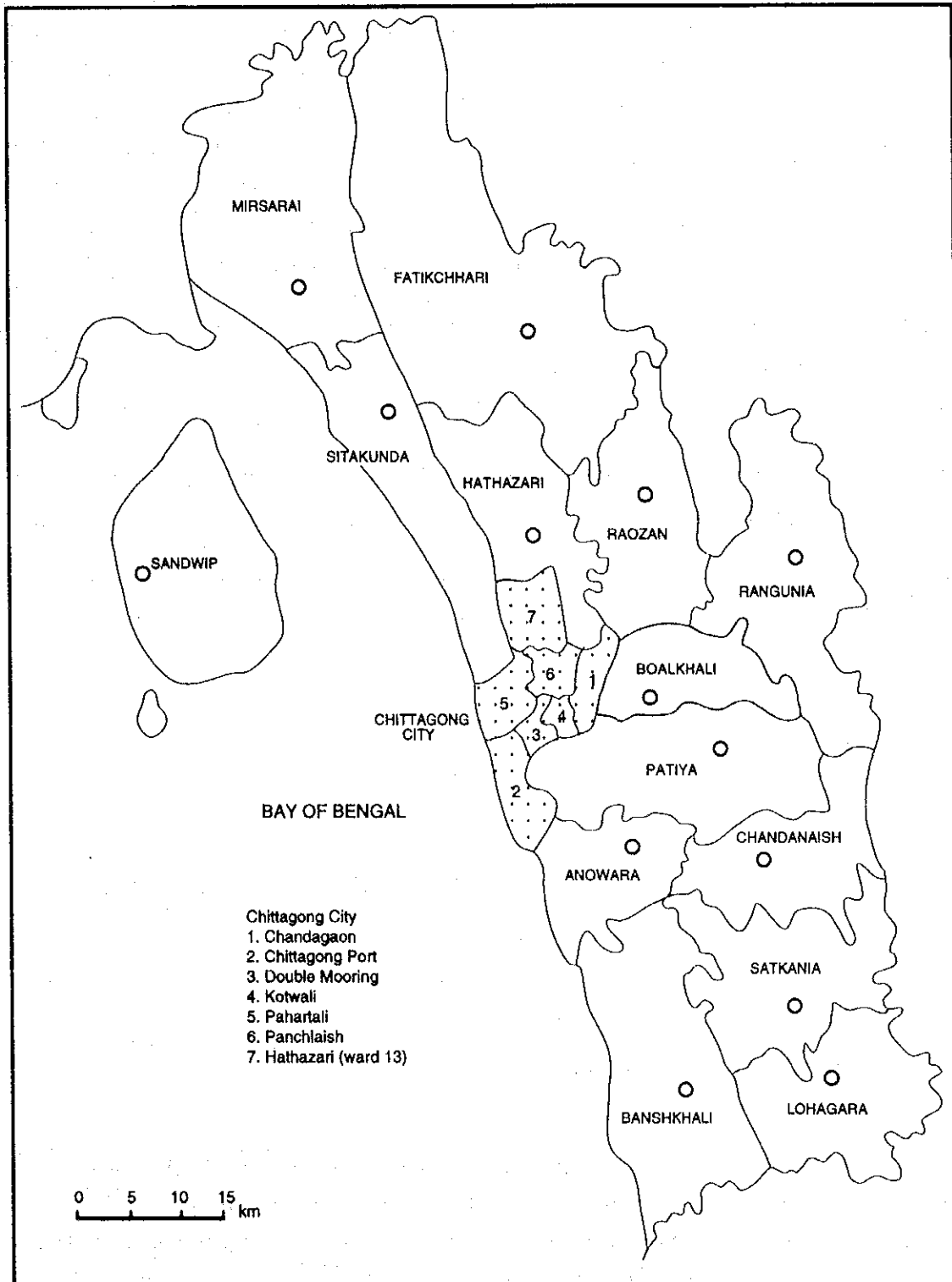
Population growth at District, Thana and City levels, which are based on the enumerated data, is also indicated in Table 5.1. The District's population grew at a rate of 1.72% per annum over the period 1981 to 1991. This growth is below that at national average of 1.86% over the same period. However, if one compares the District's and the Nation's population growth rates based on the adjusted census population data, the population in the Chittagong District would have grown at an annual average rate of 2.09% (that is from 4.660 million in 1981 to 5.730 million people in 1991), while the Nation's population had increased from 89.9 million to 111.4 million, that is at an annual average growth rate of 2.17% over the same period. The Chittagong City's population growth rate over the same period has been 3.11%. The population growth rate varies widely among the District's Thanas, from the highest rate of 7.39% in Pahartali Thana to the lowest rate of 0.23% in Raozan Thana.

The Chittagong District has a population of 5.3 million in an area of 5,283 km², equivalent to a population density of 1,002.5 persons/km², as compared to the national population density of 755/km² (see Figure 5.1). The population density ranges from 357 persons/km² in Sandwip to 39,566 persons/km² in Kotwali, which is a part of Chittagong City.

Table 5.1 Population, Population Growth, and Population Density of Chittagong District by Thana

Thana	Area		Population (1991)			Population (1981)			Share (1991)			Share (1981)			Growth rate (%) (p.a.)			Pop. density (1991) (person/km ²)			Pop. Density 1981
	km ²	Urban	Total	Rural	Urban	Total	Rural	Urban	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban		
1 Anowara	173.53	14.70	219,446	198,239	21,207	187,061	172,474	14,587	90.3%	9.7%	92.2%	7.8%	1.61%	1.40%	3.81%	1,264.6	1,248.1	1,442.7	1,078.0		
2 Banskhali	376.90	8.86	320,339	304,576	15,763	264,805	252,189	12,646	95.1%	4.9%	95.2%	4.8%	1.92%	1.91%	2.23%	849.9	827.6	1,779.1	702.7		
3 Boalkhali	137.53	19.35	195,607	137,315	58,292	174,364	154,652	19,712	70.2%	29.8%	88.7%	11.3%	1.16%	-1.18%	11.45%	1,422.3	1,161.9	3,012.5	1,267.8		
4 Chandanailsh	201.99	3.88	172,843	163,165	9,678	155,842	147,320	8,522	94.4%	5.6%	94.5%	5.5%	1.04%	1.03%	1.28%	855.7	823.6	2,494.3	771.5		
5 Chandgaon	32.14	32.14	219,641		219,641	157,513		157,513	0.0%	100.0%	0.0%	100.0%	3.38%		3.38%	6,833.9		6,833.9	4,900.8		
6 Chittagong Port	44.63	44.63	187,739		187,739	127,252		127,252	0.0%	100.0%	0.0%	100.0%	3.97%		3.97%	4,206.6		4,206.6	2,851.3		
7 Double Mooring	26.99	26.99	319,945		319,945	272,708		272,708	0.0%	100.0%	0.0%	100.0%	1.61%		1.61%	11,854.2		11,854.2	10,104.0		
8 Faakbhari	773.55	22.03	388,013	354,829	33,184	323,941	297,794	26,147	91.4%	8.6%	91.9%	8.1%	1.82%	1.77%	2.41%	501.6	472.1	1,506.3	418.8		
9 Hathazari	251.28	251.28	321,004		321,004	261,648		261,648	0.0%	100.0%	74.4%	25.6%	2.07%	-100.00%	16.95%	1,277.5		1,277.5	1,041.3		
10 Korwali	6.24	6.24	246,893		246,893	209,851		209,851	0.0%	100.0%	0.0%	100.0%	1.64%		1.64%	39,566.2		39,566.2	33,630.0		
11 Lohagara	258.87	9.78	203,453	181,159	22,294	164,705		164,705	89.0%	11.0%	100.0%	0.0%	2.14%	0.96%		785.9	727.3	2,279.6	636.2		
12 Mirabari	482.88	10.12	325,712	314,856	10,856	307,016	297,227	9,789	96.7%	3.3%	96.8%	3.2%	0.39%	0.58%	1.04%	674.3	666.0	1,072.7	635.8		
13 Paharali	46.62	46.62	198,894		198,894	97,518		97,518	0.0%	100.0%	0.0%	100.0%	7.39%		7.39%	4,266.3		4,266.3	2,091.8		
14 Panchlatah	27.45	27.45	193,357		193,357	144,522		144,522	0.0%	100.0%	0.0%	100.0%	2.95%		2.95%	7,044.0		7,044.0	5,264.9		
15 Pabiya	316.47	64.70	398,836	260,268	138,568	356,323	255,189	101,134	65.3%	34.7%	71.6%	28.4%	1.13%	0.20%	3.20%	1,260.3	1,033.8	2,141.7	1,125.9		
16 Raugunia	351.95	18.35	263,217	236,134	27,083	243,819	219,172	24,647	89.7%	10.3%	89.9%	10.1%	0.77%	0.75%	0.95%	747.9	707.8	1,475.9	692.8		
17 Raoran	246.58	9.97	274,344	255,000	21,344	268,033	247,123	20,910	92.2%	7.8%	92.2%	7.8%	0.23%	0.24%	0.21%	1,112.6	1,069.3	2,140.8	1,087.0		
18 Sandwip	782.42	23.12	272,179	228,883	43,296	264,188	224,729	39,459	84.1%	15.9%	85.1%	14.9%	0.30%	0.18%	0.95%	357.0	309.6	1,872.7	346.5		
19 Sabalia	280.99	17.11	299,762	256,586	43,176	247,355	211,084	36,271	85.6%	14.4%	85.3%	14.7%	1.94%	1.97%	1.76%	1,066.8	972.4	2,323.4	880.3		
20 Sitakunda	483.97	483.97	274,903		274,903	236,664		236,664	0.0%	100.0%	0.0%	100.0%	1.51%		1.51%	568.0		568.0	489.0		
District	5,282.98	1,141.29	5,296,127	2,889,010	2,407,117	4,465,158	2,838,218	1,626,940	54.5%	45.5%	63.6%	36.4%	1.72%	0.18%	4.00%	1,002.5	697.5	2,109.1	845.2		
Chittagong City	213.42	213.42	1,392,860		1,392,860	1,025,846		1,025,846	100.0%	0.0%	100.0%	0.0%	3.11%		3.11%	6,526.4		6,526.4	4,806.7		

Figure 5.1 Chittagong's Thana Map



5.1.2 Urbanisation

The Chittagong District is with a population size of 5.3 million people (as enumerated in the 1991 census) the second largest District in Bangladesh. Out of that total, some 2.4 million people live in urbanised areas, which is equivalent to 45.5% of the District's total population. Chittagong is therefore more urbanised than the national average, which was 19.7%. Chittagong is the second most urbanised area in the Nation following Dhaka. The growth rate of the urban population of the Chittagong District has been 4.0 % p.a. over the period 1981 to 1991. This was slightly less than the national average of 4.33% over the same period.

Table 5.2 shows the contribution of the Chittagong Statistical Metropolitan Area's (SMA's) contribution in accommodating the national urban population. Chittagong SMA's share to the national total urban population was 11%, that is next to Dhaka SMA's of 30%.

Table 5.2 Chittagong's Contribution to Accommodating National Urban Population 1991

Area	Urban population ('000)	Share (%)
National Total	109,900	100.0
Dhaka SMA	6,537	30.0
Chittagong SMA	2,343	11.0
Khulna SMA	966	4.5
Rahshahi SMA	560	2.5
Other Urban Centres	8,354	52.0

Source: UNDP/UNCHS, "Draft Structure Plan for Chittagong, 1994 July.

5.1.3 Labour force and Employment

Chittagong's labour force (population 10 years old and over) and employment structure are shown in Table 5.3. Those who are 10 years old and above are considered as labour force. They accounted for 3.68 million people in the District. This number is equivalent to some 69.5% of the total District population as enumerated in the 1991 census. The labour force rate is with 58.3% much lower in Chittagong City (0.812 million people in the labour force out of a total population of 1.392 million people) than in the rest of the district (67.5%, 2.634 million out of 3.903 million).

Table 5.3 Employment Structure by Area and Sex in Chittagong District

Thana	Total Labourforce		Not Working		Total Working		Total Working	Household work	Agriculture	Industry	Water, Gas	Construction	Transport Commun.	Business	Service	Other
	Working	Looking For Work	Working	Looking For Work	Working	Looking For Work										
<Employment in number>																
Chittagong District																
Male	1,981,593	450,613	74,363	39,706	1,456,617	1,456,617	1,456,617	98,038	380,608	106,674	7,951	35,263	71,099	274,161	38,088	444,735
Female	1,699,812	358,616	9,495	5,765	1,331,701	1,331,701	1,331,701	1,191,961	14,673	22,138	311	1,413	1,167	7,760	9,859	82,419
Rural Area																
Male	970,496	233,262	39,706	34,657	697,528	697,528	697,528	65,000	315,526	17,794	1,707	10,711	17,573	110,940	20,126	138,151
Female	963,066	184,106	5,765	3,730	773,195	773,195	773,195	709,128	12,105	6,867	59	691	372	3,773	4,344	35,856
Urban Area																
Male	1,011,097	217,351	34,657	34,657	759,089	759,089	759,089	33,038	65,082	88,880	6,244	24,552	53,526	163,221	17,962	306,584
Female	736,746	174,510	3,730	3,730	558,506	558,506	558,506	482,833	2,568	15,271	252	722	795	3,987	5,515	46,563
Chittagong City																
Male	638,848	122,873	19,108	19,108	496,867	496,867	496,867	13,960	7,045	59,348	4,572	16,456	41,603	111,132	10,969	231,782
Female	408,358	91,564	1,993	1,993	314,801	314,801	314,801	256,337	446	12,668	198	363	618	2,312	3,940	34,919
<share>																
<% to Total Labourforce>																
Chittagong District	100.0%	22.0%	2.3%	2.3%	75.7%	75.7%	100.0%	46.3%	14.2%	4.6%	0.3%	1.3%	2.6%	10.1%	1.7%	18.9%
Male	100.0%	22.7%	3.8%	3.8%	73.5%	73.5%	100.0%	6.7%	26.1%	7.3%	0.5%	2.4%	4.9%	18.8%	2.6%	30.5%
Female	100.0%	21.1%	0.6%	0.6%	78.3%	78.3%	100.0%	89.5%	1.1%	1.7%	0.0%	0.1%	0.1%	0.6%	0.7%	6.2%
<% share to the Total "Working">																
Rural Area	100.0%	21.6%	2.4%	2.4%	76.1%	76.1%	100.0%	52.6%	22.3%	1.7%	0.1%	0.8%	1.2%	7.8%	1.7%	11.8%
Male	100.0%	24.0%	4.1%	4.1%	71.9%	71.9%	100.0%	9.3%	45.2%	2.6%	0.2%	1.5%	2.5%	15.9%	2.9%	19.8%
Female	100.0%	19.1%	0.6%	0.6%	80.3%	80.3%	100.0%	91.7%	1.6%	0.9%	0.0%	0.1%	0.0%	0.5%	0.6%	4.6%
Urban Area	100.0%	22.4%	2.2%	2.2%	75.4%	75.4%	100.0%	39.2%	5.1%	7.9%	0.5%	1.9%	4.1%	12.7%	1.8%	26.8%
Male	100.0%	21.5%	3.4%	3.4%	75.1%	75.1%	100.0%	4.4%	8.6%	11.7%	0.8%	3.2%	7.1%	21.5%	2.4%	40.4%
Female	100.0%	23.7%	0.5%	0.5%	75.8%	75.8%	100.0%	86.5%	0.5%	2.7%	0.0%	0.1%	0.1%	0.7%	1.0%	8.3%
Chittagong City	100.0%	20.5%	2.0%	2.0%	77.5%	77.5%	100.0%	33.4%	0.9%	8.9%	0.6%	2.1%	5.2%	14.0%	1.8%	33.0%
Male	100.0%	19.2%	3.0%	3.0%	77.8%	77.8%	100.0%	2.8%	1.4%	11.9%	0.9%	3.3%	8.4%	22.4%	2.2%	46.6%
Female	100.0%	22.4%	0.5%	0.5%	77.1%	77.1%	100.0%	81.4%	0.1%	4.0%	0.1%	0.1%	0.2%	0.7%	1.3%	11.1%

Source: Bangladesh population Census 1991; Zila Chittagong, Community Series

Note: Labourforce is population 10 years and over

For employment status of the labour force, the 1991 Census shows the following main activities:

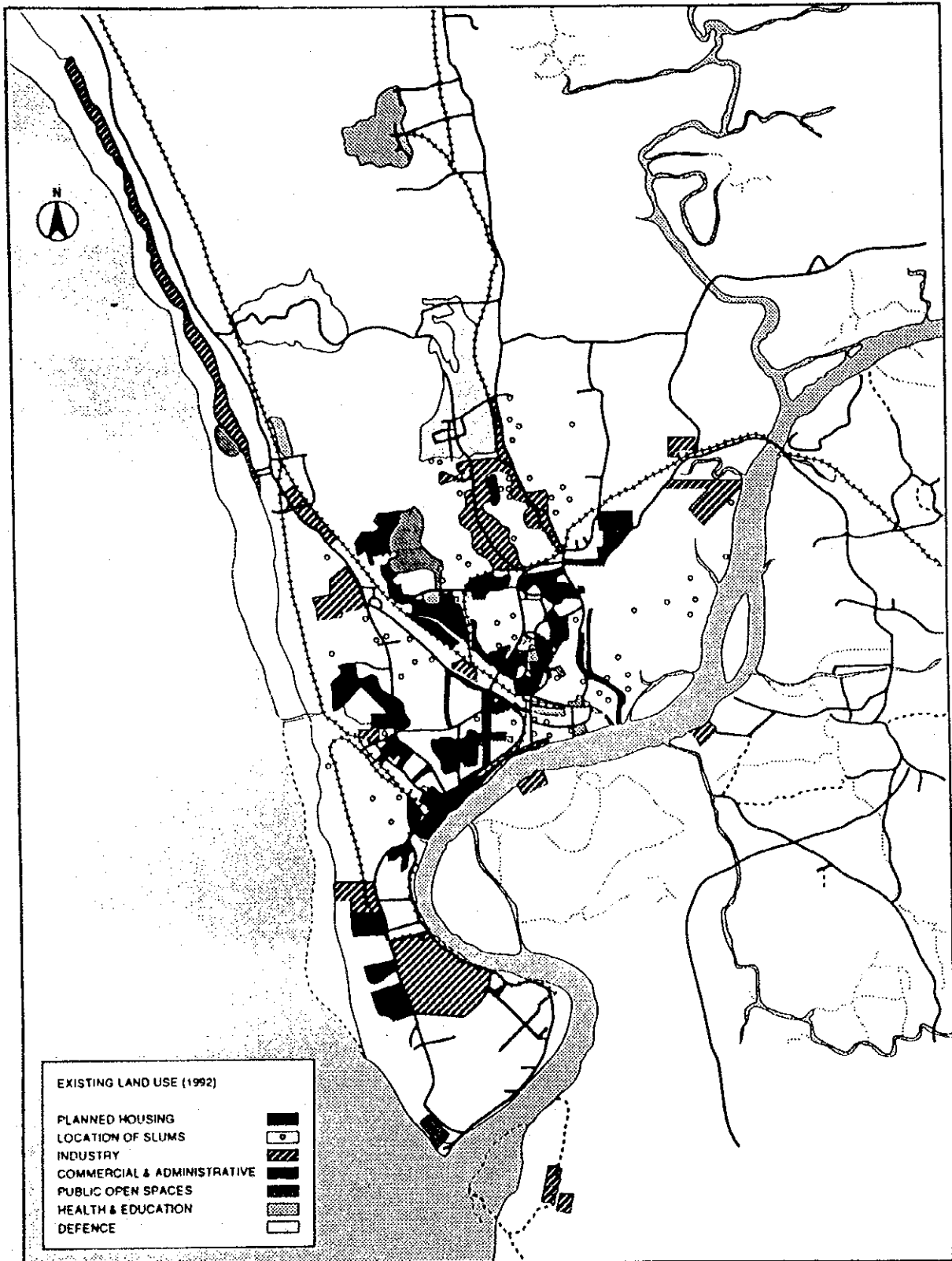
- Does not work
- Looking for work
- Household work
- Seven specified areas of activity (agriculture, industry, water/gas, construction, transport/communication, business and services); and
- Other.

The employment structure between male and female is very different as shown in Table 5.3. Participation rates do not differ much by sex and area. They range from 75% to 80% of the total labour force. It is noted, however, that "household work" absorbs a very high share of employment. According to the population census, such work accounted for 46.3% of total employment. However, there is a big difference between the male and female employment structure in the household sector. Some 89.5% of the total working females were in the "household work" category, while only 6.7% of the total male work in this category. Most of the female working in the household sector are thought to be housewives. Apart from the "household sector," and "other", which consists mainly of the so-called informal sector, "agriculture" is the biggest employment creator. Agriculture accommodated 14% of total employment and 26% of male employment, followed by the "business" sector, which accounted for 10.1% of the total employment. Industry is the third important sector for employment, covering 4.6% of total employment in the District and 8.6% in Chittagong City itself. In Chittagong City, "business" and "industry" together accounted for 34.3% of total employment, and agriculture absorbed only 2.8% total employment.

5.1.4 Existing Land Use

Figure 5.2 shows the existing land use in Chittagong, mostly in the Chittagong City Area. There is no land use map for the Southern bank of the Karnaphuli River. The urbanised area is naturally concentrated within the Chittagong City area. Almost of all the urban facilities and land uses are located in City. On the Southern bank of the Karnaphuli, land is mostly used as paddy fields and it is classified as excellent agricultural land.

Figure 5.2 Existing Land Use in Chittagong



Source : The JICA Study Team based on CDA's land use map

Industrial land use is shown along the railway and Dhaka trunk road. There are three industrial areas in the Northern part of the City along the railway, namely Fouzderahat, Nasirabad-Sholashar and Kalurghat. Besides, on the Patenga peninsular there are government-run heavy industries and the Chittagong Export Processing Zone (CEPZ) is located to the North. Two big chemical plants, that is KAFCO and CUFL, are located on the other side of the River.

Ship breaking industries are located along the coast of the Bay of Bengal, just off the Dhaka trunk road.

5.2 Overview of the Chittagong Economy

The CTGD including Cox's Bazar is equivalent to a ten (10) percent economic region in Bangladesh and is, at the same time, the gateway of Bangladesh.

The Gross Regional Domestic Product (GRDP) of the greater CTGD or the former District including Cox's Bazar was 88.3 billion Taka or 9.8% of the national total in 1991/1992. The population size was some 6.7 million people in 1991 and the total area 7,775 Km², accounting for 6.3% and 5.3% of the nation total, respectively. The population is distributed with 5.296 million in Chittagong and 1.419 million in Cox's Bazar. CTGD abounds relatively in flat land suitable for agricultural, urban and industrial use. This advantage is one of the driving force for the growth of the District along with its good geographical location and port condition. CTGD is the major gateway of Bangladesh.

Table 5.4 Socioeconomic Indicators in Chittagong (the former District)

		[1] Chitta- gong	[2] CTG Division	[3] Bangla- desh	[1/3] Chitta -gong	[2/3] CTG Division
Population in 1991	('000)	6,715.0	27,288.0	106,315.0	6.3%	25.7%
Gross Regional Product (GRP) in 1991-92	(Mil. Taka)	88,326.0	269,204.0	904,248.0	9.8%	29.8%
Per capita GRDP in 1991-92	(Taka)	12,099.0	9,865.3	8,117.0	1.49	1.22
Area Total	(Km ²)	7,775.0	46,367.0	147,570.0	5.3%	31.4%
Highland	(Km ²)	1,638.4	17,014.3	33,220.0	4.9%	51.2%
Medium Highland	(Km ²)	1,880.8	9,533.8	59,075.5	3.2%	16.1%
Medium Lowland	(Km ²)	242.8	5,511.7	17,543.2	1.4%	31.4%
Lowland	(Km ²)	2.3	4,525.6	10,957.8	0.0%	41.3%
Very Lowland	(Km ²)	0.0	1,006.6	2,158.5	0.0%	46.6%
(Other Types)	(Km ²)	4,010.7	8,775.0	24,615.0	16.3%	35.6%
% Shares to the Total						
Highland	(%)	21.1	36.7	22.5		
Medium Highland	(%)	24.2	20.6	40.0		
Medium Lowland	(%)	3.1	11.9	11.9		
Lowland	(%)	0.0	9.8	7.4		
Very Lowland	(%)	0.0	2.2	1.5		
(Other Types)	(%)	51.6	18.9	16.7		

Source: 1993 Statistical year Book of Bangladesh (Bangladesh Bureau of Statistics/BBS)

The CTG's growth rate averaged 5.3% over 1985/86 to 1991/92 (at 1984/85 constant prices). CTG's GRDP growth rate per annum is higher than 4.8% of the national total, while lower than 7.1% of the Dhaka District as shown in Table 5.5

Table 5.5 Sector-wise GRDP in Chittagong (the former District:1991/92)

	GRDP (in million Taka)			Average Growth Rate per Annum (%: 85/86 to 91/92)		
	Chittagong	Dhaka	Bangladesh	Chittagong	Dhaka	Bangladesh
Total	88,326	121,100	904,248	5.3	7.1	4.8
01. Agriculture	17,999	17,993	310,190	2.4	2.8	2.4
Crops	9,941	12,975	221,057	2.2	2.5	2.1
Forestry	2,928	559	31,005	1.7	3.9	2.9
Livestock	1,354	2,212	28,183	3.7	4.7	3.8
Fisheries	3,776	2,247	29,945	3.4	3.6	3.6
02. Mining & Quarrying	-	-	134	-	-	99.2
03. Industry	25,408	25,932	82,571	5.6	6.2	5.6
Large scale	15,263	18,165	49,347	7.9	7.9	7.9
Small scale	10,145	7,767	33,224	2.7	2.7	2.7
04. Construction	3,450	5,566	53,590	7.2	7.2	7.2
05. Power, Gas, Water, etc.	1,595	2,749	14,011	31.5	16.6	24.4
06. Transport, Storage, Cmmn.	12,340	25,287	108,672	5.5	12.3	6.1
07. Trade Services	8,151	8,254	73,766	5.1	5.7	4.3
08. Housing Services	5,089	8,211	79,055	4.0	4.0	4.0
09. Public Admn. & Defence	2,840	5,455	43,406	9.5	10.6	8.7
10. Banking & Insurance	1,515	3,010	17,793	2.8	2.8	2.8
11. Professional & Other Svcs.	9,939	18,643	121,060	8.7	8.7	8.7
	Percent Distribution (%)			% Share to Bangladesh		
	Chittagong	Dhaka	Bangladesh	Chittagong	Dhaka	
Total	100.0%	100.0%	100.0%	9.8	13.4	
01. Agriculture	20.4%	14.9%	34.3%	5.8	5.8	
Crops	11.3%	10.7%	24.4%	4.5	5.9	
Forestry	3.3%	0.5%	3.4%	9.4	1.8	
Livestock	1.5%	1.8%	3.1%	4.8	7.8	
Fisheries	4.3%	1.9%	3.3%	12.6	7.5	
02. Mining & Quarrying	-	-	0.0%	-	-	
03. Industry	28.8%	21.4%	9.1%	30.8	31.4	
Large scale	17.3%	15.0%	5.5%	30.9	36.8	
Small scale	11.5%	6.4%	3.7%	30.5	23.4	
04. Construction	3.9%	4.6%	5.9%	6.4	10.4	
05. Power, Gas, Water, etc.	1.8%	2.3%	1.5%	11.4	19.6	
06. Transport, Storage, Cmmn.	14.0%	20.9%	12.0%	11.4	23.3	
07. Trade Services	9.2%	6.8%	8.2%	11.0	11.2	
08. Housing Services	5.8%	6.8%	8.7%	6.4	10.4	
09. Public Admn. & Defence	3.2%	4.5%	4.8%	6.5	12.6	
10. Banking & Insurance	1.7%	2.5%	2.0%	8.5	16.9	
11. Professional & Other Svcs.	11.3%	15.4%	13.4%	8.2	15.4	

Source: Bangladesh Bureau of Statistics (National Income)

Note: Average growth rate per annum is based on 1984-85 constant price.

Industry in CTG District grew at 5.6% annual growth and it corresponds to a share of 30.8% solely or 62.2% along with Dhaka District of the national total.

Agriculture is the main stay of the economy in Bangladesh and it constituted 34.3% of the total GRDP in 1991/1992. Industry (manufacturing) contributed only 9.1% of the national total of GRDP and is heavily concentrated on the Dhaka and Chittagong District, which constituted

31.4% (25.4 billion Taka) and 30.8% (25.9 billion Taka) of the GRDP generated from industry in Bangladesh, respectively. As such, Dhaka and Chittagong are two big industrial production centres, and therefore simultaneous proceeding of industrialization and urbanization is typically apparent in Bangladesh. (Table 5.5)

The contribution of the transport, communication and storage sectors to GDP are significant that is 12.0% of the national total in 1991/1992. The sector's GDP is broken down as follows:

• Bangladesh Railway	1.6% (1.75 billion Taka)
• organized road transport	14.6% (15.86 billion Taka)
• unorganized road transport	41.9% (45.53 billion Taka)
• organized water transport	3.9% (4.27 billion Taka)
• unorganized water transport	31.7% (34.43 billion Taka)
• air transport	1.4% (1.50 billion Taka)
• communication	4.7% (5.16 billion Taka)
• storage	0.2% (0.17 billion Taka)

Road transport constitutes 56.5% of the sector's GDP in 1991/92 as shown above, and rickshaw including auto-type is the main and multi-purpose transport means in Bangladesh. There is a registered total of 414,162 rickshaw (organized 30,162, unorganized 384,000). Water transport is also important and likewise accounts for 45.6%, since Bangladesh ("Bangladesh" means a wet land and wide plains.) is separated by big rivers. Five divisions of Bangladesh (Barisal, Chittagong, Dhaka, Khulna and Rajshahi) are set based on the river system along with the railway network.

5.3 PRESENT CONDITIONS OF EXISTING INDUSTRIES

5.3.1 Industrial Structure and Major Industries

Chittagong District (CTGD) is one of 15 Districts (zila) in the Chittagon Division comprising the other Districts of Bandarban, Brahmanbaria, Chandpur, Comilla, Cox's Bazar, Feni, Habiganj, Khagrachari, Lakshmipur, Moulvibazar, Noakhali, Rangamati, Sunamganj and Sylhet. In 1989/90 there were 4,546 industrial establishments with 781,490 workers located in the Division, corresponding to 18.2% and 39.5 % of the Bangladeshi total, respectively as shown in Table 5.6 (manufacturing: establishments base with 10 or more workers, hereinafter the same.).

**Table 5.6 District-wise Industrial Establishments and workers
in CTG Division (1989/90)**

zila code	Distict (Zila)	Total	Food, Beverage etc.	Textiles, apparel, leather goods	Wood products & furniture	Paper & printing	Chemicals rubber & plastics	Non-metallic mineral products	Basic metal products	Metal Products & machinery	Other industries
	Total Estb.	4,546	1,801	641	341	142	329	474	132	649	37
3	Bandarban	19	8	1				9		1	
12	Brahmanbaria	182	88	20	9		4	47	2	11	1
13	Chandpur	219	131	26	15	2	6	19		20	
15	Chittagong	2,290	627	463	115	98	225	178	116	454	14
19	Comilla	485	249	41	39	9	24	53	5	56	9
22	Cox's Bazar	108	58	1	17	1	2	17		7	5
30	Feni	164	84	10	13	4	9	19	2	22	1
36	Habiganj	69	47	4	4		1	9		3	1
46	Khagrachari	22	8		5			9			
51	Lakshmipur	66	34	5	17	1		6		3	
58	Moulvibazar	186	136	3	11		3	20		12	1
75	Noakhali	292	149	26	26	13	34	13		29	2
84	Rangamati	67	22	10	11	3	4	16		1	
90	Sunamganj	69	38	2	16	1		11		1	
91	Sylhet	308	122	29	43	10	17	48	7	29	3
	Total Workers	781,490	363,372	232,473	13,529	13,389	34,490	53,896	25,407	43,209	1,725
3	Bandarban	5,124	4,557	27				514		26	
12	Brahmanbaria	7,793	1,408	2,701	163		275	2,701	29	505	11
13	Chandpur	14,707	3,920	7,204	222	38	217	2,455		651	
15	Chittagong	450,493	147,210	180,893	6,534	6,278	25,332	21,599	24,318	37,081	1,248
19	Comilla	45,655	11,978	22,750	753	142	3,781	2,865	627	2,575	184
22	Cox's Bazar	3,983	1,838	14	331	12	48	1,453		144	143
30	Feni	5,637	1,775	1,788	170	59	133	1,004	180	511	17
36	Habiganj	18,713	16,523	565	60		300	1,190		57	18
46	Khagrachari	2,780	2,411		70			299			
51	Lakshmipur	9,451	4,257	1,792	2,337	12		987		66	
58	Moulvibazar	166,332	153,180	1,320	209		355	10,837		418	13
75	Noakhali	14,297	5,265	6,660	455	255	523	586		508	45
84	Rangamati	16,071	1,760	4,865	1,364	5,156	1,836	1,056		34	
90	Sunamganj	4,143	676	72	195	1,283		1,907		10	
91	Sylhet	16,311	6,614	1,822	666	154	1,690	4,443	253	623	46
Percent Shares to the National Total Establishments in Selected Zilas											
	Total Estb.	18.2	7.2	2.6	1.4	0.6	1.3	1.9	0.5	2.6	0.1
3	Bandarban	0.1	0.0	0.0				0.0		0.0	
12	Brahmanbaria	0.7	0.4	0.1	0.0		0.0	0.2	0.0	0.0	0.0
15	Chittagong	9.2	2.5	1.9	0.5	0.4	0.9	0.7	0.5	1.8	0.1
19	Comilla	1.9	1.0	0.2	0.2	0.0	0.1	0.2	0.0	0.2	0.0
22	Cox's Bazar	0.4	0.2	0.0	0.1	0.0	0.0	0.1		0.0	0.0
30	Feni	0.7	0.3	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
36	Habiganj	0.3	0.2	0.0	0.0		0.0	0.0		0.0	0.0
58	Moulvibazar	0.7	0.5	0.0	0.0		0.0	0.1		0.0	0.0
84	Rangamati	0.3	0.1	0.0	0.0	0.0	0.0	0.1		0.0	
91	Sylhet	1.2	0.5	0.1	0.2	0.0	0.1	0.2	0.0	0.1	0.0
Percent Shares to the National Total Workers in Selected Zilas											
	Total Workers	39.5	18.4	11.7	0.7	0.7	1.7	2.7	1.3	2.2	0.1
3	Bandarban	0.3	0.2	0.0				0.0		0.0	
12	Brahmanbaria	0.4	0.1	0.1	0.0		0.0	0.1	0.0	0.0	0.0
15	Chittagong	22.8	7.4	9.1	0.3	0.3	1.3	1.1	1.2	1.9	0.1
19	Comilla	2.3	0.6	1.1	0.0	0.0	0.2	0.1	0.0	0.1	0.0
22	Cox's Bazar	0.2	0.1	0.0	0.0	0.0	0.0	0.1		0.0	0.0
30	Feni	0.3	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
36	Habiganj	0.9	0.8	0.0	0.0		0.0	0.1		0.0	0.0
58	Moulvibazar	8.4	7.7	0.1	0.0		0.0	0.5		0.0	0.0
84	Rangamati	0.8	0.1	0.2	0.1	0.3	0.1	0.1		0.0	
91	Sylhet	0.8	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0

Source: Directory of Manufacturing Establishments (employing 10 or more persons), 1989/90 (BBS)

In CTGD, there were 2,290 industrial establishments with 450,493 workers, corresponding to 9.2% and 22.8 % of the Bangladeshi total, respectively. In terms of workers, industries of food-beverage-etc. and textiles-apparel-leather goods are outstanding, accounting for 7.4% and 9.1% of the national total, respectively. In addition, industries such as metal products and machinery, basic metal products and chemicals also agglomerate in CTGD.

5.3.2 Main Industries and Locational Distribution

Table 5.7 shows the "Top 100 Industries" (number of workers base) in the Chittagong District (CTGD) in 1989/90. These agglomerated industries comprise food processing like tea and salt, textiles such as jute, cotton, rope, garments, iron and steel and bricks. In addition to iron and steel mills, such port-oriented industries agglomerated as ship building and repairing, ship breaking, fish processing centring on frozen shrimps, grain milling like flour, fertilizer (export-oriented), and industries depending on imported raw materials such as industrial chemicals, petroleum refinery and cement .

The following are industries heavily concentrated or solely located in CTGD among the Districts in Bangladesh and factories of public corporations are also concentrated in CTGD.

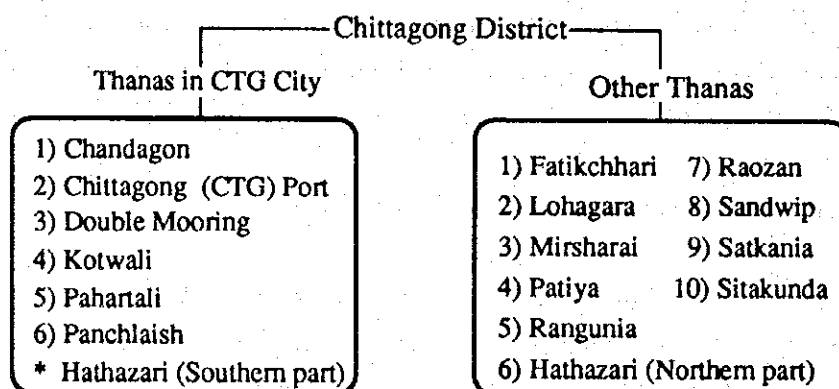
- Tea processing and blending, edible salt refinery, vegetable oils
- Cotton ginning, wooden structural products, paints and varnishes, glass
- Iron and steel mills, ship breaking, boat building and repairing, and
- Handicrafts-ceramic, glass.

In terms of City- and Thana- wise locational distribution, industries are heavily concentrated in the Chittagong City area.

The Chittagong District consists of 16 Thanas as shown in Figure 5.3 The Chittagong City Corporation, not the local government but one of the autonomous bodies, administers the City area, which consists of 6 Thanas and the Southern part of Hathazari Thana, where industries agglomerate with around 360,000 workers, accounting for 80% of the District's total manufacturing workers in 1989/90.

Figure 5.5 shows main industries of Thanas based on their number of workers in the Chittagong City excluding Hathazari. Among 6 Thanas in the City, Double Mooring is the largest with 145,570 workers, of which tea blending workers are dominant mainly due to including those counted under the name of the Bangladesh Tea Board. The second is Panchlaish (67,164 workers centring on garments, cotton textiles, jute textiles, and iron and steel rerolling mills), where the Nasirabad Industrial Area and industrial estate of the Small and

Figure 5.3 Composition of Chittagong District



Cottage Industrial Corporation (BSCIC) are developed. The third is Chandagaon (58,310 workers comprising mostly jute textiles, rope, garments, and soap and detergents), which also accommodates the Kalugrahat Industrial Area and BSCIC estate. The other BSCIC estates are developed at Pahartali and Chittagong (CTG) Port in the Chittagong City and Patiya outside the city.

The CTG Port Thana, which accounted for 27,791 workers, has not only port areas, but also the Chittagong Export Processing Zone (CEPZ) that is the first EPZ in Bangladesh followed by the Dhaka EPZ. In the CEPZ operated 54 factories (other 34 factories are already registered, some of which are under construction.) that comprise mostly garments, sporting goods, electronic parts, metal chain and foundry. The CEPZ employed more than a total of 21,000 workers in 1994.

Figure 5.5 illustrates the locational distribution of industrial workers in 1989/90. The Figure depicts that industries agglomerate more in the Northern Thanas of the District, such as Sitakunda, Fatikchhari and Hathazari. Industries located at Hathazari Thana have around 9,400 industrial workers mostly comprising those engaged in bricks making. The brick industry is very common in Bangladesh as one of the construction or housing materials industries, which are located at almost all of the Thanas, moving the site after raw clay has been depleted.

Sitakunda Thana is developed with a total of 58,035 workers, that is the second largest following the Chittagong City. More than 36,000 workers are engaged in jute and cotton textiles production. Ship breaking in Bangladesh is almost solely located at Sitakunda with 7,008 workers. Assembly of motor vehicles is also sizable with 889 workers. Sitakunda lies along the Dahka-Chittagong Road, neighbours on the Chittagong City and faces the Bay of Bengal. These good locational conditions may attract industrial investments.

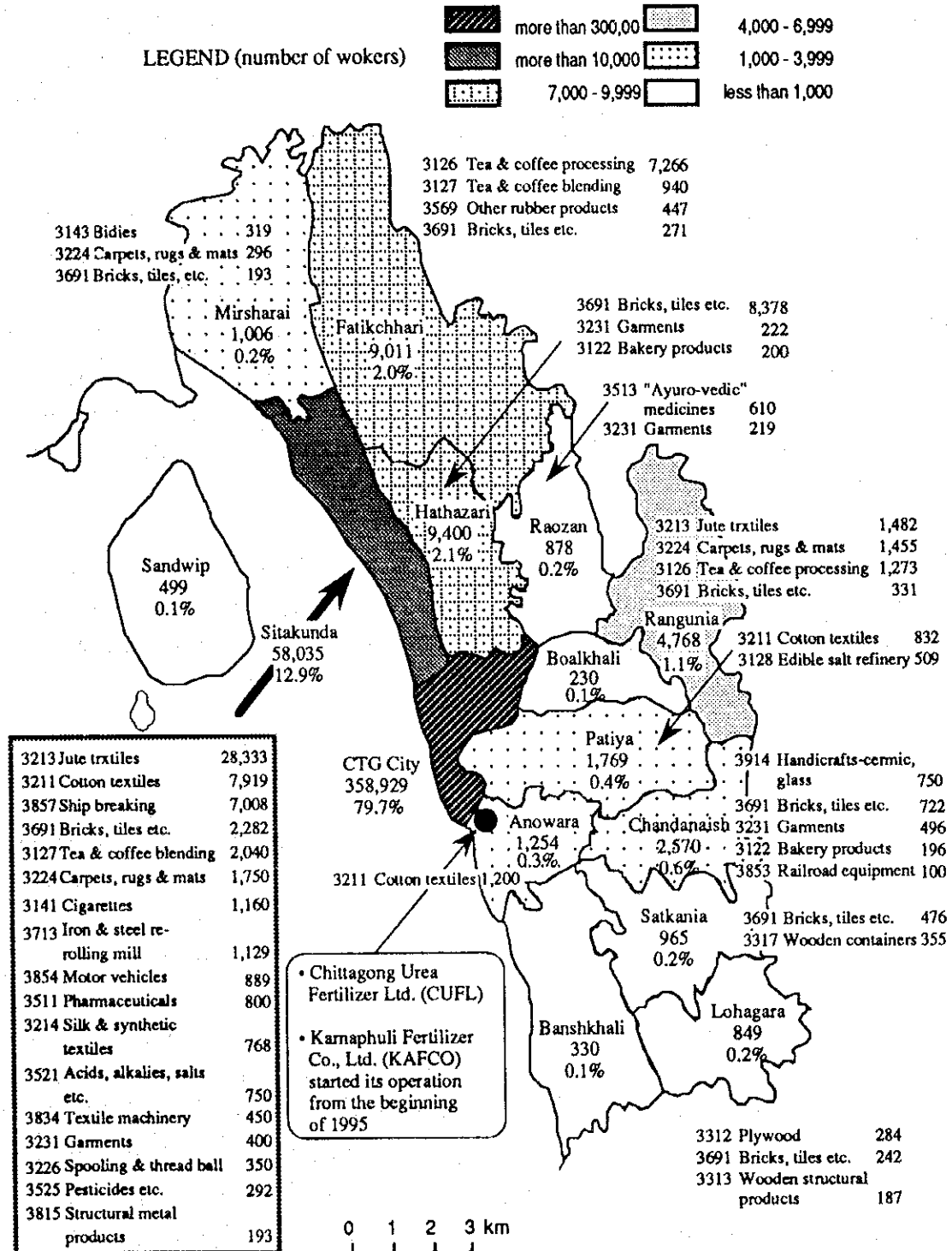
Table 5.7 Top 100 Industries in CTGD (4 digits and worker base) in 1989/90

	Total Workers			% Shares to the Nation		
	Bangladesh	1,979,829		Workers	CTG Div.	
	CTG Division 751,490			% Shares to the Nation		
	Workers			Workers	CTG Div.	
ALL INDUSTRIES	450,493	22.8	57.6			
3127 Tea & coffee blending	97,291	100.0	100.0	3853 Railroad equipment	747	13.5 95.6
3213 Jute textiles	63,324	27.2	74.3	3569 Other rubber products	743	9.2 57.7
3231 Garments	63,245	26.4	99.3	3815 Structural metal products	706	13.0 55.7
3211 Cotton textiles	28,144	16.8	71.8	3844 Insulated wires & cables	703	26.0 82.7
3128 Edible salt refinery	19,959	82.4	91.0	3532 Cosmetics, toiletries etc.	692	35.6 97.7
3691 Bricks, tiles etc.	19,580	13.1	39.7	3314 Hard board etc.	649	32.7 100.0
3711 Iron & steel mills	14,643	98.9	100.0	3541 Petroleum refinery	632	49.8 100.0
3225 Cordage, rope & twine	10,698	64.2	93.3	3536 Ink	627	56.4 95.9
3126 Tea & coffee processing	9,724	5.2	5.2	3832 Agricultural machinery	609	10.5 42.6
3713 Iron & steel re-rolling mills	9,106	34.7	92.8	3222 Other made-up textiles	587	8.2 42.0
3533 Soap & detergents	7,133	43.2	79.1	3523 Gases	523	52.9 100.0
3857 Ship breaking	7,033	100.0	100.0	3212 Woolen textiles	513	37.3 88.8
3851 Ship building & repairing	6,778	49.4	97.6	3317 Wooden containers	501	63.7 100.0
3114 Fish processing	5,143	32.6	76.7	3579 Other plastic products	485	7.2 86.9
3224 Carpets, rugs & mats	4,386	65.4	89.7	3412 Paper board	481	37.4 93.8
3423 Printing	3,996	25.3	91.5	3827 Metal plumbing equi. etc.	463	11.6 93.3
3819 Utensils-aluminium	3,886	30.5	75.3	3413 Articles of paper. etc.	452	18.7 100.0
3214 Silk & synthetic textiles	3,871	5.1	24.3	3311 Saw & planing mill	446	3.5 9.9
3511 Pharmaceuticals	3,582	13.5	59.2	3134 Soft drinks etc.	440	33.5 86.3
3321 Wooden furniture	3,319	27.9	75.7	3112 Dairy products	419	8.6 37.3
3524 Fertilizers	3,192	41.6	67.2	3818 Wire products	417	28.7 76.8
3116 Edible vegetable oils	3,006	25.6	53.3	3814 Metal furniture & fixtures	394	10.8 50.9
3854 Motor vehicles	2,812	52.6	91.7	3261 Cotton ginning etc.	388	91.5 100.0
3122 Bakery products	2,708	10.2	30.2	3842 Radio, TV, commu. equip.	382	8.6 100.0
3141 Cigarettes	2,499	21.4	30.5	3712 Iron & steel foundry	375	11.1 61.1
3531 Paints, varnishes etc.	2,213	86.2	100.0	3692 Cement	367	25.7 27.6
3816 Metal stamping etc.	1,997	61.9	98.3	3229 Other textiles	332	18.5 96.0
3834 Textile machinery	1,809	49.1	95.6	3833 Metal & wood working machinery	331	7.0 82.8
3529 Other industrial chemicals	1,456	67.7	99.3	3817 Heating, cooking & lighting equip.	326	29.3 100.0
3849 Other electrical apparatus	1,433	33.7	100.0	3313 Wooden structural products	313	70.5 93.2
3226 Spooling & thread ball	1,362	19.3	60.8	3217 Textile dyeing, bleaching etc.	312	2.3 33.4
3223 Knitwear	1,313	10.5	86.4	3525 Pesticides etc.	292	19.9 92.4
3143 Bidiies	1,297	1.1	8.8	3847 Electrical components	273	50.5 100.0
3535 Matches	1,273	10.5	89.6	3621 Glass	269	71.2 100.0
3118 Grain milling	1,215	12.7	42.4	3829 Other fabricated metal products	267	8.0 86.7
3843 Electrical appliances	1,165	42.7	98.5	3845 Electric bulbs & tubes	218	15.4 100.0
3824 Tin cans & tinware	1,133	41.5	97.1	3944 Brooms & brushes	214	50.1 100.0
3839 other general machinery	1,119	11.0	63.8	3622 Glass products	212	3.3 100.0
3115 Vegetable oils	1,074	88.8	100.0	3419 Other paper products	205	38.1 100.0
3119 Rice milling	1,065	1.9	20.8	3539 Other chemical products	198	10.4 46.3
3241 Leather tanning etc.	1,060	12.1	94.9	3859 Other transport equipment	198	20.9 44.4
3312 Plywood etc.	1,016	65.0	65.9	3113 Fruits and vegetable processing	197	24.1 36.3
3521 Acids, alkalies, saltsetc.	990	33.0	35.5	3318 Other bamboo & cane products	188	3.2 14.4
3826 Bolts, nuts, rivets etc.	989	16.8	71.4	3552 Other petroleum products	180	49.6 61.2
3693 Cement products	988	62.1	85.1	3422 Publishing	173	4.8 51.8
3251 Leather footwear	861	17.7	98.2	3938 Umbrellas etc.	167	7.3 83.5
3421 Newspapers	827	13.4	88.9	3699 Other non-metallic products	149	15.0 100.0
3513 "Ayuro-vedic" medicines	788	43.5	96.7	3852 Boat building & repairing	145	93.5 93.5
3129 Other food products	758	17.5	54.7	3216 Handloom textiles	143	5.0 40.1
3914 Handicrafts-ceramic, glass	750	95.3	98.6	3572 Polythine products	131	11.3 70.1

Source: Directory of Manufacturing Establishments (employing 10 or more persons), 1989/90 (BBS)

Note: National Total-Establishments 24,945, Workers 1,979,829

Figure 5.5 Locational Distribution of Industries at Thanas excluding Thanas within Chittagong City (4 digits and worker base: 1989-90)



Source: Directory of Manufacturing Establishments (employing 10 or more persons), 1989/90 (BBS)
 Note: Persons engaged in tea blending includes those counted under the name of the Bangladesh Tea Board.

Two big fertilizer factories are located at Anowara Thana. One is the factory of Chittagong Urea Fertilizer Ltd. (CUFL), which started its operation in 1987 and which was registered at Chittagong Port Thana by the Directory of Manufacturing Establishments 1989/90. The other is the factory of Karnaphuli Fertilizer Co., Ltd. (KAFCO), which started its operations from the beginning of 1995. These factories produce fertilizers from natural gas pipelined from Comilla, that is one of the Districts in the Chittagong Division. Another big fertilizer factory of TSP Fertilizer Complex Ltd. is located at Chittagong Port Thana.

In summary, it may be said that industries concentrate heavily in the Chittagong City. Its industrial workers amounted to around 360,000 excluding those working at establishments with less than 10 workers, household and handloom units. In other words, more than one-third of the population (about 1.5 million) are engaged in industries. However, this does not mean that all the industrial workers are the residents in the Chittagong City. A sizable number of workers commute from neighbouring Thanas and some workers come from the other Districts throughout Bangladesh. Considering the above, it could be said that the Chittagong City is literally an industrial city and urban area in Bangladesh.

However, overall Chittagong's industries still stay at a developing stage. They comprise mostly the so called "traditional industry" with a long history, but lack "modern industry" or "sophisticated or advanced industry" leading the growth of Chittagong and Bangladesh. This is one of the fundamental problems with regard to the industrial structure.

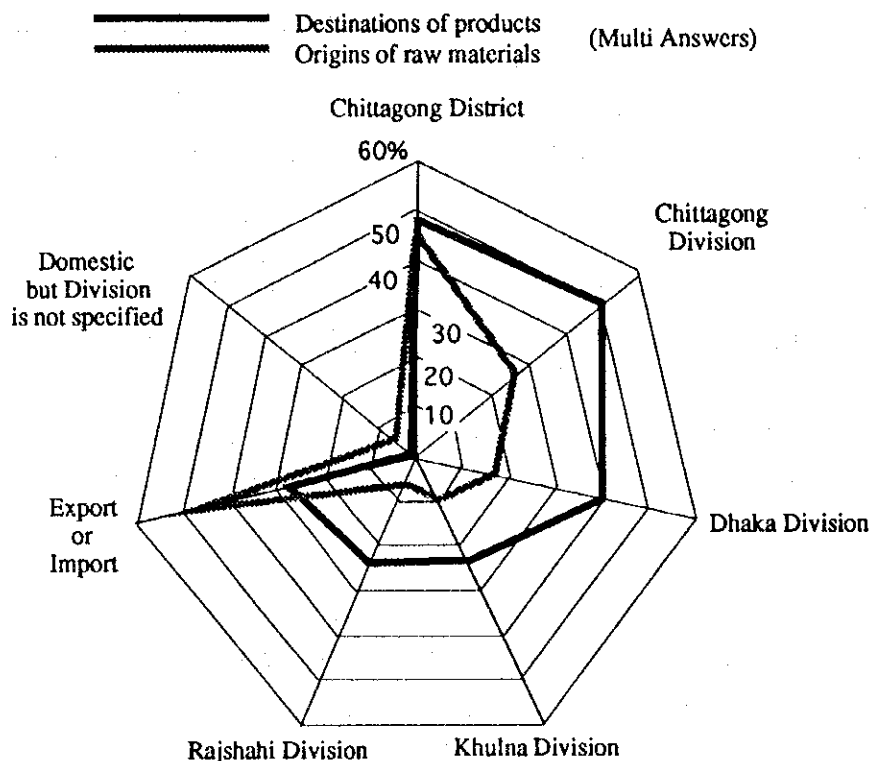
5.3.3 Regional Linkages

Chittagong is the national production and export centre, while heavily depending on imported raw materials.

Figure 5.6 depicts regional linkages of the Chittagong District's industries based on the outcome of the Survey by the Study Team. Based on the response of 247 establishments, destinations of their products are broken down as follows: the Chittagong District and Division accounted for 47.8% and 49.4% of the total, respectively. Dhaka with the largest urban market is the second largest destination among Divisions with a share of 40.5% to the total. Khulna and Rajshahi constitute more or less than 25% of the total responded. Foreign countries for export are also the main destination and they accounted for 27.9%. As such, Chittagong District is the national production and export centre of Bangladesh.

Chittagong plays an important role of transshipment hub and processing trade functions in Bangladesh.

Figure 5.6 Main Regional Linkages in Production and Market of Industries in Chittagong District (Number of Answered Establishments Basis)



Source: Survey by the Study Team (SST)

Note: Number of responded establishments --- Destinations 247, Origins 245
 Percent shares are not based on the volume of cargoes, but on number of establishments answered to the questions.

The origin of raw materials is not so diversified as the destination, centring on the Chittagong District and foreign countries, which accounted for 45.3% and 52.7% of the total respondents, respectively. The weight of Dhaka and other Divisions decreases. Such heavy dependence on imported materials and wide area market of Chittagong's industries means that the Chittagong District has played an important role of transshipment hub and processing trade functions in Bangladesh. The Chittagong Port is the crucial infrastructure for such functions of the District. The port handled a totaled cargo of 7.04 million tons in 1991/92 that corresponded to 72.6% of the national total. The imported cargo amounted to 6.27 million tons, 5.50 million tons more than the exported cargo of 0.77 million tons.

According to the Survey by the Study Team, main imported materials for Chittagong's industries and their origins were as follows:

- Wheat for flour (Canada, USA),

- Beans, seeds for vegetable oil (Brazil),
- Nylon chips (Korea, Japan),
- Raw cotton (India, Pakistan, USA, Egypt, Central Asia, Korea),
- Raw cloth or fabrics for garments (China, Hongkong, Taiwan, Korea, Singapore, India, Pakistan, USA, EU),
- Foam and leather for footwear (Korea),
- Aluminum or other materials for houseware (India, Korea, Brazil, Australia, EU, USA, Japan),
- Paper and board for packing (India, Indonesia, Korea, Japan, EU),
- Ink (China, Japan, Jamaica),
- Raw synthetic resin or plastics (Singapore, Thailand, Korea, China, Australia, EU, Japan),
- Raw materials for pharmaceuticals (Australia, Japan, Korea, China, India, EU),
- Raw materials for soap (Australia, New Zealand, India, Singapore),
- Raw materials for paint (EU, China, Japan),
- Raw rubber (Sri Lanka, Malaysia),
- Petroleum oil (Middle East through refining in Singapore),
- Carbon black (Thailand, Singapore, India, Pakistan, Korea, Japan),
- Clinker and gypsum for cement (India, Middle East, China),
- Cement (Pakistan, India, Thailand, Malaysia, Canada, Japan),
- Marble (Pakistan, India, Thailand),
- Iron and steel including pig iron and scrap (Turkey, Hongkong, Korea, EU, USA, Brazil, Japan),
- Knockdown components or parts for commercial vehicle (India, Japan), and
- Scraped ship (EU, Japan).

Exports and their destinations by Chittagong's industries are as follows:

- Frozen shrimp (EU, USA, UK, Japan),
- Tea (EU, UK, Pakistan, Middle East, Japan),
- Jute products including carpet and other textiles (Middle East, Africa, Canada, USA, EU, Indonesia),
- Garments (USA, Canada, EU, Japan),
- Leather (Hongkong, Taiwan, Korea, Japan, Australia, EU, Middle East),
- Packing paper board (Korea)
- Fertilizer, and
- Petroleum products (naphtha, furnace oil: Singapore).

Exports from Chittagong District are few in items and their destinations concentrate relatively on developed countries as seen above. On the other hand, Chittagong's industries are heavily

dependent on imported materials from developed countries, Asian NICs and countries of the "South Asia Associations for Regional Cooperation (SAARC)", which Bangladesh took an initiative to form. Table 5.8 shows that imports from SAARC countries to Bangladesh constituted 10.1% of the total (13.38 billion Taka), while her exports to them was 2.2 % of the total exports (1.67 billion Taka) in 1991/92. By item of imports, SAARC's shares were bigger in animal or vegetable fats (77.6%), chemical products (28.3%) and vegetable products (18.8%). As regards exports, SAARC's shares were relatively larger in textiles-garments. (18.4%), vegetable products (17.7%), rubber and plastic products (13.3%) and transport equipment (10.7%).

Bangladesh has a common border with India and Myanmar. It is reported that border trade is very active and popular while not being recorded by the official statistics. The Chittagong Export Processing Zone (CEPZ) enterprises exported a total of 6 billion Taka in 1993/94, that is 15% growth against those in 1992/93. The exported goods comprise textiles, garments, caps, towels, footwear, leather goods, steel chain, casting, electrical and electronic products, audio and video tapes, automobile parts, camera lenses (plastics), sporting goods like tents, sleeping bags, fishing reels and golf shafts and toys.

5.3.4 Strength/Weakness and Internal Problems

Bangladesh is a member country of the General Agreements on Tariff and Trade (GATT) that was transformed to the World Trade Organization (WTO) in January 1995. Bangladesh is already a member country automatically by ratifying the agreement of GATT Uruguay Round, of which the principal components are as follows:

a) Industrial Goods:

- Overall tariff cut of at least 33% of the year 1986 level,
- Scrap of tariffs by Industrial Countries over the next 5-10 years,
 - pharmaceuticals, medical equipment, steel, paper, furniture, toys, beer, distilled spirits
- Tariffs reduction by Developing Countries,
 - semiconductors, computer parts, chipmaking equipment to fall by 50-100%,
 - tariffs on chemicals at 6.5%, and
- Phasing-out of the Multifibre Arrangement (MFA) on quotas of textiles and garments by the year 2005 (a 10 year period) through four stages.

b) Agriculture:

- "Tariffication" of all quotas and other quantitative restrictions (QRs),
 - lift of rice import ban: Japan in 6 years, Korea in 10 years,

**Table 5.8 Bangladesh International Trade and Shares of SAARC Countries
(1991/92)**

	Total Imports	SAARC Total	Pakistan	India	Srilanka	Nepal Maldives Bhutan
IMPORTS						
Total Value (in million Tk.)	132,756	13,379	4,337	8,743	300	0
(Shares of total)	100.0%	10.1%	3.3%	6.6%	0.2%	0.0%
Live animals; animal products	2,791	3.7%		3.3%	0.4%	0.0%
Vegetable products	12,758	17.7%	2.1%	15.5%	0.1%	0.0%
Animal or vegetable fats, oil, etc.	7,736	0.8%		0.0%	0.8%	
Processed foods, beverages, etc.	1,113	7.3%	0.4%	6.9%	0.0%	
Mineral products	21,701	6.2%	0.7%	5.5%		
Chemical products	12,457	6.0%	0.5%	5.4%	0.2%	
Rubber & plastic products	4,650	13.3%	0.1%	11.7%	1.6%	
Leather & leather products	122	1.8%	0.0%	1.8%		
Wood & wood products	241	0.7%		0.7%		
Pulp, paper & paper products	2,077	6.1%	0.1%	6.0%	0.0%	
Textiles, garments, etc.	28,743	18.4%	13.0%	5.1%	0.3%	
Base metals	10,108	8.0%	0.0%	7.9%	0.0%	
Machinery & equipment	21,688	6.6%	0.4%	6.2%	0.0%	
Transport equipment	3,054	10.7%	0.3%	10.4%	0.0%	
Precision instruments	1,428	2.1%	0.3%	1.8%	0.0%	
Others	2,089	6.5%	0.2%	5.8%	0.4%	0.0%
EXPORTS						
Total Value (in million Tk.)	74,198	1,669	1,248	49	371	2
(Shares of total)	100.0%	2.2%	1.7%	0.1%	0.5%	0.0%
Live animals; animal products	6,440	0.1%	0.1%	0.0%		0.0%
Vegetable products	1,580	18.8%	18.8%	0.0%	0.0%	
Animal or vegetable fats, oil, etc.	9	77.6%		77.6%		
Processed foods, beverages, etc.	206	2.4%	0.1%	0.8%	1.5%	
Mineral products	663	0.6%	0.0%	0.5%		
Chemical products	802	28.3%	0.0%	0.0%	28.3%	
Rubber & plastic products	2					
Leather & leather products	5,027	0.5%	0.0%	0.5%		
Wood & wood products	168	0.7%	0.4%		0.2%	
Pulp, paper & paper products	5	2.1%	2.1%			
Textiles, garments, etc.	55,615	1.9%	1.7%	0.0%	0.2%	0.0%
Base metals	122	0.6%		0.6%		
Machinery & equipment	2,538	0.5%	0.2%	0.0%	0.3%	
Transport equipment	397	0.1%	0.0%	0.1%		
Precision instruments	11	0.3%		0.3%		
Others	613	0.7%	0.5%	0.1%	0.1%	

Source: Foreign Trade Section, BBS

Note: SAARC (South Asia Associations for Regional Cooperation)

- phasing-out of import quotas in US: sugar, dairy products, peanut,
- phasing-out of import ban in the Philippines: corn, coffee, cabbages, onions, potatoes, garlic, feed substitutes, certain meat products, certain species of seeds in commercial quantities,

- phasing-out of quantitative restrictions on agricultural products except for rice,
- Tariffs reduction: by 36% in 6 years (Industrial Countries), by 24% in 6 years (Developing Countries),
- Domestic subsidies reduction: by 21% over 6 years (Industrial Countries), by 13% over 10 years (Developing Countries: except for irrigation, fertilizer subsidies, credit support and the like)

In addition, the new WTO will promote further decrease in non-tariff barriers to trade, protection of trade-related intellectual rights, streamline of trade-related investment measures and expansion of service trade.

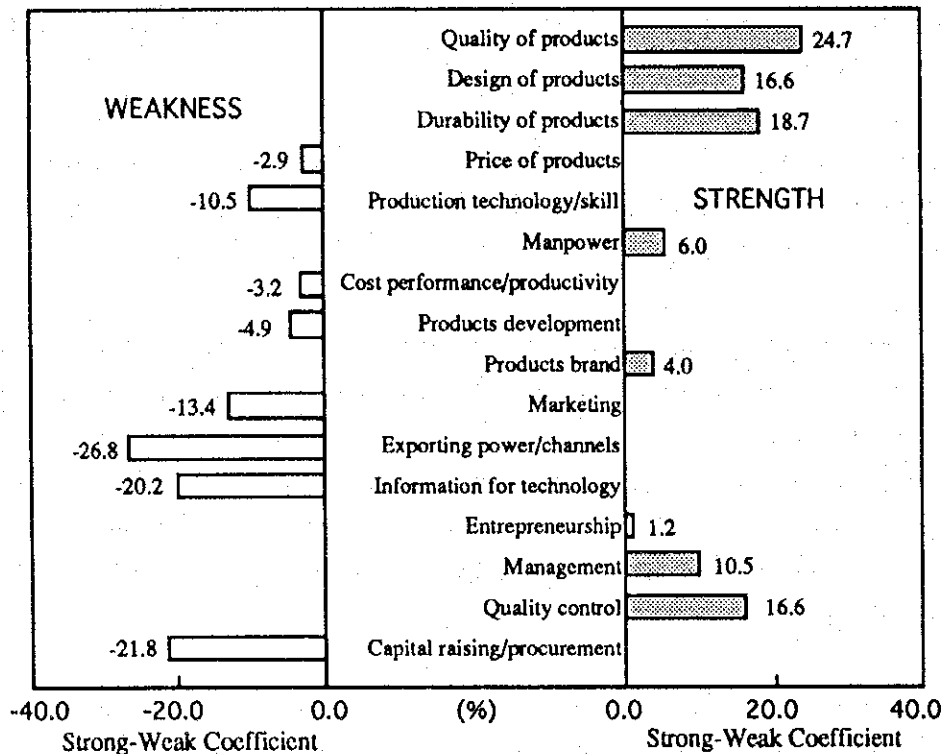
An open-market policy is imperative according to the said progress of globalization of the economy and/or a border-less economy. The Bangladeshi government has reduced tariff rates of some commodities. Under such business circumstances, international competitiveness is crucial for survival of the existing industries in the Chittagong District (CTGD), not only for export-oriented industries but also for domestic market-oriented. In this context, it is significant to reconfirm the strength or weakness and internal problems of the existing industries in CTGD.

Figure 5.7 illustrates the outcome of the Survey by the Study Team (SST) undertaken among the existing industries (EIs). EIs in CTGD evaluate themselves in comparison to the general situation of the same business area in Bangladesh and ASEAN countries as being strong in quality including quality control, design, durability, manpower, brand and management. They perceive themselves to be weak in exporting power/channels, capital raising, information for technology, marketing, products development and production technology/skills.

Figure 5.8 illustrates likewise the most critical internal problems of the existing industries in CTGD, which are broken down as obsolete production facilities (79 respondents or 32% of the total of 247 installed their facilities before 1984.), lack of R&D staff, low rate of operation, environmental problems, lack of skilled workers and so on.

Strength and weakness of the subsectors in CTGD are illustrated in Figure 5.9 by classifying them into "stronger, strong, and slightly strong or slightly weak, weak and weaker" based on a Strong-Weak coefficient (see the note of Figure 5.7).

Figure 5.7 Self-diagnosis by the Existing Industries in Chittagong District (CTGD) excluding CEPZ enterprises



Source: Survey by the Study Team (SST)

Note: Strong-Weak Coefficient = $RR-S/ASEAN - RR-W/B$

RR-S/ASEAN: Rate responding "stronger than industry/enterprises in ASEAN countries"

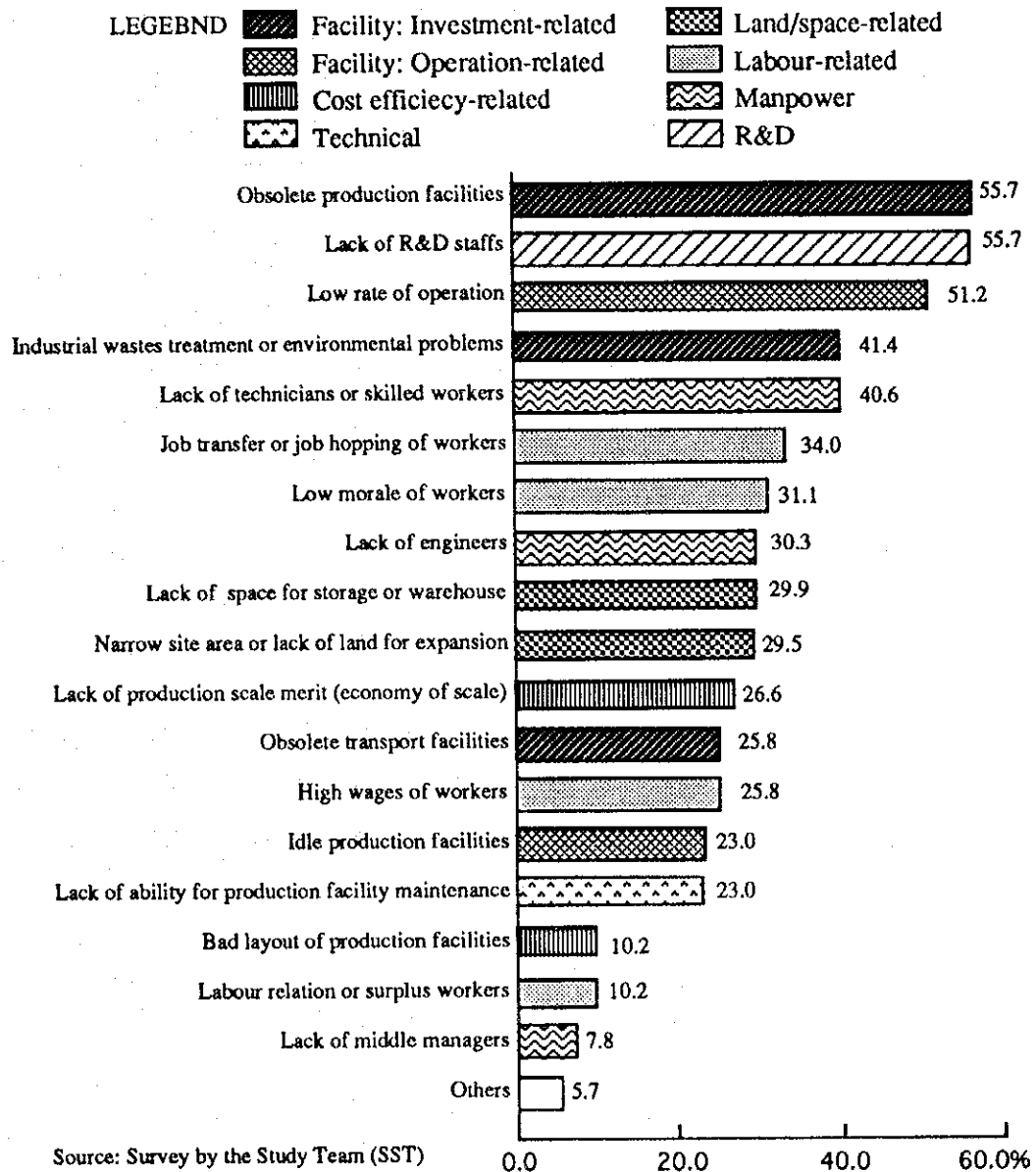
RR-W/B: Rate responding "stronger than other /enterprises in Bangladesh"

According to the said grading, the subsectors could be classified as follows:

- Overall strong: garments (except information for technology) transport equipment including ship breaking (except export power/channels),
- Overall and slightly strong: fish processing mainly comprising frozen shrimps,
- Relatively and slightly strong: other textiles than jute (except price, exporting power, information for technology, and capital raising).

In Conclusion, the subsectors in CTGD are confident about the quality, design and durability of their products on the whole. These elements are, in other words, "life line of producers". On the other hand, other subsectors than "strong industries" identified above are mostly aware of weakness in the price of their products, technology/skills, products development, marketing, information for technology and capital raising. In addition, export industries have many strong

Figure 5.8 The Most Critical Internal Problems of the Existing Industries in Chittagong District (CTGD) excluding CEPZ enterprises (choosing within 8 items among 19 items)



points as compared to the domestic market-oriented industries. Export industries heavily depending on imported raw materials like the garment industry are stronger than those such as jute textiles based on local raw materials or indigenous resources. Theoretically speaking, the latter should be stronger than the former. However, that the actual situation is reverse suggests that local raw materials or indigenous resources are relatively costly or of low quality.

Figure 5.9 Self-diagnosis by the Existing Subsectors in Chittagong District (CTGD) excluding CEPZ enterprises

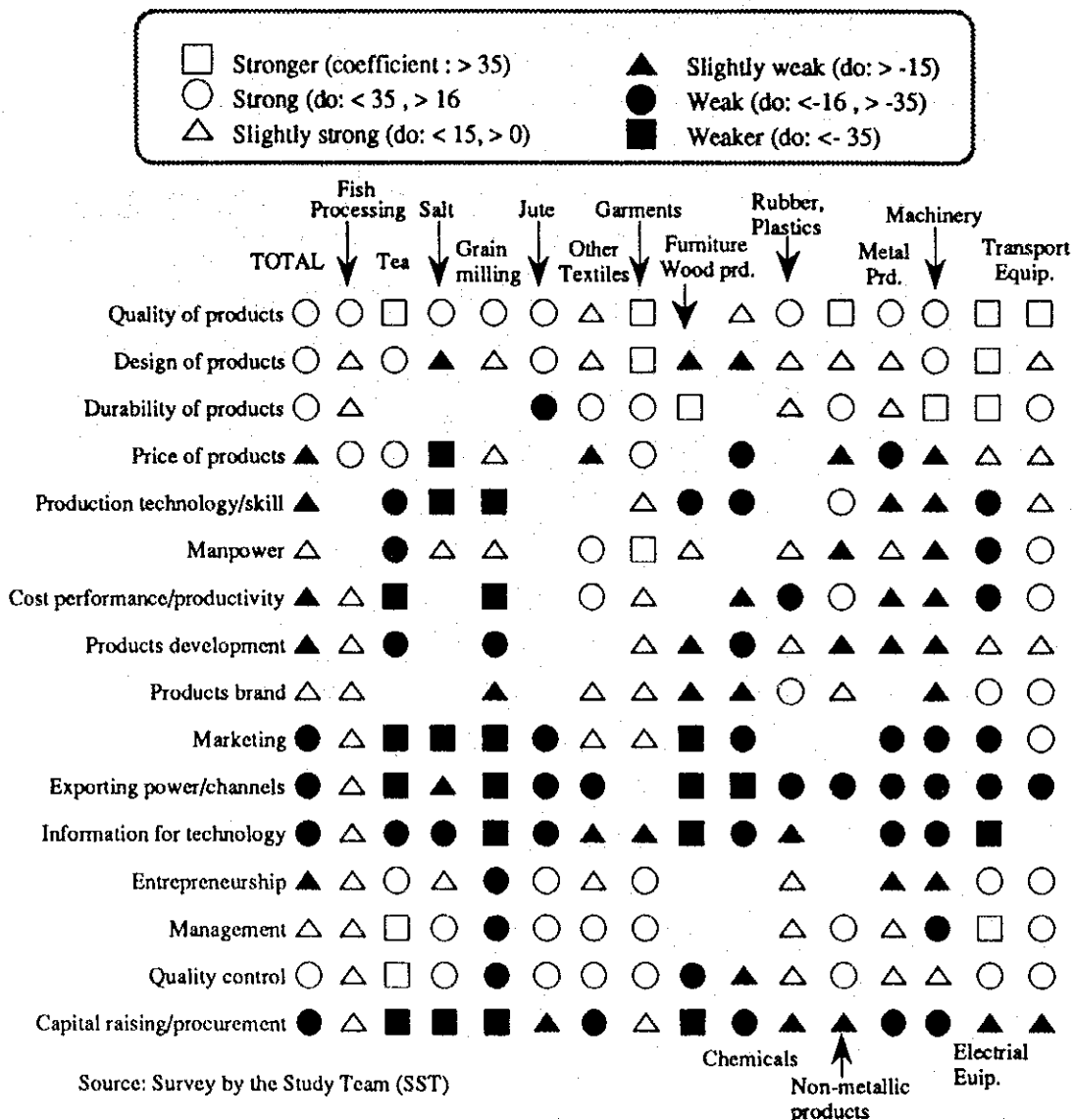
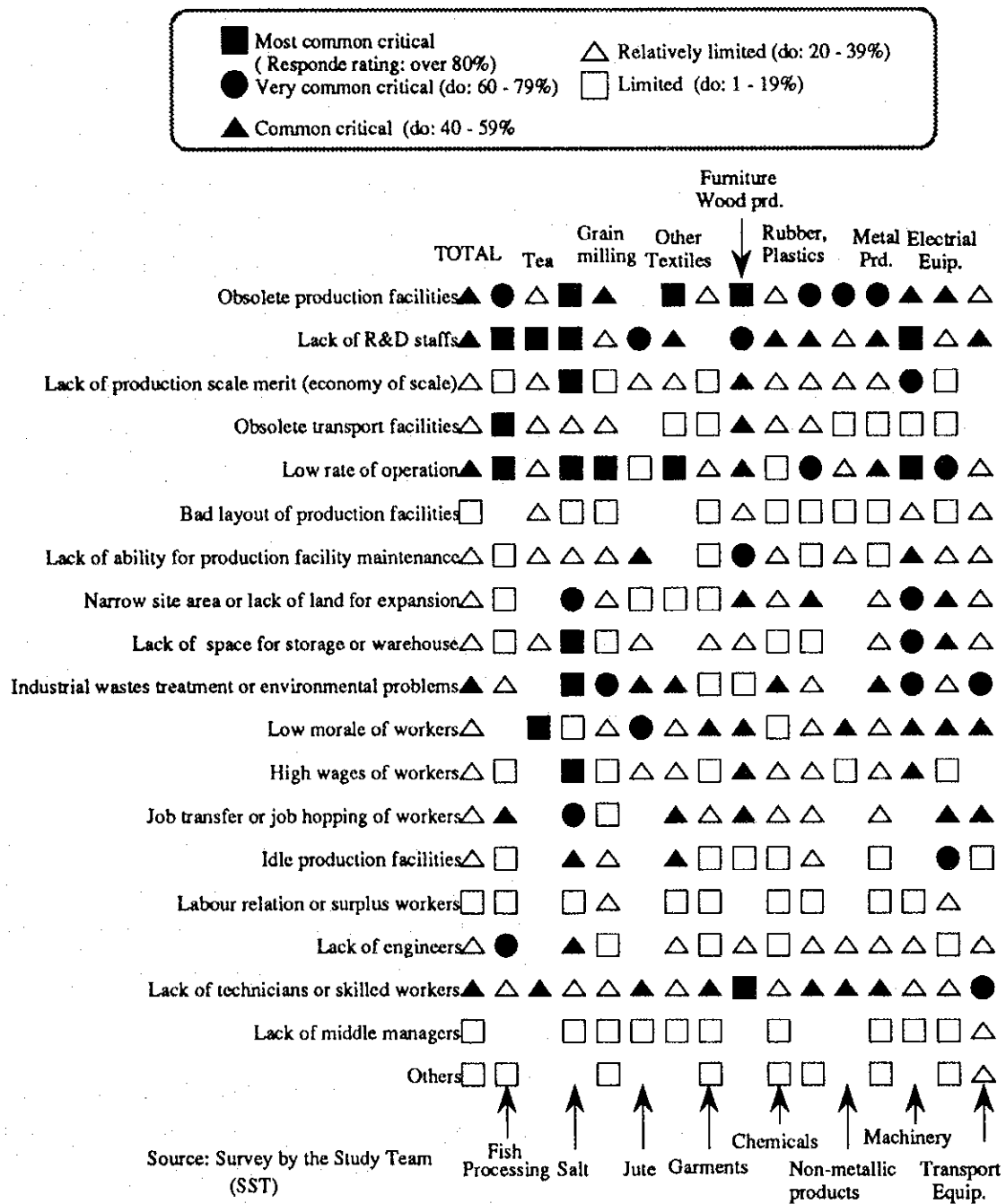


Figure 5.10 illustrates the most critical internal problems by subsector. Edible salt refinery has many critical problems, which are mostly common to the respondents to the Survey. These are obsolete production facilities, lack of R&D staff and production scale merit, low rate of operation, lack of space for storage, pollution problems (water) and high wage of workers. The salt refinery is heavily concentrated in the Double Mooring Thana. This locational condition seems to be closely related to such internal problems as those concerning space and wages.

Figure 5.10 The Most Critical Internal Problems of the Existing Subsectors in CTGD excluding CEPZ enterprises (choosing within 8 items among 19 items)



The general machinery has several internal problems mostly or very common to the respondents, namely lack of R&D staff and production scale merit, low rate of operation, narrow space or lack of land for expansion and pollution problems (noise and waste).

In the case of "strong subsectors" classified previously, low morale of workers and lack of technicians or skilled workers are critical internal problems common among garment producers. Pollution (water and noise) and lack of technicians or skilled workers are critical problems very common among the transport equipment producers. Obsolete production facilities and low rate of operation are critical problems mostly common among other textile producers than jute textile and fish processing firms. Obsolete transport facilities are also mostly common internal problems among fish processing firms.

On the whole, obsolete production facilities is a critical problem common to almost all of the subsectors. This may be partly due to the damages caused by the devastating cyclone and tidal wave of April 29-30, 1999. However, not all the factories were damaged. Domestic capital formation (DCF) in Bangladesh constitutes only just about 10% of the total national expenditure. This DCF ratio is absolutely low when compared to the more than 20% in the Philippines and more than 30% not only in Korea and Japan but also in Thailand, Malaysia, Singapore and Indonesia. There is no "growth" without "investments." A low investment level is the most crucial problem that Bangladesh will have to address and resolve.

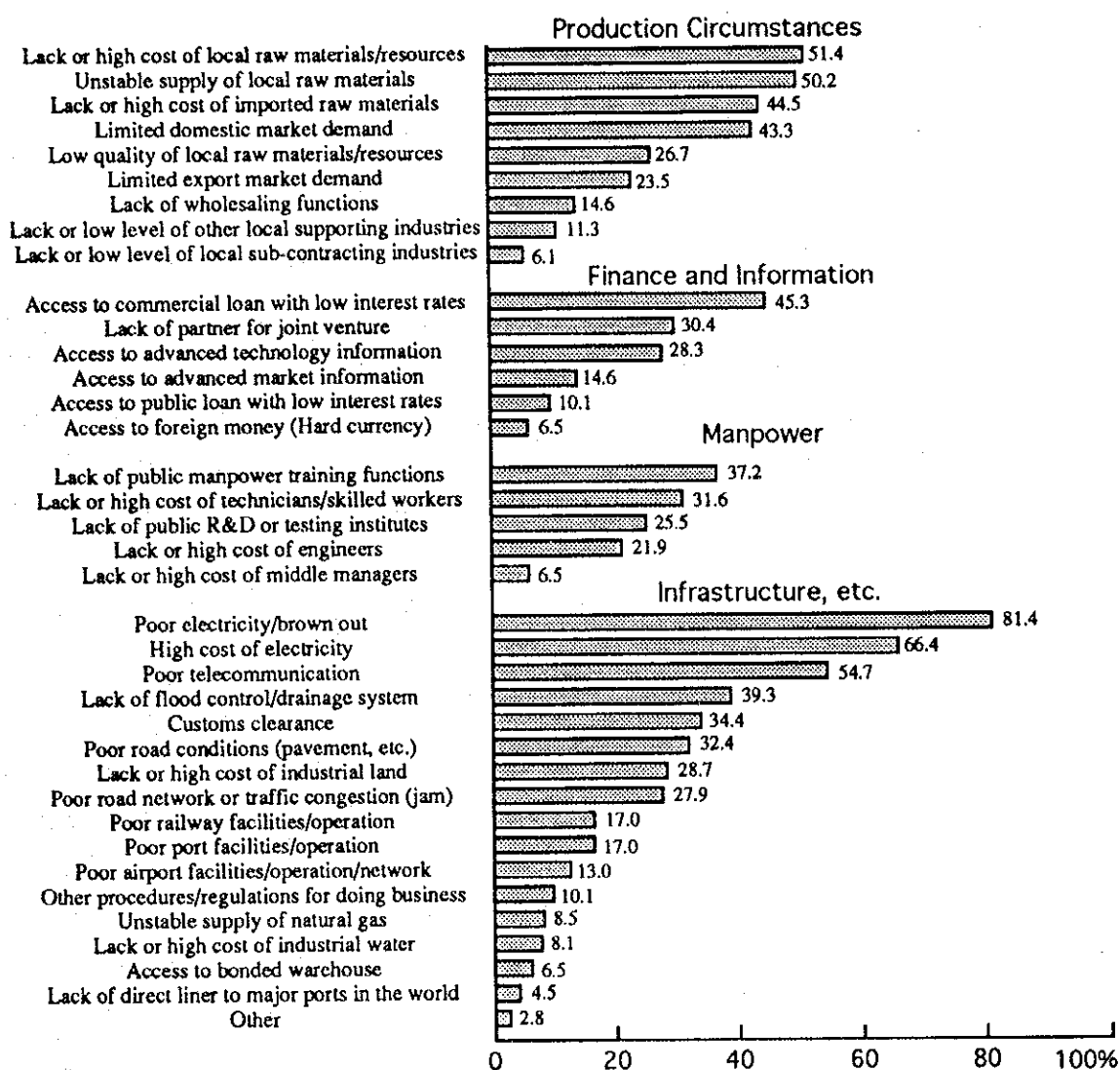
5.3.4 Extenal Constraints

In addition to the intenal problems, industries in the Chittagong District face external constraints management and production that are related to infrastructure such as electricity and telecommunication as shown in Figure5.11. Lack of flood control or drainage system is also one of the most critical constraints.

In terms of production circumstances, lack or high cost and unstable supply of local raw materials are the most critical external constraints common to the existing industries. Lack or high cost of imported raw materials and limited domestic market demand are also common. These constraints are negative factors for the competitiveness of the existing industries and obstacles to their further growth.

As to finance/information, hard access to commercial loans with low interest rate is a common critical constraint, while the constraint on access to public loan is limited among the existing industries. The interest rate of commercial loans is an ordinary 16% with collateral, against 5% for public loans, mostly funded by foreign aid. There are no loans without collateral and voluminous documents are required in Bangladesh. Concerning manpower, 37.2% of the total respondents regard lack of public training functions as the most critical external constraint.

Figure 5.11 The Most Critical External Constraints of the Existing Industries in CTGD excluding CEPZ enterprises (choosing within 10 items among 37 items)

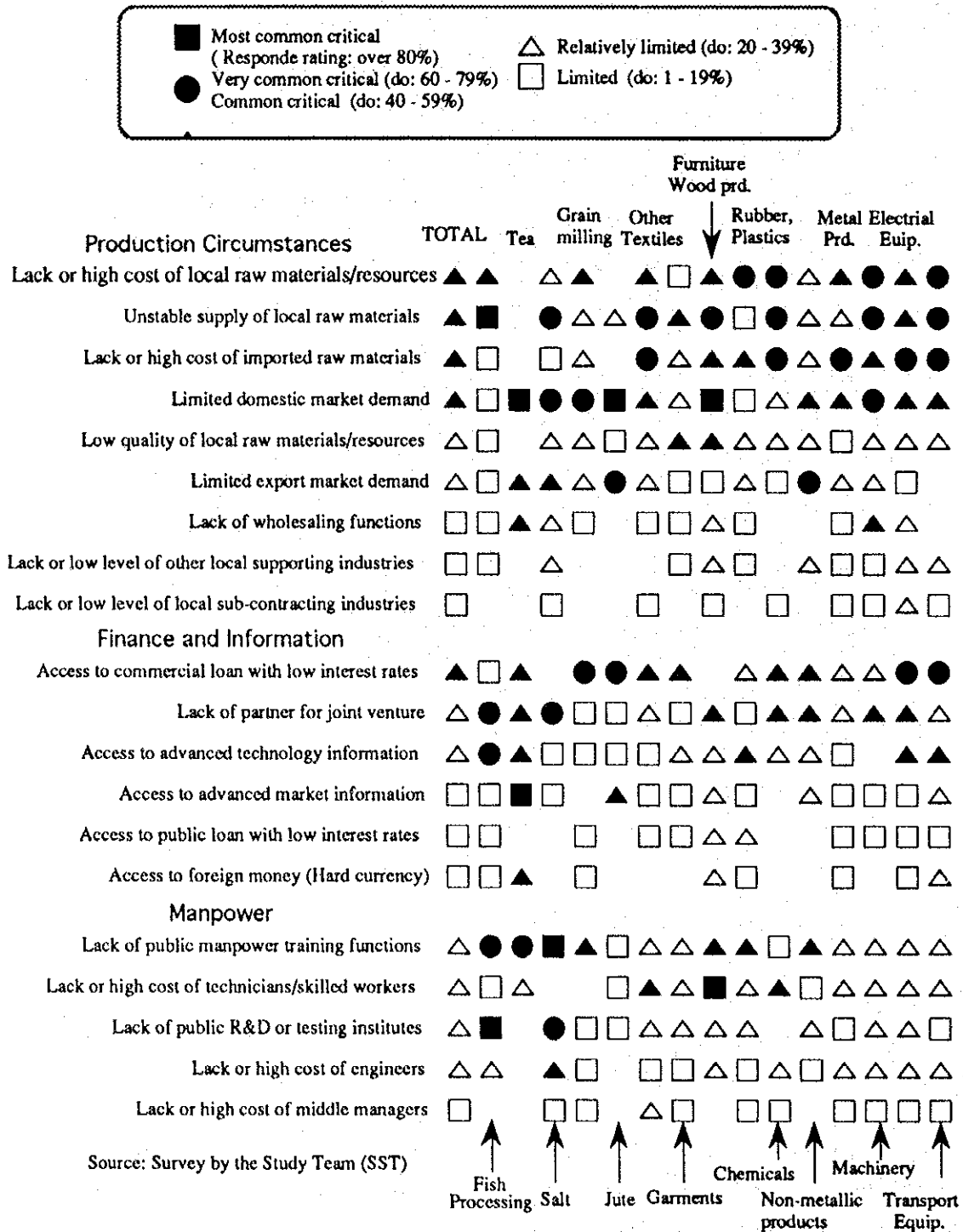


Source: Survey by the Study Team (SST)

Figure 5.12 shows external constraints by subsector excluding those on infrastructure that are generally not specific to the industrial sector, but originate from regional or locational factors.

Fish processing industry mainly comprising frozen shrimps is an export industry with overall and slightly strong competitiveness. However, it has critical internal problems such as lack of R&D staff, obsolete transport facilities, low rate of operation and so on. As to external constraints, unstable supply of local raw materials is a mostly common critical constraint to the

Figure 5.12 The Most Critical External Constraints of the Existing Subsectors in CTGD excluding CEPZ enterprises (choosing within 10 items among 37 items)



respondents to the Survey by the Study Team (SST). This means perhaps that capacity of shrimp hatchery and growing is smaller than the sharp demand increase or that shrimp aquaculture is sensitive to climate including cyclone and flood. Lack of public R&D or testing institute in CTGD is a mostly common critical constraint, reflecting that frozen shrimps and shrimp aquaculture are new and capital-intensive industries in Bangladesh and need technology development/upgrading specific to them.

Tea blending is one of the major and export industries in CTGD. Nowadays, it faces the critical constraint of limited domestic market demand, mainly due to the penetration of imported tea into the market. Hard access to advanced market information is also a critical constraint for marketing of tea. Edible salt refinery is one of the domestic market-oriented industries, but faces critical constraints such as limited domestic market demand and lack of partners for joint ventures. The demand for edible salt is steady but not expected to increase steeply. Lack of partners for joint ventures may reflect needs for modernisation of production facilities, since the existing facilities are mostly obsolete and small size without production scale merit.

Limited domestic market demand is also mostly or a very common constraint among grain milling mainly comprising flour milling and vegetable oil, jute textiles and wood products including furniture. The grain milling industry is forced to operate at a low rate. Replacement of jute textiles has proceeded rapidly by synthetic fibre and plastics. Limited domestic market demand on wood products roots in the fact that the income of the populace is low and that a major construction material is bricks in Bangladesh.

In case of garment industries, the most critical external constraints are not common to all but limited to a few establishments. This could be attributed to the fact that the industry is a typical export industry heavily dependent on imported raw materials and it has overall and strong competitiveness.

5.3.5 Conclusion

It is pointed out that there are many "system losses", which may be attributed to the socioeconomic system and natural conditions vulnerable to calamity, not only in the economy but also in the politics and governance of Bangladesh. However, Bangladesh is a young country with a 23 year experience since her independence and needs more accumulation of experience and more lessons from trial and error. In this context, external constraints and "system losses" will be mitigated through establishing an appropriate framework for economic activities led by an effective strategy and targeted towards the forthcoming 21th century.

