

A Situation Analysis Report on Environment (MDG 7)

Bangladesh

A Baseline for Needs Assessment and Costing



**General Economics Division, Planning Commission,
Government of the People's Republic of Bangladesh &
UNDP Bangladesh**



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Conducted by

**General Economics Division, Planning Commission,
Government of the People's Republic of Bangladesh &
UNDP Bangladesh**

This report is the situational assessment of the MDG 7 on Environment and has been prepared by Dr. Nepal C. Dey as Environment and Sustainable Development Specialist for the Project "Support to Monitoring PRS and MDGs in Bangladesh". The inferences from the study were utilized for the MDG Needs Assessment and Costing for Bangladesh through the Thematic Working Group (TWG) on Environment.

The MDG Needs Assessment and Costing (2009-2015) for Bangladesh contains the detailed situation analysis, the challenges, proposed interventions and costs for implementing the interventions to achieve the MDGs in Bangladesh.

Disclaimer

The analysis, findings & recommendations of this situation analysis report on the MDG 7 on Environment do not necessarily reflect the views of General Economics Division, Planning Commission and United Nations Development Programme, Bangladesh, rather with which the duly author is concerned.



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A B B R E V I A T I O N

ADB,	Asian Development Bank
AQMP,	Air Quality Monitoring Project
BBS,	Bangladesh Bureau of Statistics
BBS/Unicef,	Preliminary results of the Multiple Indicator Cluster Survey (MICS)
BBS,	The Bangladesh Demographic and Health Survey
BRTA,	Bangladesh Road Transport authority
BWDB,	Bangladesh water Development Board
BDHS,	Bangladesh Demographic and Health Survey
BIDS,	Bangladesh Institute of Development Studies
CFC11,	Trichlorofluorometehe
CUS,	Center for Urban Studies
HCFC-22,	Chlorodifluoromethene
CNG,	Compressed natural Gas
DPHE,	Department of Public Health
DOF,	Department of Forest
GoB,	Government of Bangladesh
LGED,	Local Government Engineering Department
LPUPAP,	Local Partnerships for Urban Poverty Alleviation Project
MDG,	Millennium Development Goal
MoEF,	Ministry of Environment and Forests
NGO,	Non-government organization
NPA,	National Plan of Action
NSP,	National Strategic Plan
OECD,	Organization for Economic Cooperation and Development
O3,	Ozone
ODS,	Ozone Depleting Substance
PPP,	Purchasing power parity
PRSP,	Poverty reduction strategy paper
SEDA,	Sustainable Energy Development Agency
SEP,	Sustainable Energy Programme
UNEP,	United Nations Environment Programme
UNICEF,	United Nations International Children Emergency Fund
UNDO,	United Nations Development Programme
VGf,	Vulnerable Group Feeding
WASA,	Water Supply Authority

GLOSSARY

Proportion of land area covered by forest: The proportion of land area covered by forest areas as a share of total land area, where land area is total surface area excepting water bodies' areas. Forest includes both natural forest and forest plantation.

Ratio of area protected to maintain biological diversity to surface area: The ratio of area protected to maintain biological diversity to surface area is defined as national protected area as a percentage of total surface area of the country.

Energy use (Kg oil equivalent) per \$1000 GDP (PPP): The Energy use (Kg oil equivalent) per \$1000 GDP (PPP) is commercial energy measured in units of oil equivalent per \$1000 of gross domestic product converted from national currencies using PPP conversion factor.

Carbon dioxide per capita emission: The carbon dioxide per capita emission is the total amount of carbon dioxide emitted by a country as a consequence of human activities divided by the population of the country.

Consumption of ozone depleting CFCs (ODP Tons): Consumption of ozone depleting CFCs is the sum of the consumption of the weighted tons of the individual substances in the group-metric tons of the individual substance.

Proportion of population using solid fuels: The proportion of population using solid fuels is the proportion of the population that relies on biomass (wood, charcoal, crop residues and dung) as the primary source of domestic energy for cooking and heating.

Proportion of population with sustainable access to improved water source: The proportion of population with sustainable access to improved water source is the percentage of the population who use any of the following types of water supply for drinking, piped water, public tap, borehole or pump, protected well, protected spring or rainwater. Improved water sources do not include vendor-provided water, bottled water, tanker trucks or unprotected wells and springs.

Proportion of population with sustainable access to improved sanitation: The Proportion of population with sustainable access to improved sanitation refers to the percentage of the population with access to facilitate that hygienically separate human excreta from human, animal and insect contact.

Proportion of population with access to secure tenure: The proportion of population with access to secure tenure is 1 minus the percentage of urban population that lives in slums. Lack of security of tenure is defined as the lack of formal documentation for the residence or perceived risk of eviction.

Jhupri: Jhupri structures are those structures made of temporary materials like; jute stalk, sack, leaves of trees etc.

Kutcha: Kutcha structures are those structures made of bamboo, wood, straw, sun hemp and other semi-durable materials like CI sheet, etc.

Semipucca: Semi-pucca structures are those structures where the wall and floor are made of brick and cement and the roof is made of CI sheet, tiles etc.

Slum: A slum is a contiguous settlement where the inhabitants are characterised as having inadequate housing and basic services. A slum is often not recognized and addressed by the public authorities as an integral or equal part of the city.

Secure tenure is the right of all individuals and groups to effective protection by the state against unlawful evictions;

A slum household is a group of individuals living under the same roof that are lacking in at least one of the components of access to sanitation, access to safe water, secure tenure, durability of housing and sufficient living area (UN Habitat, 2003).

Pucca: The pucca structures are those structures where both wall and roof are made of cement and brick

MDG 7

STATUS AT A GALANCE

GOAL	TARGET	INDICATORS	Base year 1990-95	2006	Target 2015	Status of progress	
GOAL 7 ENSURE ENVIRONMENTAL SUSTAINABILITY	Target 9 Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.	Proportion of land area covered by forest	9	11.32	20	Needs Attention	
		Proportion of protected area to surface area to maintain biological diversity	1.6	1.83	5.0	Needs Attention	
		Carbon dioxide emissions (metric tons per capita)	0.14	0.3	-	On track	
		Consumption of ozone depleting CFCs	280.6	195.5	-	On track	
		Energy use (kilogram oil equivalent) per USD1000 GDP (PPP)	123.1	92.0	-	Needs attention	
		Proportion of population using solid fuels	88.7	86.8	-	Needs attention	
	Target 10 Halve, by 2015, the proportion of people with sustainable access to safe drinking water and basic sanitation	Proportion of the population with sustainable access to an improved water source	rural	78.0	77	100	On track
			urban	76.0	71	100	On track
		Proportion of the population with sustainable access to sanitary latrines	rural	15.3	81.5	100	On track
			urban	61.2	80	100	On track
	Target 11 By 2020, have achieved a significant improvement in the lives of at least 100 million slum dwellers	Proportion of households with access to secure tenure	31.18	36.4	39.74	(Needs attention)	

1.1 Background of the study

Bangladesh is one of the signatories among 189 countries in the world to the Millennium Declaration (2000). As a part of that agreement, Bangladesh is working towards achieving the Millennium Development Goals (MDGs). MDGs were selected as a set of quantifiable and time-bound goals for reducing poverty, ensuring environmental sustainability and for significantly improving the human condition by 2015. MDGs offer a unique opportunity to guide development planning, resource allocation, and higher resource mobilization in low income developing countries like Bangladesh. They enable all actors in the development process to shift from asking “how well can Bangladesh do with respect to the MDGs with its given constraints?” to asking the question “in order to achieve the MDGs, what DOEs Bangladesh need to do.

Ensure environmental sustainability is one of those development goals committing her to a set of internationally agreed development targets. A number of serious environmental problems such as resource depletion, ecological degradation, indoor and urban air pollution, waste disposal and vulnerability to natural disasters threaten the lives of many people in Bangladesh today. The viability of Bangladesh's economy has been in question since its birth, because of its high population density, vulnerability of natural disasters, and high dependence on few agricultural commodities. For this reason, environmental degradation is imposing a heavy burden on Bangladesh. Energy is also an important component for enabling the maximum benefits to the community that act as a key factor in development and is one of the main indicators for modernisation of society and appear to be vital factors in achieving sustainable development

This analysis report is prepared to assess country's development record regarding MDG 7 since 1990 to present situations and trends for achieving the targets by 2015. These environmental situations were analyzed in different period of times and linked to government policies and programs for verifying the status of progress of environmental and sustainable development. It will also provide background information on the environmental constraints, needs and opportunities in Bangladesh. The situation analysis report will mostly used to identify the casual factors for improving or degrading the environmental issues and explore the scope of interventions to meet the challenges and options for achieving the targets by 2015.

1.2 Objectives of the Study

The broad objective of the Analysis Report is to elaborate analysis of the development records, strategic plan and challenges to the MDG 7. The specific objectives of the analysis report are as follows:

- Take stock of the country's development record on MDG 7 from 1990 to present.
- Analyze the existing policy frameworks and strategies that contribute to the MDG 7;
- Identify the major challenges for the government/s to attaining of the MDG 7

1.3 Organization of the Report

This present chapter is followed by chapter 2 which discusses the methodology adopted in this report. Chapter 3 explains the baseline to the present situation and achievement, and government's policies implication on environment, energy and water supply & sanitation and slum dwellers livelihoods of Bangladesh. Conclusion and bibliography are added at the end of the report.

Chapter 2

METHODOLOGY

2.1 Data Sources

This analysis report is prepared based on data collected from several survey reports of the government of Bangladesh. Data, relevant reports, departmental publications were collected from the Department of Environment, Department of Forest, Forest Department, Department of Public Health Engineering (DPHE), Local Government Engineering Department, Bangladesh Power Development Board (BPDB), Bangladesh Demographic and Health Survey (BDHS), Bangladesh Bureau of Statistics (BBS), Multiple Indicator Cluster Survey (MICS) conducted by UNICEF and BBS, Bangladesh Water Development Board (BWDB), BUET, and concerned UNDP. The policy documents such PRSP-I, IPRSP and draft PRSP-II, different reports published from GED, Planning Commission have been consulted.

2.2 Methodology and Assumptions

The methodological approach adopted in this report is roughly as follows. Growth rate is estimated by a linear equation, $r = (P_1 - P_0) / P_0 \times t$, where, P_0 is initial value, P_1 is final value, t is the duration (year). For projecting the time-path of the different MD outcomes to 2015, linear and sometimes logarithmic equations are followed. Missing data are estimated by regression equation based on available data collected from different sources. Target values of some indicators are not set and in that case new target is set based on projection value from the regression equation.

2.3 Limitations

By its very nature, any empirical analysis is predicated on assumptions about data quality and measurement, inferences of causality between variables, and potential biases of statistical and econometric estimates. The analysis presented in this report is not immune to these same concerns. It is therefore important to note that the results and simulations presented in this report may give an impression of precision. They should be treated as indicative of possible broad trends, and could usefully be complemented with other analyses using different methodological approaches.

Finally, it is important to note an important limitation of the simulations performed in this report. The simulations are based on statistical analysis. By its very nature, such analysis tends to over-emphasize readily-measurable variables, such as access to infrastructure, consumption, and under-emphasize qualitative variables.

Chapter 3

MDG 7

ENSURE ENVIRONMENTAL SUSTAINABILITY

Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources

Environment

Bangladesh is set to achieve the seventh MDG of ensuring environmental sustainability even though natural calamity is common phenomenon of this country. Reducing poverty and fostering human development are fundamental prerequisites for achieving sustainable development. Bangladesh has a diverse wealth of natural resources. But high population density is threatening its rich natural heritage through the expansion and intensification of agriculture and destruction of natural habitats and ill planned urbanization.

9.1 Forest Cover

The role of forest is not only for maintaining the ecological balance but also plays an important role in our national economy through creation of employment opportunity, support for subsistence and socio-economic up-lift of rural poor. Poverty reduction through social forestry is now success story within Forestry Sector of Bangladesh. About 0.335 millions rural poor are now engaged directly to the participatory co-management approach in the social forestry program. This sector is contributing 5% of the nation's GDP, which is significant in highlighting the real importance of the sector. Notwithstanding this sector is the major source of energy, furniture, construction materials etc. and plays a vital role of protecting extreme climatic events.

According to the MDGs Progress report, 2007 and FAO studies only 13 percent of the country has actual forest coverage. However, National Forest and Tree Resources Assessment, 2007 claims that the forest area is 10 percent of the total area. The growth rate (**GR**) of forest cover was 1.3 percent during 1995-2005 and 16 percent during 2005-2007 (**Fig. 3.1**). The extraordinary achievement was seen during 2005-2007. This might be happened due to well implementation of government policy and programmes.

To achieve the target by using GR (a) of 1.3, it will be required 74 years from 2005. Similarly the achieving time would be 17 years if overall **GR** ($c=0.42$) is maintained (**Table 3.1**). Since 1966 to till today, about 0.153 million hectares of land has been established for coastal afforestation along the coast as a part of protecting lives and properties form tidal surge and tropical cyclones. During 1995-2002, Department of Forest (DOF) has established 1394 km of embankment plantation, 7540 km of roadside plantation, 665 hectares foreshore plantation and 28.9 million seedlings raised for creation of greenbelt in the coastal districts of Bangladesh. By 2015, Bangladesh aims to have 20 percent of forest cover to achieve millennium development goals.

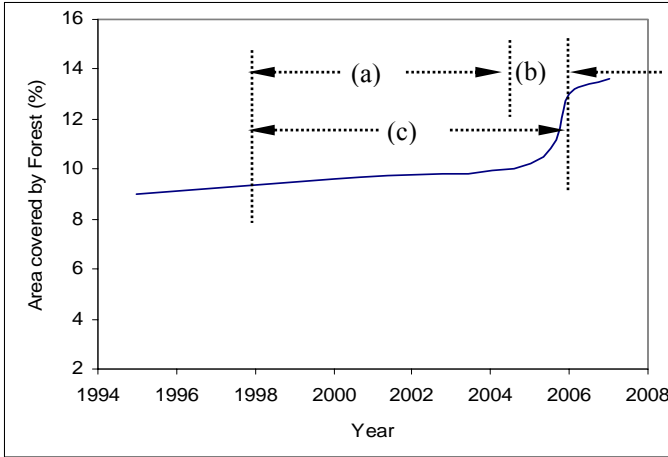


Figure 3. 1. Proportion of land area covered by Forest

Segment of the curve	Growth Rate	Target 2015	When to achieve? (Year)
(a)	0.013	20	71

Table 3.1: Tentative time of achieving the target

Data table

Year	1995	2000	2005	2006	2007
% cover	9	9.6	10.2	13	13.61

Degradation of Forest

Forests were declining at a rate of nearly 70,000 hectares per year and Bangladesh has less than 0.02 hectares of forest land per person, one of the lowest forest-man ratios in the world. In the 1990, degradation rate was 37700 ha per year and it became nearly double in 2006/7. The depletion rate (DR) was 0.029 during 1990-2006/7 (Fig. 3.2).

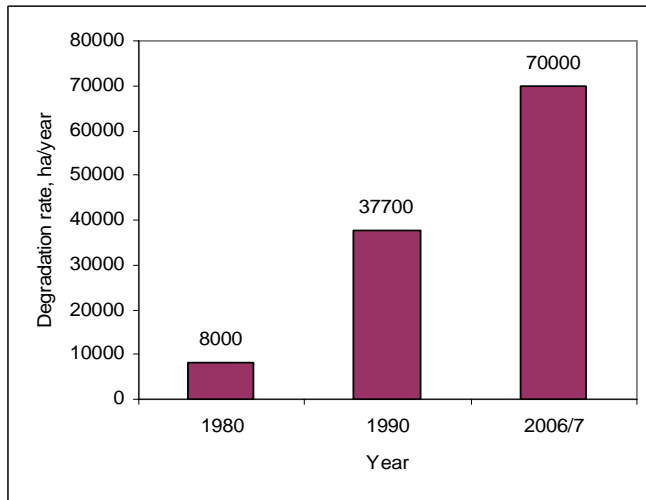


Fig 3.2. Forest degradation rate

Actual forest Growth

Therefore, the actual forest growth (AFG) can be estimated from the relation (AFG=Growth Rate of Forest –Depletion Rate of Forest) and the value was 0.013.

Forest Policy and Sustainable Forest Management

Current forest policy formulated in 1994 has been considered to be the most elaborate policy in the history of the country. Under this policy, participatory social forestry has been institutionalized in Bangladesh.

The analysis shows that, it is uncertain to attain the MDGs targets, progress is slow and is blocked on several fronts. A number of identified technical, managerial and logistical problems are hindering policy and program implementation. In addition, corruption contributes to the observed problems.

The real strength of Bangladesh forestry is locally based, participatory forestry, co-management of protected areas and highly motivated people who increasingly recognize the need for a healthy forest ecosystem that will provide future economic stability. Because it is the rich homestead forests of Bangladesh that generate the majority of commercial forestry products, it is important that education continues at the grass-roots level. In addition, educated forestry and environment professionals have been identified as the future driving forces towards better, and sustainable, forest management.

Key Challenges and Actions

For further improving the situation several future challenges are identified. PRSP I and Draft PRSP II, 2008 has also identified the following issues:

The problems in Bangladesh Forestry are many folds and intricate with various other sectors.

- Consumption of wood for fuel has contributed to deforestation and other environmental problems in Bangladesh.
- Per capita forestland in Bangladesh has shrunk from 0.035 hectares in 1980 to around 0.022 in 1990. The annual deforestation rate in South Asia is 0.6% and it is 3.0% for Bangladesh. Available information suggests that currently only 10% of the 1,20,000 hectare sal forest in Dhaka, Rangpur, Mymensingh, Tangail, Dinajpur and Rajshahi districts carries a tree cover of Sal. In Tangail District alone the sal forest has shrunk to 1,000 hectare in 1990 from 20,000 in 1970 (ADB, 2004).
- Land degradation in the form of soil erosion is mostly human induced and is more serious in Chittagong and Chittagong Hill Tracts (CHT). Deforestation and destruction of natural reserves in the CHT was further intensified by development activities such as dam, highway, road construction and other infrastructure development.

The major causes of forest depletion in Bangladesh may be enumerated as under:

- Lack of proper monitoring
- Lack of accountability and corruption
- Absence of people's participation
- Absence of NGOs' involvement
- Inadequate legal backup
- Lack of law and order
- Poor administration
- Absence of incentives of the Forest Department employees
- Low priority attached by the Government towards forests, forestry and the FD

Increased salinity due to reduced fresh water flow in the downstream regions, increasing spillage/discharge of fuel oils and lubricants from ships and industrial chemicals polluting the mangroves waters might have led to top-dying of several species of trees in the Sundarban. Already 40% of the Sundarban forest is affected by top dying, which is killing the famous Sundri tree from the top down wards.

Actions

For halting the **degradation of forests and loss of forest lands**, general the future investments in forestry sector should look into the following aspects as crosscutting issues of environment, under the mainstream funding:

- Forestry sector activities should be participatory so that it is pro-poor and help in poverty alleviation.
- Nursery raising may be completely be switched over to "Buy Back System" and NGOs may be involved.
- Monoculture should not be allowed in any afforestation program.
- Large scale clear felling should never be allowed in any forestry management activity.
- Planting of exotic species in any of the PAs (protected area) should not be allowed.

- Planting of exotic species in places other than PAs should be limited and scientifically weighted and balanced.
- Conservation of ecosystems should get higher weight ages in formulating forest management prescriptions for government owned forest tracts.
- Watershed management aspects need to get adequate weight ages in forest management.
- Eco-tourism should be encouraged under a local people participation arrangement so as to assist poverty alleviation and combat adverse affects of eco-tourism, such as pollution, loss of flora and/or fauna etc.
- The Park Service Department should be created and all the protected areas (Pas) should be placed under that for scientific management.

9.2 Protected area for biological diversity

Protected areas play an important role for conservation and protection of natural and cultural resources. The unique and biological fitness of protected areas provide economic, recreational, educational, scientific and spiritual benefits to man and serve as the gene bank of the more important flora and fauna. There are **20** Protected Areas in Bangladesh covering an area of **2441.75** sq. km which is **12.7%** of the total forests areas of the country (**DOF, 2008**) and about **2 percent** (Table 3.2) of the country. Estimates from indicate that the protected area under national parks and wildlife sanctuaries increased over the years. It was only 1.64 percent of the total land area over 1990-95 and increased to 1.73 in 2000 and further increased to 1.83 in 2005. In 2007 it raised to 1.84 percent (**Table 3. 2**). The areas have been demarcated as biological corridors which connect the wildlife sanctuaries, national parks, game reserve to allow the free and uninhibited movement of animals and birds within the natural range. A total 19 are notified under the Bangladesh wildlife (preservation) order 1973 except Hazarikhil Wildlife Sanctuaries. The biggest Protected Area in Bangladesh is the Sundarbans West Wildlife Sanctuary with an area of **71502.103** hectares and the smallest Protected Area is the Ramsagar National Park with an area of **27.76** hectares. The protected area harbors around **500** species of wild vascular plants and around **840** species of wild animals. These flora and fauna are vital ingredients to the people's existence and important components of ecological balance

Table 3. 2. Ratio of protected area to surface area for maintaining biological diversity

Year	1990-95	2000	2005	2006	2007	Target 2015	Predicted 2015
Protected Area (%)	1.64	1.73	1.83	1.835	1.843	?	2.3

Total land area: 14757000 ha

Source: Compendium of Environment Statistics of Bangladesh, BBS, 2005

*Forest Department, 2008

<http://www.infoplease.com/ipa/A0107317.html>

Ecologically Critical Areas

Government of Bangladesh has recently declared **8** areas as Ecologically Critical Area (ECA) under environmental conservation act, 1995 (Table 3.3).

Table 3.3. List of Ecologically Critical Areas (ECAs) in Bangladesh

Serial No	ECAs	District/s	Total area in Hectares
1	The Sundarbans	Bagerhat, Khulna, Satkhira	7,62,034
2	Cox's Bazar (Teknaf, Sea beach)	Cox's Bazar	10,465
3	St. Martin Island	Cox's Bazar	590
4	Sonadia Island	Cox's Bazar	4,916
5	Hakaluki Haor	Maulavi Bazar	18,383
6	Tanguar Haor	Sunamganj	9,727
7	Marjat Baor	Jhinaidha	200
8	Gulshan-Banani-Baridhara Lake	Dhaka	-

The ECAs are Cox's Bazar Teknaf Sea Beach, Saint Martin's Island, Sonadia Island, Hakaluki Haor, Tanguar Haor and Marjat Baor. St Martin's Island is one of the few areas in the world where coral-algal communities dominate rocky reefs that supports significant breeding areas for globally threatened marine turtle species and serving as a stepping stone for several globally threatened migratory waders. In the recent times, national and international tourists are increasing rapidly in the Saint Martin Island tourists. With the increasing tourist local inhabitants with migratory labors including Rohingya refugees are increasingly destroying the island's environment to sustain their daily needs, especially endangered green turtles and Olive Ridley turtles are reached such an extent that they are no longer come to the island to lay their eggs. It is one of the major indicators of the health of sea, are not getting the suitable environment for laying eggs.

The number of species, especially the flora and invertebrates, of Bangladesh not yet counted exactly for certain. Khan (2001) reported that Chittagong zone alone possess over 2,259 species of flowering plants. Hassan (2003) stated that there are over 700 species of flowering plants, 500 species of medicinal plants, 300 species of mangrove and mangrove associate plants and 300 species of wetland plants in Bangladesh. The fauna, especially the wildlife includes 125 species of mammals, 750 species of birds, 500 species of fishes, 125 species of reptiles and 9 species of amphibian.

Bangladesh has lost about 10% of its mammalian fauna, 3% avifauna and 4% reptile during the last 100 years. IUCN Bangladesh has identified 201 species of wildlife in the country are threatened under different degree of extinction risk (**Table 3.4 and Table 3.5**). Loss of species is mostly coupled with loss of habitat. For most of these endangered species the forest and wetlands are the last refuge. Forest cover, is also under constant threat. Forests are increasingly being degraded and denuded by encroachment and faulty management practices. Wetlands are in worse condition compared to that of forests. Wetlands are being converted into agricultural land and substantially degraded through the so-called development activities.

In recent years, Bangladesh has demonstrated increased determination and commitment to address the challenges of ensuring sustainable use and conservation of its natural resources, including its biodiversity. The objective of these activities is to develop a National Biodiversity Action Plan which fulfils Bangladesh's international commitments under the Convention on Biological Diversity (CBD), while also reflecting national priorities and the country's unique cultural, historical and geographical setting. A number of specific policies, laws, action plans and strategies have been developed in this regard. A major current challenge is to ensure the effective implementation of the 1995 Environmental Conservation Act, which provides the Department of Environment (DOE) with broad powers for the conservation of sites that it determines to be Ecologically Critical Areas (ECA's). In the context of implementing this project, DOE has taken the crucial step of nominating the first six ECA's, all within the country's highly significant coastal, marine and freshwater wetland ecosystems. The overall objective of the present project is to

establish and demonstrate an innovative system for management of ECA's in Bangladesh that will have a significant and positive impact on the long-term viability of the country's important biodiversity resource.

Table 3.4. Status of inland and resident vertebrates of Bangladesh (IUCN, 2000a)

Group	Total no. of living species	Extinct	Threatened			Total	Data deficient (DD)	Not threatened (NO)
			Critically endangered (CR)	Endangered (EN)	Vulnerable (VU)			
Fishes (freshwater & brackish water)	226	0	12	28	14	54	66	146
Amphibians	22	0	0	3	5	8	7	7
Reptiles	109	1	12	24	22	58	39	12
Birds	388	2	19	18	4	40	53	17
Mammals	110	10	21	13	6	40	53	17
Total	895	13	64	86	51	201	323	371

Table 3.5. Status marine and migratory vertebrates of Bangladesh (IUCN, 2000a)

Group	Total no. of living species	Extinct	Threatened			Total	Lower Risk (LR)	Data deficient (DD)	Not threatened other than CR, En, VU, LR and DD
			Critically endangered (CR)	Endangered (EN)	Vulnerable (VU)				
Fishes (marine)	442	0	0	0	1	3	0	438	
Reptiles (marine)	17	0	1	4	0	5	0	12	
Birds (migratory)	240	0	0	2	4	6	6	224	
Mammals (marine)	3	0	0	2	1	3	0	0	
Total	702	0	1	9	8	18	6	674	

9.3 Carbon dioxide per capita emission

Carbon dioxide (CO₂) is one of the most important compounds in the atmosphere. Natural emission of CO₂ from living animals, humans, wetlands, volcanoes, and other sources is nearly balanced by the same amount being removed from the atmosphere by plant photosynthesis and by the oceans. Human activity, on the other hand, is disturbing this equilibrium by generating increased CO₂ from fossil fuels (i.e. coal, gas, and petroleum products; and combustion via electricity generation, transportation, industry, and domestic use). The results of these imbalances are believed to be greenhouse effects: global warming, melting of polar ice sheets and caps, a rise in sea levels and subsequent coastal inundations, and damage to agriculture and natural ecosystems, among others. Therefore, it is important to study CO₂ emission from human activity in a developing country such as Bangladesh, which is highly vulnerable to its adverse effects. Model predictions suggest that a doubling of atmospheric CO₂ concentration would increase global temperature by 2-4 degrees C.

The main source of CO₂ emission in Bangladesh is the combustion of fossil fuels which contributed more than 40 percent CO₂ in the air. Emission of CO₂ was increased about 25 percent during 1990-95. It was 0.141 Mt in 1990 and increased about 20 percent in 2000 and it became double (0.30 Mt) in 2007 (**Fig. 3. 3**). The net effect of CO₂ gas emission was reduced to 11 percent by the cooling effect of aerosols during 1992-2002. However, the emissions became double in 2007 which was nearly same as the per capita emission of CO₂ from a semi industrialized country like **India**. As there is no specific target for this emission, the predicted target can be set based on the growth rate which would be 0.36. It will be required 23 years to achieve the target of 0.36 (**Table 3. 6**). Though contribution of CO₂ to air pollution of this country is low, however, the current trend depicts that CO₂ emission is increasing day by day. The present situation could be managed indirectly but per capita forest coverage is lowest in our country in the world and needed to think about it. Some studies explain that air pollution level in Dhaka varies from locations to locations. Carbon dioxide emission is highest in Dhaka city due to large number of vehicles and most of the industry occupied Dhaka. The busiest road intersections in Dhaka like, Farmgate, Kawranbazar, Mohakhali, Shantinagar and Jatrabari have the highest level of particulate matters in the air. In some cases, it is 2 to 3 times higher than the maximum allowable level in the dry season.

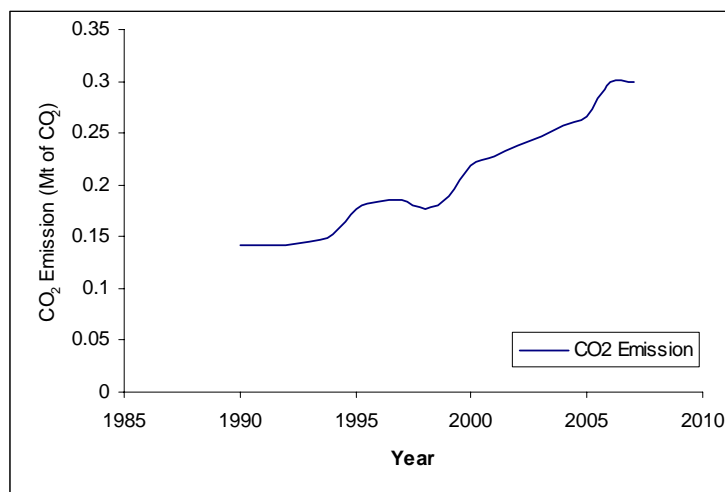


Figure 3. 3. Carbon dioxide per capita emission

Growth rate	Target	Predicted Targets	When to achieve? (Year)
		2015	

Table 3.6: Present growth rate of CO₂ emission and future prediction

Data table: Carbon dioxide per capita emission

CO ₂ emission	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2005	2006	2007
	0.141	0.141	0.141	0.145	0.153	0.177	0.183	0.186	0.177	0.189	0.218	0.27	0.3	0.31

Challenges

Air pollution

Air pollution is more acute in urban areas than in rural areas. Polluted air is harmful for human health depending on the nature of the pollutant, concentration, duration of exposure and the state of health and age group of the recipient. Polluted air causes respiratory problem, asthma, bronchitis, headache and dizziness, nasal congestion, renal damage etc. Lead pollution has harmful affect on children that is 3 times more at risk than adults. Apart from impact on human health, air pollution has detrimental impact on the ecosystem, vegetation and livestock. In urban area, the main sources of air pollution are emission of harmful gaseous matters from vehicle, industrial sectors, and construction and open dumping of garbage. In rural area, main sources are brick kilns and wood and biomass consumption. Due to rapid urbanization the total number of vehicles has increased rapidly. The automobiles on the road are often very old, overloaded and poorly maintained and emit smoke far exceeding the prescribed limit. Industrial development is another major source of air pollution. Most of the industries in Bangladesh are situated in major urban areas. Food industry emits maximum amount of pollutants followed by cement, pulp and paper industry and textile. Among food industry, most of the pollutants come from the sugar mills. **Table 3.7** shows the top 5 industry that pollute the air most.

Table 3.7. Top five polluters that causes air pollution (Islam, et. al., 2001)

Rank	Industrial sector	Emission (tons/Year)	% Contribution	Cumulative Percent
1	Food industry	146356.06	38.7%	38.7%
2	Cement/clay	62725.88	16.6%	55.3%
3	Pulp and Paper	51963.92	13.7%	69.0%
4	Textile	39831.01	10.5%	79.5%
5	Tobacco	16992.22	4.5%	84.0%

Bad traffic management causes drivers to use horns when it is usually not required. Such management failures include non-compliance of rules related to pedestrian crossings, non-enforcement of lane disciplines and unawareness of the drivers. It has been observed that a large portion of drivers of smaller vehicles (like three wheelers) is becoming deaf due to high level of noise pollution. This will become a public safety concern in near future for travelers.

The direct costs related to hospitalization and medicine will tremendously increase in the coming years if higher level of air pollution is not reduced in Dhaka and also in other urban locations. The cost of air pollution to the nation will exceed few billions if we take account other indirect costs like loss of life and loss of workdays.

Two-stroke engines and old vehicles, which are very inefficient in burning fuel, are the major source of such high air pollution level in Dhaka. At the same time, plying of motorized and non-motorized vehicles (like rickshaws) on the same road together with bad traffic management often multiplies the level of pollution.

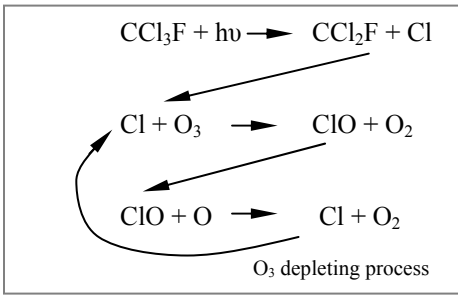
A continuous monitoring is necessary to evaluate air quality and for the development plan to mitigate the health risk from air pollution. DOE has set up 4 monitoring station at four divisional towns namely, Dhaka, Khulna, Chittagong and Bogra. More stringent enforcement to reduce air pollution is required.

9.4 Ozone depleting CFCs

Without ozone, every living thing on earth would be incinerated. Approx. 90% of the ozone is found in stratosphere where the peak conc. is 300 ppb. A steady decline of about 4% of the total amount per decade is found in stratosphere. The presence of ozone in stratosphere provides a barrier to UV radiation. Too much exposure to UV rays causes skin cancer and suppresses immune systems

Ozone Destruction:

- ❖ CFC used as aerosol propellants and refrigerants reacts with ozone.
- ❖ Chlorine atom removes ozone from the system and is continually recycled to convert more ozone to oxygen
- ❖ 5% reduction in ozone could result in 10% increase in skin cancer. Here, $h\nu$ =light energy; (ν =freq. of light, h =Plank’s constant, 6.626×10^{-34} J/Hz)



The consumption pattern of ozone depleting substances, CFC's, is presented in **Fig. 3. 4**. The major Ozone Depleting Substances, such as CFC-11, CFC-12 and CFC-115 dropped from 280.68 metric tons in 1995 to 182.45 metric tons in 2007. On the other hand the use of low ozone depleting substances yet not controlled under Montreal Protocol. HCFC-22 increased from 37.81 metric ton to 376. During this period the highest consumption (867.05 MT) of CFCs was recorded in 1997 which was reduced to 327.0 Mt ODS use in 2002. Consumption reduced sharply during 2000-2002 due to the implementation of ACI project. The highest value appeared due to the more consumption in the aerosol sector.

However, implementation of ‘CFC Free Technology Transfer’ project (1998-2002) by ACI Ltd reduced the highest limit consumption in the aerosol sector and reduced about 50percent consumption of CFCs (**Fig. 3. 4**).

Bangladesh took a good number of country policies and programme to protect ozone layer at national and international level since 1994. In 2005, country programme was updated with the financial support of multilateral fund (MLF) under Montreal Protocol. A national ODS phase out plan was finalized in 2004 to reduce 85% of the ODS use by the end of 2007, and 100% reduction by 2010. National ODS Phase-out Plan is now implementing by the DOE. Progress towards achieving these target are being made also through instituting a licensing system to control the import of ODSs and ODS containing products that are already in use the country.

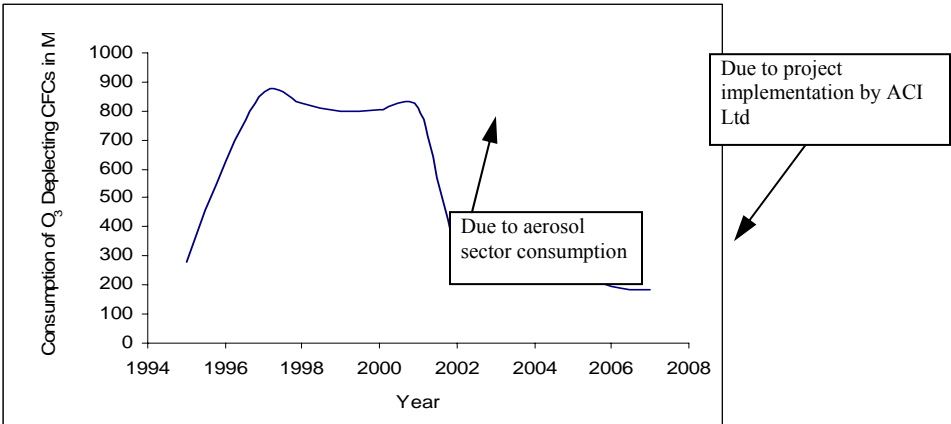


Figure 3. 4: Consumption of Ozone Depleting CFC's

Data table: Consumption of Ozone Depleting CFC's

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
O ₃ CFCs	280.68	628.3	867.05	829.24	799.54	804.69	807.3	327	332.99	294.34	262.14	195.5	182.45

Source: Dr. SK Purakayastha, Ozone cell, DOE, 2008

Activities to Protect Ozone layer in Bangladesh

The Government of Bangladesh undertook a reconnaissance study on import and consumption of ODSs in 1993 and based on the study, a detailed Country program was drawn in 1994. According to the paragraph 1 of Article 5 of the Protocol, Bangladesh is operating activities and enjoying the 10 year grace period of phasing out the ODSs. Bangladesh estimated baseline consumption by taking the average consumption in 1995, 1996, 1997 and starting its phasing out operation since 1st January 1999 and a National Technical Committee was formed in 1994 for phasing out ODSs within the timeframe. The following projects were implemented or are under the process of implementation under the Montreal protocol.

- Institutional Strengthening for Phase out ODSs
- Conversion to CFC Free technology for the production of Aerosol Products at ACI Ltd.
- Implementation of a National Programme for Recovery & Recycling of Refrigerants;
- Training Programme on Good Practices in Refrigeration
- Training Programme for Customs Officers,
- National ODS Phase-out Plan,
- Phasing out of CFC in the manufacturing of metered dose Inhaler in Medicine manufacturing sector in Bangladesh.
-

As per Montreal Protocol obligations Bangladesh is now in full compliance.

Energy

9.5 Energy Use

According to the Bangladesh Power Development Board (BPDB 2006) indicated that the country has a total installed capacity potential of about 5,245.00 MW with a mean annual energy production capacity of 22,741.53 GWh. Electricity demand was 5000 MW whereas supply was 3000 MW, resulting in a shortage of about 2000MW. In the urban areas grid coverage electricity (45 percent) is the main source of lighting and kerosene is mainly used in the rural areas. Changes in this ratio over time and across countries reflect structural transitions in the economy, and energy efficiency of different fuel mixes in different sectors. In principle, the lower the ratio, the higher the energy efficiency. Over time Bangladesh has been able to improve its energy efficiency from 123 per US\$1000 GDP (PPP) in 1990 to 88 in 2007 (**Fig. 3.5**). Efficiency improved about 14 percent during 1990-2000 and 10 percent during 2000-2007.

Natural gas contributes more than 88 percent of the total net energy generated by public sector (BPDB) and private sector (IPP) (**BPDB, 2006**) which meets 24 percent of the country's total fuel need while hydroelectricity provides another three percent. Nine percent of the fuel comes from imported coal and mineral oil (**BPDB, 2006**) (**Fig. 3.6**).

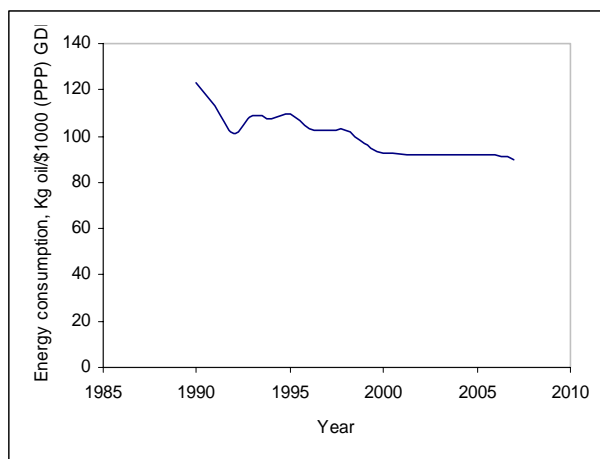


Fig. 3.5: Energy use

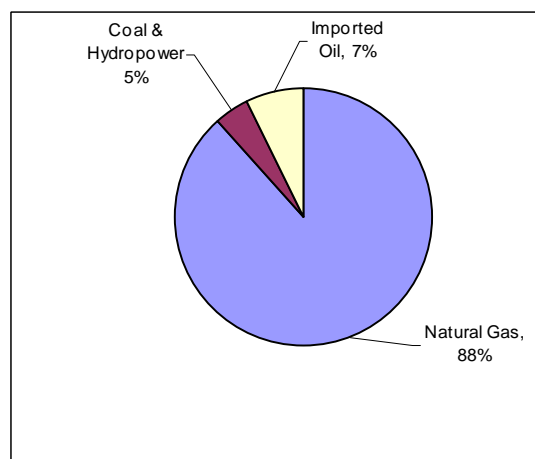


Fig. 3. 6. Primary commercial energy consumption by source, 2006
Source: BPDB 2006

Data table: Energy use

1990	1991	1992	1993	1994	1995	2000	2006	2007	2015
123.18	113.08	100.95	108.8	107.69	109.81	92.36	92	90	74

However, low electricity coverage, high demand of -supply gap and frequent supply disruption are other problems associated with the electricity sector. Issues of energy security and non access to electricity by roughly 60 percent of the total population remain as major concerns in the form of excessive pressure on biomass reserves leading to deforestation (UNDP 2007).

9.6 Use of Solid Fuels

Although not a global indicator, it was considered important for Bangladesh to track the proportion of population using solid fuel. About 88% percent of commercial energy consumption is met from natural gas, the remainder coming from oil augmented by hydropower and coal. Non-commercial energy sources, such as wood, animal wastes and crop residues, are estimated to account for over half of the country's energy consumption.

Currently, 30 to 50 percent of the total organic energy demand is met by fuel wood, and the remaining from agricultural by-products and cow dung (**Table 3. 8**). As the heavy reliance upon bio-fuel in the rural areas has direct influence on the physiochemical characteristics of soil and the availability of fodder and fruit trees, there is urgent need for introducing alternative energy technology in the rural area. The lack of alternatives has already adversely impacted the greener concerns of environment and if allowed to continue, will lead to the rapid depletion of forest resources.

Table 3. 8: Proportion of population using solid fuels

Type of fuel	Residence	1990*	1997	1998	1999	2000	2006	2007*
	Wood/Bambo	National	35.35	34.5	39.5	35.6	37.8	38.35
	Rural	30.6	30.8	35.7	35.2	37.1	39.06	40.86
	Urban	52.45	46.8	50.6	38.1	39.3	37.95	31.45
Leaves/Husk/ Cow-dung	National	53.65	54.2	50.3	49.7	49.4	49.25	44.65
	Rural	68.6	67.1	63.1	54.9	60.1	54	51.08
	Urban	3.75	12.1	10.5	16.5	27.2	29.4	34.53
	Total	89.0	88.7	89.8	85.3	87.1	87.6	88.74

Sources:

MICS, 2006

Poverty Monitoring Survey 1999

Report of health and demographic survey, BBS 2006

*Calculated by extrapolation method

Bangladesh is also highly dependent on biomass fuels. More than Fifty five percent of the total energy consumption comes from biomass fuels (**Fig. 3.7**) and rest from commercial fuels, namely, natural gas, oil, electricity and coal of this country.

The energy needs of the estimated 85 percent of Bangladeshis living in the rural areas are primarily met through biomass, straw, jute stick, animal dung and fuel wood (**Fig 3. 8**). The impacts of energy deprivation include drudgery for rural women and children burdened with the task of collecting, processing and using biomass, as well as health impacts related to indoor air pollution. The development of informal rural markets for even low-quality traditional biomass sources (for example, rice husk and animal dung) indicates an impending rural energy crisis, with prices of even the most basic fuel sources spiraling out of the reach of the very poor.

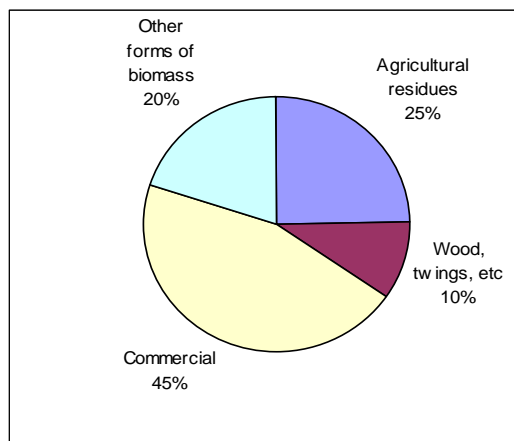


Fig. 3.7: Consumption of biomass fuel

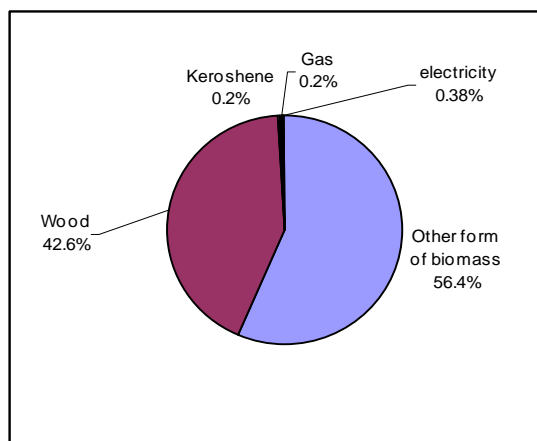


Fig.3. 8. Percentage of households using different sources of fuels in rural areas
Source: BBS 2002

The vision statement on power identifies energy as a primary resource for poverty reduction. Rural electrification has been made a key goal and the government has targeted 100 percent electrification of all 84000 villages in the country by 2020 (GOB 2004a). The national emphasis on rural electrification is also reflected in the National Poverty Reduction Strategy (PRSP), which identified rural electrification as a key area to foster economic growth with a pro-poor orientation (GOB 2005). Increased demand for electricity from households, educational and health care facilities, and industry will require a 65 percent increase in annual power supply (**BIDS, 2004**). However, the big challenge for Bangladesh is to increase access electricity, ensuring that the poor are not excluded. Interestingly, compared to their urban counterparts, rural Bangladeshi consumers receive fewer subsidies, pay their bills more promptly and engage in less pilferage. The widening gap between the rich and the poor, however, could lead to greater challenges.

Key Challenges

Huge monitoring and evaluation

- Electricity demand is higher than present supply resulting in a shortage of about 2000MW. Therefore electricity disruption is common phenomenon in the rural as well as urban areas.
- There is no central agency with the mandate and capacity to analyse the government/donar investments for development, particularly the linkages between energy and poverty.
- There is no specific indicator linking energy and poverty on the one hand and energy information management system that can provide information for sound planning, management and implementation for future initiatives on the other.
- There is no baseline database to help capture the socio-economic impacts of energy services.

Facilitate easier access to information

- There is no local or national platform to discuss or disseminate lessons from rural energy projects or the impacts on poverty.
- There is no specific indicator to link energy and poverty, making information dissemination a difficult process.
- A few independent/neutral reporting and monitoring studies are available for dissemination.

Actions

Though Bangladesh has a proven gas reserve of 176 billion M³, about 90% of her population is dependent on biomass fuel. It could have been an environment friendly scenario if a sustainable output of

these biomass fuels can be made available; leaving aside the organics from the farms to manure the agricultural fields to alleviate the soil degradation problem. Intensive afforestation and management of denuded sites; homesteads, roadsides, railroad sides, etc. may assist this issue to a great extent.

- Use of higher quantum of per capita energy is definitely desirable. Under this context the fuel to generate the quantum target energy is a major case to decide upon, so that such increased energy consumption, instead of enhancing the pollution and degradation of environment, will be rather an environment friendly proposition.
- Keeping in view of these stated above, investment projects on the following areas are suggested.
- Domestic use of solar energy may be initiated. The solar energy may be used for generating electricity or for heating the water. Small household type equipments need to be developed. Donor may come up with the required technical assistance to develop the devices and involve the NGOs for adoption, sale, distribution, etc..
- Intensive afforestation on non-government land involving the communities through NGOs may be initiated for the production of fuel wood. This may be an obligatory component of government or any NGO for extending assistance to Railways for rail road sides, R&H for road sides, LGED for homesteads, and so on. In every such case the government of Bangladesh must be involved to provide all the required technical assistance in this regard.
- Bottling of condensates that comes out with the natural gas to produce LPG for cooking. In every gas field a condensate processing plant may be established to produce the LPGs. ADB has shown interest to assist the government in this regard and include this aspect as an obligatory component of any ADB project related to natural gas (ADB, 2004).

Target 10: By 2015, the proportion of people without sustainable access to safe drinking water and sanitation

Water and Sanitation

Safe drinking water and sanitation policies of Bangladesh Government have focused on making water and sanitation services available to all in the shortest time in rural and urban areas at. The Department of Public Health Engineering (DPHE), Water Supply and Sanitation (WASSA) of Ministry of Local Government and Engineering Division (MOLGED) is responsible for planning and implementation of all water and sanitation activities in the country.

10.1 Water

It was estimated that in 1990 about 1.0 percent of population in urban and about 7.0 percent is rural population had no access to safe drinking water. The proportion of population of the urban without access to safe drinking water had been reduced to 0.1 percent from 1.0 percent in the year 2007 (**Table 3. 9**). However, discovery of Arsenic has changed the picture in rural areas where Arsenic contamination of groundwater contributing to a reversal of that trend. However the implementation of Arsenic Mitigation – Water supply project by MLG&RD during 1998-2004 changed the picture and people started to have good quality of water for drinking. The proportion of the rural population without safe drinking water increased to 13.7% in 2007 from 6.9 percent in 1990. Growth rate is -0.25 during 1990-2007. If present growth is maintained in the up coming years then it would be possible to reach the target by 2010.

However, according to Asian Development Bank (2006) report, about 28% urban population and 41% of the rural population still don not have access to safe water.

Table 3. 9. The proportion of population without access to safe drinking water

Water target		Year					
		1990	1995	2000	2005	2006	2007
Without access to safe drinking water	Urban (%)	1.0	0.10	0.5	18.0	0.8	0.10
	Rural (%)	6.9	3.50	2.7	28.0	21.0	13.77

Sources: MDGs Mid Term Bangladesh Progress Report, 2007

MICS 2006

BIDS 2004

DPHE 2008

Circle wise water source & coverage is shown in Table 3.10 & Fig.3.9 -3.10. Number of safe water pump is highest in Dhaka circle where as lowest in Chittagong circle (Fig.3.9). Circlewise coverage by running water pump is highest in Khulna circle and lowest in the Chittagong circle (3.10). From the study it is revealed that Chittagong circle is still lagging behind than other circles.

Table 3.10. Circlewise water sources & coverage

Sl No.	Circle	No. of District	No. of Upazila	Total water source			No. of cont. public TW	No. of safe WP (Running)	Coverage (person per water source)
				Running	Ch. up	Total			
1	Dhaka	12	93	283510	12254	295764	29300	254210	101
2	Chittagong	8	72	247344	17327	264671	46583	200761	101
3	Sylhet	4	37	78471	3928	82399	7017	71454	101
4	Barisal	6	40	108693	7125	115818	6045	102648	78
5	Faridpur	5	27	81831	3298	85129	23372	58459	103
6	Rajshahi	6	49	135497	6540	142037	5932	129565	90
7	Rangpur	10	75	180499	7958	188457	2525	177974	98
8	Khulna	10	59	158379	8889	167268	35934	122445	110
9	CHT	3	25	17485	6833	24318	0	17485	71
	Bangladesh	64	477	1291709	74152	1365861	156708	1135001	97

Source: NMIC, DPHE, February, 2008

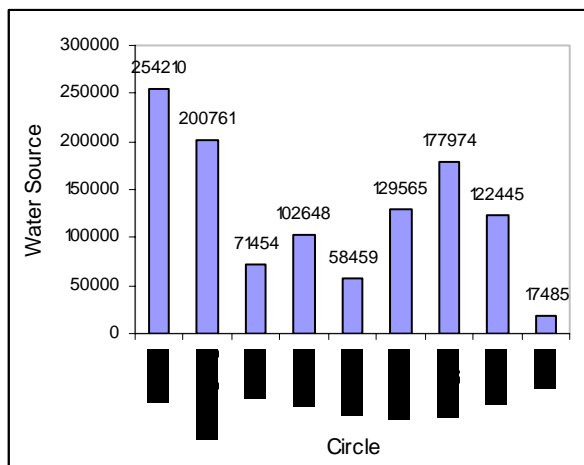


Fig. 3.9. Circle wise water source

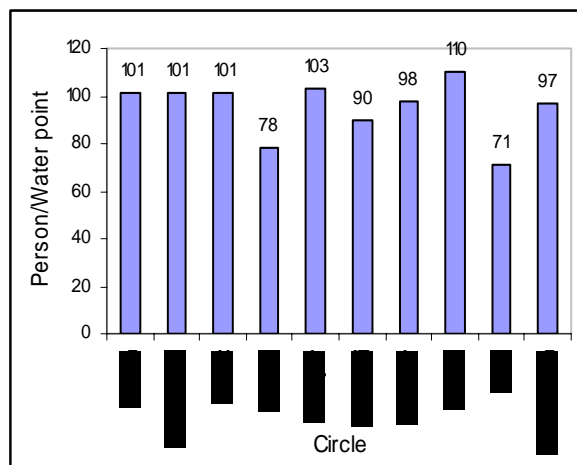


Fig. 3.10. Circle wise running water source coverage

The total number of Pourashava & City was 315 where as piped water supply covered 31% of the total town areas (**Table 3.11**). The number was 68 under implementation and number of yet to undertake for piped supply was 147.

Table 3.11. Water Supply Coverage

Urban	Pourashava & City	Piped supply	Under implementation	Yet undertake for piped supply	to Coverage (towns having piped)
	315	100	68	147	31%

Source: DPHE, June 2007

Some gaps remain in under served, un-served, poor communities, low coverage in arsenic affected, low water table and difficult areas.

10.2 Sanitation

A nationwide “community based Total sanitation’ campaign was lunched in 2003 with aim of reaching 100 percent coverage by 2010. Also the following projects named ‘alternative water supply/sanitation’ and ‘water sanitation & flood protection capacity building’ were implemented by MLG&RD during 1998-2004. In 1990, 38.8 percent of urban population and 84.7 percent of rural population had no access to sanitary latrines. Coverage had increased dramatically and proportion of without access to sanitary latrines reduced to 12 percent from 38.8 percent in urban and 15 percent from 84.7 percent in rural areas by June 2007 (**Table 3. 12**).

Table 3. 12: The proportion of population without access to sanitary latrines

Sanitation Target		Year					
		1990	1995	2000	2005	2006	2007
Without access to Sanitary latrines	Urban (%)	38.8	14.5	26	47.5	45.4	12
	Rural (%)	84.7	44.5	65	19.6	18.5	15

Sources: MDGs Mid Term Bangladesh Progress Report 2007; MICS 2006; BIDS 2004; DPHE 2008; BBS 2006

However, Multiple Indicator Cluster Survey (MICS) by UNICEF & BBS, 2006 found that the percentage population without access to sanitary latrines was 42% for urban and 68% for rural. A study conducted by DPHE in 2003 found that lack of money more than 72.0% of rural and 80.0% of urban population do not have a latrine. **(Table 3. 13)** The values were 84.5% and 88.4% in case of City Corporation and municipalities. The percentage was higher (31.5%) in case of city corporation population of having latrine due lack of space. Lack of awareness, 25.3% of urban population was not interested to have latrine. City corporation people (5.5%) do not have latrine because of preference of open defecation. However, lack of maternal, 3.2% population of City Crops, do not have a Latrine.

Table 3. 13. Reasons for not having a Latrine

Area/Region	Number of households with Latrines	Lack of money (%)	Lack of Space (%)	Lack of awareness (%)	Preference for open defecation (%)	Lack of maternal (%)
National	8982551	73.23	10.64	25.13	4.23	1.99
Rural	8595626	72.90	10.30	25.32	4.27	2.05
Urban	386925	80.47	18.26	20.85	3.32	0.59
City Crops.	30727	67.91	31.53	23.04	5.53	3.20
Municipalities	356198	81.55	17.12	20.66	3.13	0.37

Challenges in Water and Sanitation

Water Challenges

Arsenic in Drinking Water

Invention of arsenic (As) in groundwater have reduced the safe water supply coverage has been reduced from 97% to 75% during the past 5 years. And so far, more than 10,000 arsenic affected patients identified so far. The following **Figure 3.9** shows the percent of tubewells with arsenic level above the same limits in selected areas of the country. Spread of disease has caused havoc in many parts of the country and families with arsenic affected patients are considered 'unwanted' in many rural areas. Arsenic mitigation should be high priority

As problem:

- ❖ Total number of Districts: 64
- ❖ Districts tested for contamination: 64
- ❖ Districts with arsenic above 0.01 mg/l: 54
- ❖ Districts with arsenic above 0.05 mg/l: 47
- ❖ Population at risk: 62%
- ❖ Number of known patients: >10,000
- ❖ Number tubewells: 37% ≈ 7.5 to 8 million

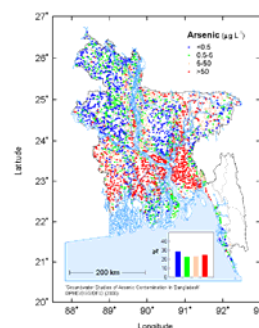


Fig.3.9 As affected areas

The problem needs both short term and long term measures. First, a short term measure to deal with affected people and to deal with potentially affected people in Bangladesh. Second, a long term measure to deal with the hydro-geology of Bangladesh and to improve the level of arsenic contamination at the aquifers. The short term measures include:

- Establish effective co-ordination among the bodies dealing with arsenic problems to help the patients and to rehabilitate them socially.
- Co-ordinate action plan on arsenic mitigation. Promote safe water technologies and educate people on these.
- Arrange treatment of arsenic affected people

Action

- Reducing groundwater withdrawal in the dry season and particularly for irrigation purpose.
- Promoting use of surface water for agricultural and household use.
- Promoting the traditional approach of 'drinking water pond' in rural areas and help people in the maintaining the quality of water in these ponds.
- Allowing maximum recharge of the ground water table and preserve lakes and other water bodies in cities.

Water Pollution

Water pollution is a major problem in most parts of Bangladesh. The nature of the problem varies between regions and locations. For example, major urban water pollution is linked with disposal of untreated industrial wastes in the rivers and lakes and major rural water pollution is linked with open-air latrine by the rivers and creeks. Major rivers by the cities like the *Buriganga*, the *Karnafuly*, the *Surma*, the *Korotoa*, the *Rupsa* are heavily polluted rivers. Most of the pollution in these rivers originates from industrial discharge of untreated liquid wastes. Pollution in rivers creates a major health risk and the financial cost is quite heavy. The severity of the problem should be understood clearly. For example, DWASA has estimated that within the next 50 years period, water from the *Sitalakhya*, the *Buriganga*, the *Meghna* will be so polluted that the city will need water from the *Jamuna*. This projection clearly shows the cost of pollution.

- Disposal of untreated sewage as well as industrial wastes should stop immediately.
- Government should take steps to clean-up major rivers of Bangladesh.
- WASA should be held legally responsible for non-compliance of drinking water standards set by the Department of Environment.
- Municipalities / Industrial Authorities / EPZAs – the licensing authorities of industrial units – should be legally responsible any violation of water quality standards set by the Department of Environment in water bodies.
- These authorities should also be held responsible to ensure removal of solid and liquid wastes in environment friendly manner.
- Tighten the grip of the Department of Environment on compliance of environmental quality standards on existing industries.

Open-air defecation in rural areas is a major cause for deaths related to water-borne diseases. This is also true in many cities. Considering the risks involved in terms of public health, government should come-up with action plans. In this connection, we should note the success of similar programs in health and education.

Action

- Concept of 'Model Village' in terms of sanitation quality should be introduced as a program of action in rural areas.

Water Supply

- Although Bangladesh is a riverine country, its water supply has remained very vulnerable for many reasons. Many parts of the country suffer from critical shortage of water for agricultural production (see Volume 4, Task Force Report 1991). However, in the last decade, it is the supply of drinking water that has become a critical issue for the nation.
- Dhaka WASA and Chittagong WASA supply only between 60-65 percent of the total daily demand for drinking water.
- Rural Bangladesh is increasingly lacking in terms of a good source of water for drinking purpose. Studies have shown that a large part of rural Bangladesh is now exposed to high level of arsenic in the ground water from the shallow aquifer (see figure below).
- On average the groundwater table in many parts of Bangladesh is being receding by 1.5 meters per year.
- And finally bacterial contamination of water supplied through the WASA and other agencies is very high. This has contributed to excess use of fuel for boiling water in every household living in urban locations.
- To improve monitoring of water quality so that actions can be taken before a complete destruction of water sources, government should establish an effective EMP (Environment Monitoring Program) involving representative from the civil society.

Water resource management

National Water Management Plan (NWMP) provides the guiding principle for water resource management in Bangladesh. The plan is very comprehensive and includes a detailed investment option in water sector. The ADB assistance in combating environmental problem in water sector should also be guided by the NWMP.

River bank erosion

River bank erosion has been identified as an important environmental and social problem. Major issues related to contemporary approach to river erosion will be to establish the strong institutions on a coordinated effort that integrates reliable forecasting of river behavior with sound planning and design of bank protection measures, construction that rigidly adheres to the planning schedules and designs, and post construction verification river surveys.

Sanitation Challenges

The following specific issues need to be addressed for further improvement in the sanitation sector.

- Lack of awareness of the benefits of sanitation on health and economic productivity.
- Lack of financial resources for having latrines in the households of hardcore poor. Hardcore poor includes landless/homeless, day laborer, households headed by disabled or non-earning persons. It is not fully ensured that the allocated government subsidy reaches the hardcore poor. Amount of subsidy remains despite varying need at different places (WHO, 2006).
- Absence of mechanism for identifying hardcore poor and ensuring effective utilization of government subsidy.
- Lack of space particularly among landless people. This is particularly critical in flood prone, low lying areas and in urban slums.
- Land tenure-ship/ownership remains a crucial issue for providing services to urban slum dwellers. In absence of clear cut policy, this has become a major obstruction to service provisions.
- Lack of technological know-how among people for building low cost hygienic latrine. Limited technology options to address sanitation requirements particularly in densely populated slum areas, marshy land, flood prone and high water table areas.
- Urban sanitation suffers from lack of a variety of options that could be used to suit different socio-economic conditions. Sanitation facilities at public places are grossly inadequate.

- Lack of institutional capacity/mechanism to support people builds their own hygiene latrine at affordable cost.
- Inadequate hardware outlets. Even if people are motivated, installation of hygiene latrines is not being done at a required place due to inadequate hardware production outlets particularly at village level.
- Public agencies still remain project and hardware focused and lack orientation on process based approach. Partnership is not yet sufficiently strong among public agencies, local government institutions, non-government organizations, private sector and development partners. Absence of emergency response plan on sanitation. This is particularly important as the country faces recurring floods and cyclone disasters.
- Absence of a legal framework for improved sanitation. Legal restriction on use of hygiene latrines is not yet adequate. Sanitary facilities in water transport and railways are not legally enforced.

Sanitation Challenges in Urban Slums

The sanitary condition of urban slums is deplorable. Most of the slum dwellers have literally no latrines, only a few have pit or surface latrines. They often defecate on the drains, in open fields, near the roads, or on the riverbanks. The problem is acute with female residents who have to wait till sunset for defecation or use a neighbour's latrine, if available. Unhygienic hanging latrines are still prevalent in urban slums.

- The linkage between sanitation and poverty is often overlooked. It is the poor people who suffer most from lack of access to basic facilities and services. Loss of earnings and production are additional handicaps for poor people, for whom physical fitness is the main productive asset.

Target 11: By 2020, have achieved a significant improvement in the lives of at least 100 million slum dwellers

Improving the Lives of Slum Dwellers

Migration of people to metropolitan cities, and particularly to the capital city of Dhaka, from the rural areas became the common phenomenon in Bangladesh over the last several decades. However, the potential benefits of life in cities, fail to reach the majority of the poor migrants. As a result, many of the migrants live in poor housing like, slums, squatters' settlement with some living without a shelter in unhygienic and unendurable environment. The population density in the slums is 200 times greater than the usual density of Bangladesh (CUS, 2005). One third of the urban population live in extreme conditions of poverty, congestion and lack of basic amenities, footpaths, drainage are about to absent in different slums of Bangladesh (LGED/UNDP/UN-Habitat, 2007). Despite the problems, migrants from rural areas continue to migrate to the cities. The global indicator for Target 11 is the proportion of households with access to secure tenure. Four additional dimensions of this target 8 have been identified by UN Habitat: i) Access to security/durability of housing; ii) access to safe water; iii) access to sanitation; and iv) sufficient living area.

Secure tenure/Durability of housing

The security of tenure has been declining in urban towns and increasing in rural as well as national level (**Fig. 3. 10**). In the urban areas, the proportion of household with access to security of tenure declined from 68.28 percent in the 1990 to 63.2 in 2007. Reflecting security of tenure in the national level increased from 31.18 percent in 1990 to 36.69 percent in 2007. The growth rate of urban security declined more than 10 percent in 2007 from 1990. If this trend continues then population access to security of tenure would be about 60 percent for urban, 40 percent for rural and overall 40 percent for national by 2015.

Bangladesh currently has no clear-cut policy for urban management. Local Partnerships for Urban Poverty Alleviation Project of LGED/UNDP/UN-Habitat during 1996-2006 has improved community empowerment specially women and strong partnerships between the local government and communities in some areas of Bangladesh.

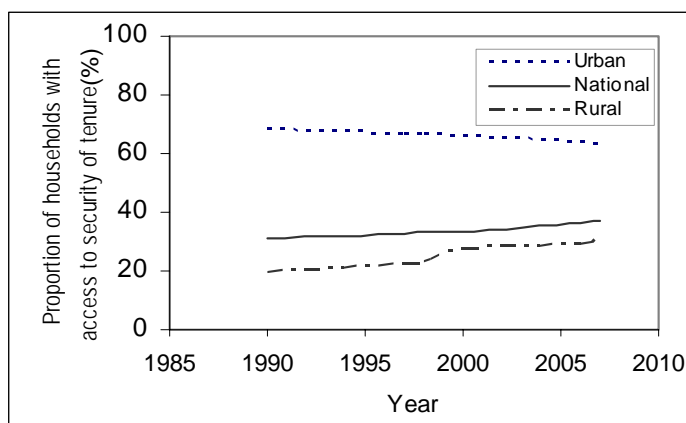


Fig. 3. 10. Proportion of households with access to secure tenure

Data Table

Residence	1990*	1997	1998	2000	2006	2007*
National	31.18	32.73	33.3	33.33	36.4	36.69
Urban	68.28	66.57	67.02	65.77	63.6*	63.2
Rural	19.34	22.41	23.01	27.29	29.13	31.36

Sources:

* Calculated by extrapolation method

Health and Demographic Survey, BBS, 2000

Statistical year book of Bangladesh, BBS, 2006

MICS, 2006

Tenure Insecurity

Wholesale evictions of slums on government land are a common event. A study conducted by Center for Urban studies (CUS, 2005) found of the 9,048 slums, 6.5% experienced one or more evictions in their present location or were currently under the threat of eviction (**Table 3.14**). It must be emphasized, however, that this provides only a partial indication of the extent of eviction.

Table 3.14. Threat of Eviction: Tenure Insecurity

Eviction Incidence	(% of clusters)						
	Dhaka	Chittagong	Khulna	Rajshahi	Sylhet	Barisal	All cities
None	95.5%	89.6	82.5	91.1	98.9	94.9	93.5
Once	1.4	2.8	5.0	-	0.5	1.7	1.7
Twice/More	1.9	1.9	6.0	6.9	0.1	3.1	2.4
Currently under eviction threat	1.2	5.7	6.5	2.0	0.4	0.3	2.4
Don't know	0	0	0	0	0	0.3	0
Total	100	100	100	100	100	100	100

Source: CUS, 2005

It requires agreement of the landowner to at least 10 years security of tenure for getting household security. It is not clear however that communities recognize this as sufficient security to risk investment of their own capital and savings in improving their housing as seen in other Asian cities (LGED/UNDP/UN-

Habitat, 2007). Indeed, when questioned why families were not investing in improved shelter, the common response was that this may be wasted investment if they are required to move.

Access to safe water

The major sources of drinking water in slums areas were municipal taps and tube wells (**Table 3.15**). A small portion of households (1.9%) collected drinking water from other sources (rivers, ponds, lakes, canals etc.). Dhaka's slum residents typically relied on municipal tap water while those in other cities usually used tube wells. In the overwhelming majority of clusters (99.5%) where tap water was available (**Table 3.15**) households shared it. In 40.9% of these clusters, one tap was shared by 6-10 households while in 22.7% a single tap was used by 11 to 20 families (**Table 3. 16**).

Table 3. 15. Source of Drinking water by City
(% of clusters)

City	Municipal Tap	Tube well	Other sources	Number of Cluster
Dhaka	92.3	6.5	1.2	4966
Chittagong	28.7	65.2	6.1	1814
Khulna	2.1	97.9	0	520
Rajshahi	12.8	87.3	0	641
Sylhet	36.3	62.8	0.9	756
Barisal	15.6	84.4	0	351
All cities	61.1	37.0	1.9	9048

Source: CUS, 2005

Table 3. 16. Tap Water Sharing Pattern by City (% of clusters, among those with tap water source)

Number of households sharing one Tap	Dhaka	Chittagong	Khulna	Rajshahi	Sylhet	Barisal	All cities
Not shared	1.4	24.2	38.1	8.7	1.0	-	4.5
2-5	19.6	24.4	4.8	20.9	6.5	26.1	19.6
6-10	45.8	23.7	4.8	34.9	20.3	14.5	40.9
11-20	21.7	15.7	28.6	28.6	45.9	43.5	22.7
21-30	4.7	3.9	23.8	4.4	20.3	8.7	6.8
Above 30	6.8	8.0	-	2.4	5.9	8.7	6.8
Total	100	100	100	100	100	100	100

Source: CUS, 2005

Access to sanitation

Latrines linked to sewers and septic tanks and water sealed latrines are considered safe from hygienic standpoint. Only 28.8% of slum households had access to one of these three types of latrines (**Table 3.17**). Dhaka slum residents had the best access to safe latrines (35.6%) while those in Sylhet and Barisal had very poor access (only 2.1% and 0.4%, respectively). Pit latrines, a very widely regarded as

unsafe, were common in slum areas. In almost all slums, latrines were usually shared by two or more households (**Table 3.17**). In 13.4% of slums, one latrine was shared by 11 or more families (**Table 3.18**).

Table 3.17. Household access to different type of latrine by city (% of households)

City	Sewerage/septic tank	Water sealed	Pit	Hanging	Open	Others
Dhaka	33.7	1.9	46.3	13.9	3.2	1.0
Chittagong	10.9	6.4	60.5	16.0	5.7	0.4
Khulna	1.0	9.1	79.9	4.0	5.2	0
Rajshahi	5.6	31.5	50.6	8.8	3.5	0
Sylhet	1.6	0.5	90.6	3.8	3.1	0.3
Barisal	0	0.4	86.5	0.7	11.9	0.4
All cities	24.8	4.0	52.8	13.5	4.1	0.8

Source: CUS, 2005

Table 3.18. Latrine sharing Pattern of Households' by city (% of clusters)

Number of households sharing one Latrine	Dhaka	Chittagong	Khulna	Rajshahi	Sylhet	Barisal	All cities
Not shared	1.1	2.5	1.5	13.1	0.5	8.0	2.5
2-5	48.6	40.8	41.9	81.4	21.0	70.9	47.5
6-10	38.8	37.5	42.9	4.0	50.8	17.1	36.5
11-20	7.8	13.8	11.1	0.9	23.9	2.6	9.9
21-30	1.7	3.4	1.7	0.5	2.0	0.6	1.9
Above 30	1.9	1.9	0.8	-	1.7	0.8	1.6
Total	100	100	100	100	100	100	100

Source: CUS, 2005

Drainage Situation in Slums

On an average, only 10% of slums had sufficient drainage to avoid water logging during heavy rains. 37.0 % and 52.7% slums were moderately and poorly drained. The worst drainage situation was in Dhaka and Chittagong, while the best was in Barisal (**Table3.19**).

Table 3.19. Drainage Condition in Slum Areas by City (percent of clusters)

Drainage	Dhaka	Chittagong	Khulna	Rajshahi	Sylhet	Barisal	All cities
Well drained	11.4	2.7	10.2	1.2	6.3	59.8	10.3
Moderately drained	30.0	38.4	51.1	74.6	39.8	34.2	37.0
Poorly drained	58.7	59.0	38.6	24.2	53.8	6.0	52.7
Total %	100	100	100	100	100	100	100

The income status of different urban sites households describes in **Table 3.20**. It is found that household incomes were to be less than Tk. 5000 per month. The highest percentage was found within the range of Tk. 2001-3000.

Table 3.20. Income group

Income range(Tk/Month)	Darajanganj %	Chittagong %	Custia %	Total %
<2000	1.0	0.0	2.2	0.7
2001-3000	4.4	0.0	4.4	9.3
3001-4000	4.4	0.0	0.0	2.1
4001-5000	1.0	0.0	1.1	1.5
>5000	1.1	0.0	0.0	4.3
Total	100	100	100	100

Source: LGED/UNDP/UN-Habitat, 2007

Regarding the type of housing and services of the study area, it was found that 6.18% of households live in pucca dwellings, 47.08% semi-pucca and 52.34 in Kutcha houses (**Table 3.21**). Only a few were found to live in 'Jhupris'-these being the most temporary of shelters.

Table 3.21. Table: Household structure

Study area	No. of Settlements	Pucca	Semi-pucca	Kutcha	Slum
Custia	10	1.35	1.15	1.35	1.15
Narayanganj	8	1.40	1.30	1.05	1.25
Chittagong	10	1.43	17.63	19.94	1
1001-5000	1	1.0	1	1	
Total	38	1.18	7.08	12.34	1.4

Source: LGED/UNDP/UN-Habitat, 2007

The condition of services shows that on average 84.7% households have drainage services, 98.1% have provision of footpaths, 79.0% have electricity and 64.8% have a gas connection. Only 27.1% have a solid waste management system (**Table 3.22**). Waste Management system is very poor in Narayanganj compare to the other two study sites.

Table 3.22. Existing services

Service	Narayanganj	Chittagong	Custia	Average
Roads	14.4	100	100	18.1
Drainage	13.3	15.7	15.0	14.7
Electricity	14.4	100	100	18.1
Gas	14.4	100	100	18.1
Sanitation	14.4	100	100	18.1
Waste Management	1.6	15.7	10.0	7.1

Source: LGED/UNDP/UN-Habitat, 2007

Challenges

It was estimated that urban population in 2000 would be 26 million. Under the assumption that population growth will stabilize by 2035, and that current rate of rural-urban migration is maintained, it was estimated that urban population in 2015 will reach nearly 50 million. The majority will be living in the four major cities of Dhaka, Chittagong, Khulna and Rajshahi. To achieve Target 11 by 2015, health, water and sanitation

services must be reached to 50 million urban dwellers, while ensuring that the services also reach urban slum dwellers.

Policy Actions

Policy reform is needed to recognize the contribution of the poor to the growth of the urban economy and to integrate urban poor communities within the mainstream of urban development, governance and administration. There are some structural barriers of the provision of land for housing the poor."

The policy also recognizes the major collective contribution made to the urban and national economy by the poor and need - responsibility of government - to exchange this contribution through slum upgrading and services provision. Keeping consistency with such guidelines and objectives of tenure study the following is recommended.

Policy options for existing informal settlements need to accept that some settlements may need to be relocated because they are in environmentally vulnerable or economically strategic locations. However, where this is not the case, it is vastly preferable to upgrade such settlements in-situ. Excluding a significant proportion of urban populations from legal shelter reduces the prospects for economic development.

People who fear eviction are not likely to operate to their maximum potential, or invest in improving their homes and neighborhoods. Also when people are excluded, local and central governments are denied the revenue from property taxes and service charges, which could help improve urban living environments and stimulate local and external investment. In addition to this, uncertainty associated with insecure tenure may hinder improvement of the other services such as improved water and sanitation, durability of housing etc.

- If the principle of in-situ upgrading of 'tenable' settlements is accepted in urban Bangladesh, this raises the question of how either relocation or upgrading should be undertaken and what specific tenure options are appropriate. The following options are needed for increasing tenure security and urban land market efficiency:

Other Challenges

Natural Disaster

During the period 1973–1987, about 2.18 million tons (MT) of rice was damaged due to drought and 2.38MT due to flood. Drought affects annually about 2.32 Mha and 1.2 Mha of cropped land during the Kaharfi (summer) and Rabi (winter) seasons respectively, while soil salinity, water logging and acidification affect 3.05 Mha, 0.7 Mha and 0.6 Mha of crop land, respectively in every year (Dey, et al., 2006).

Floods and tropical cyclones are the two major natural disasters in Bangladesh. Seasonal flooding is a recurrent phenomenon in the country. About 22 percent of the land area is flooded in the wet season even in a normal year, and about 60 percent of the country are considered flood prone (ADB, 2004). Since 1954, Bangladesh experienced catastrophic floods (inundated over 33 percent of the country) in five years: 1955, 1974, 1987, 1988 and 1998. Poor and marginalized people were highly affected; especially women and children became vulnerable.

Last few years before, two major floods occurred in 1998 and in 2000. 1998 flood is the longest flood in the history of Bangladesh. The water level did not recede for a long time (flooding in Dhaka started in the 3rd week of July and continued till the 3rd week of September. The figure above shows the extent of flooding throughout Bangladesh.

Tropical cyclones, originating in the southern Bay of Bengal, strike the coast of Bangladesh in the months of April-May and October-December. Cyclones are generally associated with storm surges of several meters in height, which, in fact, are mainly responsible for major devastation in terms of loss of life and damage to property and infrastructure. In recent years, two massive cyclones hit Bangladesh - one on 12-13 November 1970 and another on 29 April 1991. The former killed about half-a-million people, but in the latter - though more severe - loss of human life was lesser due to warning signals and disaster preparedness.

Actions

- Construction of cyclone shelters should receive priority with an aim to provide protection to at least 80 percent of the high-risk population in an area. The recommendations of the Multipurpose Cyclone Shelter Plan of 1992 can provide directions for implementation.
- All shelters must be equipped with facilities to provide a decent living for the people living during disasters.
- Government shall take steps to review existing flood protection embankments for the shortcomings and inadequacies and take measures to remove them.
- To manage the flood protection and irrigation infrastructure, an appropriate management structure shall be developed so that it guarantees public participation both in selecting locations for any new embankment as well as in sharing the costs of its operations.
- The 1998 flood has shown the weakness in our current structural protection plan of Dhaka city. Consequently, embankments in all major and secondary towns to prevent urban flooding must be maintained and water level within the protected area must be monitored to prevent any future disasters. At the same time, the eastern side of Dhaka City shall be protected to reduce damages of properties and resources. An embankment along the Balu river is, therefore, recommended.
- Recent floods have shown the inherent weakness of our existing flood forecasting system. It is not possible for people to understand the true picture of the flood from the existing warning messages. Consequently, it is strongly recommended that localized flood-warning languages be used to alert people on the upcoming floods.
- Government should authorize local governments to monitor compliance of building codes during constructions to minimize life and property damages during a earthquake.
- Government should actively consider introducing 'disaster insurance scheme' to prevent a sudden collapse of the economy in case of a natural disaster. This will help the government to quickly rebuild the economy after disasters.

Infrastructure Problem

- Drainage problem
-

Unplanned Urbanization

- Unplanned infra-structural development/construction works
- Unplanned industrialization
- Unplanned road, drainage system, waste management
- Illegal grabbing of canal, river and low lands
- Air and sound pollution in urban areas/cities
- Unplanned brick field and use of trees
- Black/toxic smokes and fumes from factory (like urea fertilizer) and vehicles
- The building codes are not being followed
- Wastage, oil and chemical substances from sip breaking industry pollute sea and surrounding environment

Hazardous Agricultural Production System

- Use of chemical fertilizer in agricultural activities

Institutional weakness

- Lack of coordination among environmental development work

Soil Salinity

- Increasing salinity. About 0.83 Mha of arable land is affected by varying degrees of soil salinity.

Conclusion

The MDGs have highly laudable targets but there is no particular process to achieve them. Bangladesh is in the tract in most cases in relation to the seventh MDG targets. The country has taken significant steps to incorporate sustainable environment into policy as well as programmes. It can report successes in increasing access to drinking water, reforestation in urban areas through the social forestry movement. However, Bangladesh has less than 0.02 hectares of forest land per person, one of the lowest forest-man ratios in the world. Forests are declining at a rate of nearly 70,000 hectares per year. In terms of CO₂ emissions, CFC consumption, Bangladesh is on the tract.

Intensive afforestation on non-government land involving the communities through NGOs may be initiated for the production of fuel wood. This may be an obligatory component of government or any NGO for extending assistance to Railways for rail road sides, R&H for road sides, local government for homesteads, and so on. In every such case the government of Bangladesh must be involved to provide all the required technical assistance in this regard

The number of slum settlements has grown rapidly in recent years and the urban poor are now estimated at more than 11 million, or 37% of the urban population. The scenario is not expecting in the slum areas of urban cities, severe in Dhaka city. The sanitary condition of urban slums is deplorable. Most of the slum dwellers have literally no latrines, only a few have pit or surface latrines. They often defecate on the drains, in open fields, near the roads, or on the riverbanks. The problem is acute with female residents who have to wait till sunset for defecation or use a neighbour's latrine, if available. Unhygienic hanging latrines are still prevalent in urban slums.

The development of energy sector of Bangladesh has been slow. Electricity demand is higher than present supply resulting in a shortage of about 2000MW. Therefore electricity disruption is common phenomenon in the rural as well as urban areas. Bangladesh is also highly dependent on biomass fuels. Most of the population continues to rely on biomass for meeting its energy needs. More than Fifty five percent of the total energy consumption comes from biomass fuels. The draft PRSP II 2008 document of the Government identifies energy as an essential input for economic growth and for achieving poverty reduction and livelihood improvement. It could have been an environment friendly scenario if a sustainable output of these biomass fuels can be made available; leaving aside the organics from the farms to manure the agricultural fields to alleviate the soil degradation problem. Intensive afforestation and management of denuded sites; homesteads, roadsides, railroad sides, etc. may assist this issue to a great extent.

Domestic use of solar energy may be initiated. The solar energy may be used for generating electricity or for heating the water. Small household type equipments need to be developed. Donor may come up with the required technical assistance to develop the devices and involve the NGOs for adoption, sale, distribution, etc.

However, there are certain core issues, which need to be considered in every situation. A number of serious environmental issues such as resource depletion; land degradation, groundwater depletion and surface water scarcity in the dry period, pollution of surface water and groundwater, indoor and urban air pollution, poor sanitation in the slum areas, water resource management, river bank erosion, waste disposal and vulnerability to natural disasters threaten the lives of many people in Bangladesh.

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