Draft Final

Limited Environmental & Social Impact Assessment
And
Environmental & Social Management Framework

Bangladesh:
Dhaka Environment and Water Project

Executive Summary

Department of Environment

&

Local Government Engineering Department

May, 2010

1 INTRODUCTION

Project context: Greater Dhaka[1] currently represents more than 40 percent of Bangladesh's national GDP and its population is growing annually at around 9 percent. Dhaka's population of 12 million people is projected to nearly double by the year 2025. Dhaka is surrounded by rivers and inter-connected with canals which have always formed a life-line for city residents. In last twenty years, a convergence of unregulated industrial expansion, rural-to-city migration, encroachment of the rivers, overloaded infrastructure, confusion about the institutional responsibility for the quality of Dhaka's water bodies, and weak enforcement of environmental regulations have all taken their toll on surface water quality. There is only one sewage treatment plant at Pagla which is currently operating below capacity because of sewerage system failures, and few industries operate Effluent Treatment Plants. Almost all the waste from humans, industry, and millions of farm animals, along with tons of pesticides and fertilizers, make their way into Dhaka's surface water untreated, and a percentage of these wastes infiltrate the groundwater. As a result, pollutant levels in the groundwater are increasing, and many sections of the rivers and canals in the city and surrounding areas, especially the Buriganga and Sitalakhya, are biologically dead during the dry season, spurring widespread public concern and promoting reaction at the highest political levels.
Industrial pollution accounts for more than 60% of the organic pollution load in the Dhaka catchment area; typically concentrated in dense, informal, unplanned industrial clusters located along the major rivers.

2 PROJECT DESCRIPTION

The Dhaka Environment and Water (DEW) Project is a US$ 70 million IDA credit under the Ministry of Environment and Forests (MOEF). The objective of this 6 year demonstration project is to improve the quality of industrial effluent discharged in selected industrial sub-clusters into the greater Dhaka watershed using a technically and financially sustainable pollution prevention and abatement model. The Department of Environment (DOE) is responsible for implementing the monitoring and environmental compliance component. The Local Government Engineering Department (LGED) is responsible for implementing both the industrial pollution prevention and abatement program in 3 industrial clusters and overseeing the design, construction and operationalization of a common effluent treatment plan in one of these clusters.

Project Phasing: In order to enhance project design, maximize flexibility and maintain clear incentives, a programmatic approach will be followed in the project in two distinct phases over 6 years. The first phase will focus on setting the right incentives and institutional framework, through better monitoring and environmental compliance and pollution prevention demonstration programs. The on-going experience from the implementation of this first phase will be carefully monitored through a structured learning program in order to better design the demonstration CETP. The second phase, which involves the detailed design, construction and operationalization of the CETP, would only be initiated once key readiness criteria have been achieved (in Year 2-3). The phasing of investments will be built into the project design by attaching disbursement conditions for the financing of the CETPs.

[1] Comprising the areas administrated by Dhaka City Corporation (DCC), Dhaka District, Gazipur District, and Narayanganj District

Project Area: Project activities will initially focus on three of the nine major Dhaka watershed pollution hot-spots – located in Narayanganj and Gazipur Pourashavas. These clusters typically have over 75 percent of industries in the garment, washing and dyeing sectors, which increases cluster homogeneity and responsiveness to global supply chain incentives. Based on the alternative site analysis, Gazipur is primarily identified as the potential sites for CETPs. The Gazipur district has an area of 1,741.53 aq. km, and is bounded by Mymensingh and Kishoreganj districts on the north, Dhaka Narayanganj and Narsingdi on the south, Narsingdi on the east, Dhaka and Tangail district on the west. The main rivers are Brahmaputra, Shitalakshya, Turag, Bangshi, Balu and Banar. The Figure -1 shows the map of Gazipur district. The primary identified sites for CETP is under Gazipur Sadar Upazilla.

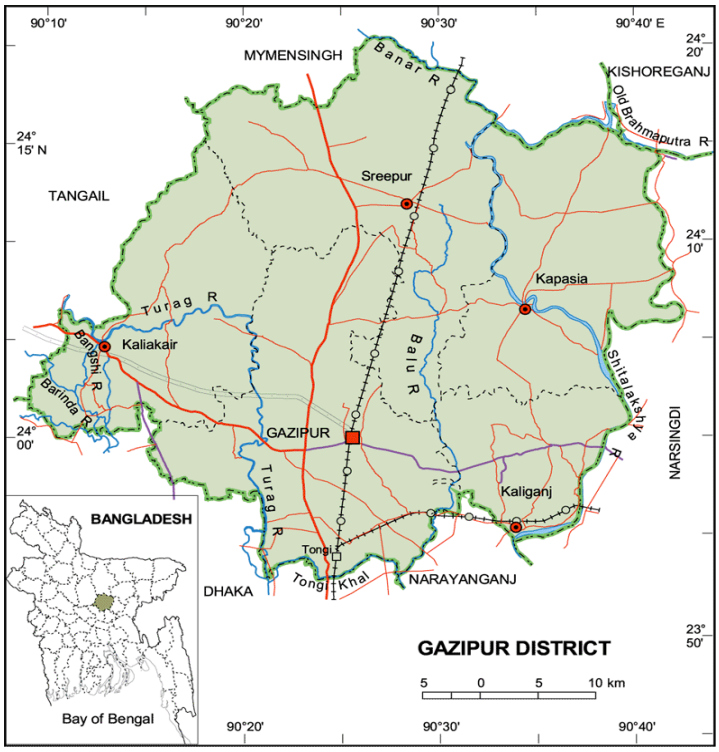

Figure – 1: Map of Gazipur District

Approach for Environment and Social Assessment: The Limited Environmental & Social Assessment (ESA) and Environment & Social Management Framework (ESMF) have been prepared by the Department of Environment (DOE) and Local Government Engineering Department (LGED), the implementing agencies for the Dhaka Environment and Water (DEW) Project. Since the design and exact locations of the cleaner productions and CETPs are not finalized at this stage and only will be available at the end of the Phase 1, the full scale environmental and social impact assessment cannot be carried out during the main project preparation. The limited ESA provides a broader analysis of the potential sites and the ESMF defines the policies and procedures to be followed during to the project implementation to adequately address the environmental and social issues.

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

Relevant Government Policies, Acts, Rules and Plans: The importance of environmental consideration, occupational health & safety and land acquisition related to construction projects has been recognized in a number of national documents.

Major applicable environmental legislation in Bangladesh

- ***Environment Conservation Act (1995)***, which includes environmental guidelines to control and mitigate environmental pollution, conservation and improvement of environment and provisions for obtaining an Environmental Clearance Certificate (ECC) for development projects.
- ***Environment Conservation Rules (1997)***, which provides a first set of rules under the Environment Conservation Act giving categories of development projects and requirements for Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), and preparation of

Environmental Management Plan (EMP), and the procedure for obtaining an ECC. Also quality standards for air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhausts are given.

Other relevant policies/legislations in Bangladesh

Environment

- Environment Policy, 1992 and Environment Action Plan, 1992
- National Environment Management Plan, 1995
- Environmental Courts Act, 2000

Water Resources

- National Water Policy, 2000
- National Water Management Plan, 2001

Industry, Occupational Health & Safety and Construction

- Industrial Policy, 2005
- The Bangladesh Labor Act, 2006
- Bangladesh National Building Code (1993, 2006)

Land Acquisition/Requisition

- Acquisition/ Requisition of Immovable Property Ordinance (ARIPO, 1982)

Implications of Policies and Environmental Clearance Procedure: According to the ECR'97, construction/reconstruction/expansion of CETPs is classified as a "Red" category project. Works such as laying of a network of pipes etc. that transport the effluents to the CETP will fall under CETP project and will also be Red Category. All major infrastructures project will require environmental impact assessments and DOE clearance. It is the responsibility of the proponent to conduct an EIA of the development proposal. The responsibility to review EIAs for the purpose of issuing Environmental Clearance Certificate (ECC) rests on DOE. The procedures for "Red" Category include submission of:

- **An Initial Environmental Examination (IEE)**
- **An Environmental Impact Assessment (EIA)**
- **An Environmental Management Plan (EMP)**

The environmental clearance procedure for Red Category projects can be summarized as follows:

Application to DOE →Obtaining Site Clearance →Applying for Environmental Clearance →Obtaining Environmental Clearance → Clearance Subject to annual renewal.

World Bank Policies on Environment and Social Safeguards: The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local populations. The effectiveness and development impact of projects and programs supported by the Bank has substantially increased as a result of attention to these policies. The World Bank has ten environmental, social, and legal safeguard policies. The following safeguards have been triggered in this project:

- **OP/BP 4.01 Environmental Assessment:** The DEW Project was classified Category A, due to the complexity of environmental issues associated with pollution control and wastewater management. The proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.
- **OP/BP 4.04 Natural Habitats:** Although no impacts on natural habitats are expected, natural habitats (OP/BP 4.04) are considered in the environmental and social framework preparation.
- **OP/BP 4.11 Physical Cultural Resources:** Although no impacts on physical cultural resources are expected, physical cultural resources (OP/BP 4.11) are considered in the environmental and social framework preparation.
- **OP/BP 4.12 Involuntary Resettlement:** Detailed site specific environmental assessment will be required before execution of the subproject. Land Acquisition and Resettlement Policy Framework (RPF) laying out the key principles of the World Bank's OP 4.12 and a strategy to fulfill the policy's requirements that is mutually agreed upon. Specific Social Impact Assessments (SIA) and Resettlement Action Plans (RAP) if needed, will have to be prepared during project implementation for each component where the specific project sites can be identified.

The following activities will be put in place to inform affected citizens, raise their awareness of the issues, and engage them in the monitoring of water quality in the areas adjacent to the project sites:

- **Information and awareness raising campaign** to educate citizens and local institutions about the risks associated with heavy pollution loads discharged into the open, and direct risks posed to the local population in terms of health, safety, and cost-sharing for cleaning up. This can be done by intervening in local schools, as well as through a program of sensitization in the localities affected by industrial water waste.
- **Collaborative (and third-party) monitoring of water quality** where national universities work together with local NGOs or citizens groups to monitor the operation of effluent treatment plants, as well as the quality of discharged water. Participating industries should also be part of this tripartite monitoring to avoid possible conflicts and at the same time to promote their behavior of those who take action to clean up.
- **Establishment of grievance procedure** for parties affected by discharge of pollutants into the open. There should be a clear mechanism for addressing concerns of affected citizens and local institutions, so that grievances are addressed adequately and in a manner that leads to resolution of issues. The grievance redressing procedure should indicated where to lodge a complaint, the roles of all stakeholders in addressing the issues, the timing of the process, and the mechanisms for appeals at various levels in the process.
- **Periodic dissemination of findings of water quality monitoring** focusing on improvements and targets reached by industries that have improved their overall discharge loads. This will work as a "positive disincentive" for other less-compliant factories that would not appear on the list of best performing companies. Reports should be made available publicly and provided to buyers.
- **National level debates on issues of industrial water pollution,** engaging the media with op-ed pieces, visual reportages, and round-tables to bring out positive experiences emerging for the DEW project and at the same time to continue raising awareness among the public on the need for cleaner production processes in Dhaka and in Bangladesh.

4 ANALYSES OF ALTERNATIVES

Alternative Site Analysis: As part of the project preparation, an industrial survey was carried out mainly to identify major pollution outfalls and to select the industries for auditing in 2006-07. The industrial survey comprised sampling and discharge measurement at important/major outfalls. Sampling of effluent was carried out at 41 major outfalls from the 9 industrial clusters2. The test results showed that organic pollution is predominant. Out of the 41 samples collected, BOD concentrations in 34 samples have been found to exceed the EQS of 50 mg/l, and DO concentrations in 40 samples are below the lower limit (4.5 mg/l) of the EQS. In addition, Ammonia concentrations of 19 samples have exceeded the EQS of 5 mg/l. Concentration of Chromium in only one sample (from Hazaribagh cluster where tanneries are situated) have been found too high (30.67 mg/l) in contrast to the EQS of 0.5 mg/l. Concentrations of Cadmium in three samples are higher (almost double) than the EQS of 0.05 mg/l. The test results showed that heavy metal pollution was widespread in Dhaka watershed during the sample collection. However, it should be noted that the samples was collected in 41 outfalls and only one time. The project will carry out continuous water quality monitoring during project implementation.

The study also attempted to compute the Biochemical Oxygen Demand (BOD) loadings from the industrial effluents and domestic effluents. It was found that concerning the pollution potential of organic pollutants (~BOD effluent load), total BOD load originating from industries is much higher than that of domestic origin: contribution of industrial effluent load is found to be about 84%. However, contribution of domestic effluent load increases from 16% to 39% when BOD effluent loads of the 13 domestic wastewater outfalls are taken into consideration. Even then, the contribution of industrial effluent load is more than 60%, which is absolutely significant and deserves serious consideration for any planning to reduce pollution in the Dhaka watershed.

Another study was carried out in 2009-10 to evaluate the PPP options for industrial wastewater treatment and reuse. The study also included a comparative analysis of clusters considered earlier. The following clusters were not considered in that study:

- Hazaribagh – The government has allocated a new industrial area to relocate the tanneries at Hazaribagh
- Tejgaon – This cluster is located in central Dhaka and is undergoing a major shift from industrial to increasingly commercial activities (with many heavy industrial activities now relocating to sites on the city's fringes). Since this trend is expected to continue, it would not be appropriate to invest in future large-scale industrial wastewater treatment investments in this location.
- DPEZ – BEPZA Authority has taken measures to set-up CETP through private investments.

The comparative analysis was carried out based on certain parameters which includes technical aspects including environmental and social issues. The parameters are: i) Delineation of area; ii) industry density; iii) water quality impacts; iv) other direct parameters; v) homogeneity of effluent; vi) land for CETP; vii) options for pre-treatment; viii) types of drainage and distance from river; ix) history of conflict/disputes; x) resettlement issues; and xi) disruption during construction. The study recommended the following sites for CETP construction.

- Konabari-Kashimpur under Gazipur district
- Fatullah under Narayanganj district (Narayanganj II)
- Enayetnagar under Narayanganj district (Narayanganj III)

[2] Tongi, Hazaribagh, Tejgaon, Tarabo, Narayanganj, Savar, Gazipur, Dhaka EPZ and Ghorashal

The feasibility study currently on-going considered the above 3 clusters for the CETP site selection. The following criteria have been considered in feasibility study to finalize the locations: Development, Operation and Maintenance of CETP; Industrial density; Nature and type of industries; Availability of land for the proposed pilot CETP; Cost of land; Existing drainage/sewerage pattern and storm water drainage facility; Resettlement issues during land acquisition for the proposed CETP; Access roads for the construction of CETP; Water quality impacts; Distance from the River to discharge the final effluent after proper treatment; Domestic waste collection, treatment and discharge facility; Population density within the area; Separation of domestic waste and industrial waste facility.

The pollution prevention and pre-treatment activities under phase I will be made available to textile factories in all 3 clusters: Konabari-Kashimpur, Fatullah and Enayatnagar. Only one section/part of one of these existing three clusters will be eligible for CETP under Phase II under the current proposed financing (although the geographical scope may subsequently be expanded through additional financing).

Based on the preliminary technical assessment of the pre-feasibility study, certain parts of the Konabari-Kashimpur industrial cluster appear best suited, from a technical point of view, for the construction of medium sized CETP under phase II. It is therefore currently the front-running cluster. For this reason, this ESMF will now focus pre-dominantly on the Gazipur cluster.

Nevertheless, since the construction of CETPs ultimately need to be demand driven (based on willingness to pay demonstrated under Phase I of the project), the relative demand between and within the 3 clusters will need to be assessed before making the final assessment on both the design and location of the CETPs.

No Action Alternative: The No Action Alternative would see the continued release of untreated sewage into the canals and rivers around Gazipur district, exacerbating the deterioration of the natural ecosystem and health hazard in the adjacent areas. In addition, the Greater Dhaka watershed demands innovative and sustainable model to improve the industrial production system and effluent discharge into the nature.

Individual vs. Common Effluent Treatment Plant: Alternative analysis was carried out between individual effluent treatment option vs. common effluent treatment options in terms of cost, environmental impacts and land availability. This has been done taking into consideration of the experience in other similar other cities in the region and also urban settings of Bangladesh.

- ***Cost:*** Individual ETPs for medium to large textile factories in Dhaka typically cost between 1 and 3 million USD to build and between 9-10 Tk/m^3 to operate. It is anticipated that around 40 factories will be able to connect to a single CETP costing around 40 million USD. Due to conversion of scale, CETP will cost on an average 5-6 Tk/m^3 to run.
- ***Environmental Impacts:*** A centrally operated CETP is more likely to yield positive environmental impacts. Due to intense monitoring requirements, and limited DOE capacity in terms of available technical staffs and logistics, it is much harder to effectively monitor the sound, continuous operation of many individual ETPs. There are also currently no provisions for the disposal of waste (including sludge) resulting in additional pollution risks. In contrast, a single CETP under the responsibility of a single operator reduces the monitoring burden of DOE. Moreover, the operator is much more likely to have greater operational know-how in terms of the sound management of a CETP, including health and safety and appropriate treatment processes. Finally, the construction process and final disposal of waste (including sludge) will be closely regulated by DOE, and will be done under the umbrella of a new CETP operations and sludge disposal guidelines (to be finalized during phase I of the project).
- ***Land availability:*** Although land availability is a major constraint for CETPs, land availability is also a major constraint for individual factories, particularly smaller ones, who simply do not have

the space and therefore cannot construct an ETP on their own premises. Moreover, it is important to note that many individual smaller textile factories simply do not have access to either the land (discussed above), or the financial resources or the managerial / technical know-how and time to invest in building and managing an ETP. In sum, for many textile factories, the choice is not necessarily an assessment of the cost-benefits of the ETP vs CETP option, For many of the smaller factories who face basic constraints mentioned above, CETPs may be the only option available to them in order to comply with national and international environmental standards and maintain export market share.

However, it is not expected that the CETP will fully replace the ETP, rather it provides a complimentary solution, particularly appropriate for small and medium textile factories within close proximity of each cluster.

Alternative Pre-treatment Options: The CETP treatment options are being designed to minimize the need for extensive pre-treatment, since this is an expensive and complex process which is beyond the capacity of this project to implement. Rather, the onus will be on the CETP design to have a sufficiently resilient system. Around 80-90% of textile factories will therefore be able to discharge their effluent after basic pre-treatment only. While the project will help all participating factories incorporate basic pre-treatment, more extensive treatment options will be restricted to either very large textile factories or non-textile factories interested in taking part.

These pre-treatment options at various industries will be required for mainly i) to protect the CETP from disturbances by toxic or other hazardous components; ii) to safeguard that the effluent standard for the CETP can be complied with the national standard (this may require pre-treatment aiming at substances, which cannot be removed by CETP; and iii) to safeguard that the sludge from the CETP will have acceptable properties for a subsequent recycling. Three types of pre-treatment options are reviewed for project design. However, actual option available to individual factories will be decided during the first phase.

Basic Pre-Treatment: Some form of basic pre-treatment is likely to be required for all medium and large textile factories (but smaller ones may be exempt). This basic pre-treatment will include the some or all of the following steps: (i) Screwing (rag removal by a grid); (ii) Oil separation (skimming of floating oil and grease and scum); (iii) equalisation (to buffer incidental high loads of pollutants); (iv) neutralization (to bring wastewater to a safe pH of 6-8.5); (v) sedimentation (to remove sand and settleable matter). In addition, combined flow metering and sampling box will be considered to measure effluent flow and the allow proper (flow proportional) sampling. These data from individual participating factories to be collected during phase I will be critical to enable the final calibration of the CETP design.

***Pre - treatment 1*:** Pre-treatment 1 may be required for 10% participating factories. The following measures aim primarily at protecting the biological treatment or the sewer system from disturbances or damages, but may also be required for complying with effluent standards, as well as safeguarding acceptable sludge qualities, e.g. for recycling to agriculture: *Extreme pH values* (acid, pH<6 and alkaline, pH>8.5) have to be neutralized through the addition of alkali or acid, respectively, preferably in combination with an automatic pH control; High concentrations of *heavy metals* have to be reduced, e.g. by some type of chemical treatment, or by suitable process changes/improvements within the industry; High concentrations of *mineral oil* will have to be reduced, e.g. by some conventional type of oil separator, sometimes enhanced by chemical or other advanced methods; High concentrations of *other toxic substances*, such as pesticides, have to be reduced, or rather eliminated. Possible methods may be internal process measures, or external treatment by chemical and/or biological methods. Choice of method is definitely depending on the individual case; High concentrations of *sulphate*, which may be

corrosive to concrete and create other problems (as mentioned above), can be reduced only by reducing the consumption or formation of sulphate within the industry.

Pre - treatment 2: Pre-treatment 1 may be required for 10% participating factories. The following measures aim primarily at *protecting the WWTP from overloading,* with respect to organic matter (BOD, COD), suspended solids (TSS), or nitrogen (N) and phosphorus (P) compounds. This may also be required for complying with effluent standards: High *TSS* concentrations may have to be reduced by treatment in settling tanks, filters etc; High *BOD* and *COD* loads normally have to be reduced by biological pre-treatment, possibly in connection with chemical flocculation; The risk that high concentrations of *nitrogen* and *phosphorus* would lead to overloading is usually negligible. If pre-treatment would be required, biological and/or chemical methods could be applied.

Alternative Treatment Options: A wide range of treatment technologies are found within the wastewater sector. The industrial cluster of Konabari-Kashimpur under Gazipur is polluted primarily with organic pollutants, which are usually measured as Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). The treatment process selection is also dominated by the effluent standards, financial soundness and ease of operation under local environment. The feasibility study considered a number of treatment options for the Gazipur clusters. These are: (i) Extended aeration (oxidation Ditch); (ii) Sequencing Batch Reactors (SBR) systems; (iii) Duel power aerated lagoons; (iv) Anaerobic reactors + aerated lagoon; (v) Trickling filters + chemical precipitation; and (vi) Chemical precipitation systems.

A Sequencing Batch Reactor (SBR) system- a fill and draw activated sludge system is likely to be highly completive and replicable model in industrial clusters with large proportion of textile factories (and other with high organic content). It has small land foot-print, which means unoccupied sites can be identified in many of Dhaka's industrial pollution hotspots. This land may initially be acquired through government, but over time it is expected to also be purchased by privately. Both O&M and capital costs are competitive compared with only other pollution abatement option (individual chemical or biological treatment option).

5 DESCRIPTION OF THE ENVIRONMENT AND SOCIAL BASELINE

Topography: Topographically the cluster is almost flat, with many depressions, natural *khals*, bounded by the Turag River. There are many vacant low lands on the bank of the Turag River, where many brick manufacturing industries exist. The depressions and canals are dominated by organic clay and peats. The cluster lies on the Madhupur Clay with its average thickness of about 10 meters consists of over-consolidated clayey slit and is underlain by the Pleistocene Dupi Tila formation. Most depression and canals are tectonically controlled.

Climate: Gazipur has a humid sub-tropical climate with large variations between summer and winter temperatures. The cluster has a tropical monsoon climate. It has three main seasons: Summer/Pre-monsoon (March to May), Rainy Season/monsoon (June to October), Winter season (November to February). The rainy season is hot and humid having about 90 percent of the annual rainfall. The winter is predominately cool and dry. The summer is hot and dry interrupted by occasional heavy rainfall. The annual average temperature maximum 360C and minimum temperature is about 12.70C. Annual rainfall is about 2,376 mm.

Land use: Agricultural crops dominate within the area and there are many "Brick fields" within the cluster. The main crops are rice, wheat, potatoes, garlic, chilli, onion and other vegetables. There are many industries located within the cluster including "Konabari BSCIC". There are many seasonal fruits

e.g. Jackfruit, mango, etc. The primary sites identified for the construction of CETP are khas lands and not used for any major economical activities. Some lands are used for seasonal cultivations.

Geology and Geomorphology: The Gazipur cluster lies on the southern corner of Madhupur Tract along the Old Brahmaputra, Turag, Bangshi and Sitolakkhya Rivers. This tract is made of sediments of Pleistocene age which is underlain by the Plio-Pleistocene Dupi Tila Formation. The Gazipur study area lies in the deep geosynclinals part. It is characterized by a huge sedimentary sequence of mostly tertiary age testified high tectonic instability or mobility. The stratigraphy of the deep basin including fore deep and fold belt to the southeast is characterized by an enormous thickness of tertiary sedimentary succession. The rocks encountered here are much younger in geologic age and ranges between Oligocene and Recent time. The basin has got the record of rapid subsidence and sedimentation.

Geological structure in Gazipur is delineated mainly based on geophysical survey named as Titas structure. This is an anticlinal fold, which has no surface geomorphic expression and is covered by Titas-Meghna River floodplain deposits. Titas anticline is a north-south elongated semi-domal structure influenced by tectonically positive element from the deep subsurface. Titas anticlinal closure is one of the largest (168 km) in Bangladesh. The structure is asymmetric in nature with steeper dip in the eastern flank and gentler slope in the western flank. There has been indication of faulting in the deeper level in the eastern flank, as shown by seismic reflection discontinuities.

Surface Water Resources: As other parts of the country, this cluster also receives sufficient amount of rainfall (average annual rainfall is 2376 mm). Turag River is the major surface water body in the Konabari-Kashimpur cluster under the Gazipur district. It receives discharges from all the industries situated along the Joydebpur-Tangail road and Konabari-Kashimpur Industrial Zone, which include textiles, footwear, food, chemical, pharmaceutical, detergent, etc. Some of the industries have got their own effluent treatment plant (ETP) and many of them have got no ETP, as a result the surround surface water bodies are polluted, which is a major concern of environmental degradation of the cluster.

Ground Water Resources: There is a good availability of ground water that is being used by hand pumps for drinking and domestic purposes. Some industries are using deep tube wells within their premises to meet the requirement of quality water for various purposes. The scattered homesteads are using hand tube well (HTW) to meet their domestic demand. No data is presently available on pumping rate. Iron and arsenic are the major water quality concern for drinking purposes in Gazipur cluster.

Ecological Resources: The ecological settings of the cluster are mostly with wetland, homestead and roadside vegetation etc. The homestead vegetation has a positive effect on improvement of soil moisture through shading and mulching process. The trees growing at homesteads also ensure for easy access to the fuel wood, fodder and other products. A large number of multipurpose trees (fruit, timber, fodder, medicine) are grown in the cluster. The most common among them are jackfruit, mango, lemon, banana etc. Two major types of fauna viz., **terrestrial and aquatic fauna** have been identified in and around the cluster.

Flora: Wetland flora plays a vital role for biodiversity conservation. The wetland habitat is characterized by anaerobic conditions, which inhibits normal plant growth. The cluster supports two types of wetland e.g., (a) Permanent wetland and (b) Seasonal wetland. The permanent wetland includes rivers and perennial water bodies. This wetland provides refuge and shelter for the most of the aquatic flora. The seasonal wetland serves as the cultivated land. Aquatic flora in the cluster can be divided into communities based on a set of environmental conditions. The communities are as follows: Free-floating plants; Sub merged floating plants; Rooted floating plants; Sedges and meadows; Marginal vegetation.

Forest and Protected Areas: Bhawal National Forest and Bhawal National Park is the biggest forest and protected area with the Gazipur district. These are far away from the proposed CETP sites and no negative environmental impacts are anticipated due to construction of CETPs.

Birds, Wildlife and Wetland Habitats: Leaving aside the common birds like crows, sparrows, shaliks, cuckoos etc. and some domestic cattle, no other wild animals inhabit the area. The wildlife that fully depends on the terrestrial land throughout their whole life, their existence, shelter, food, nesting, breeding and also producing own offspring is called terrestrial fauna. Core components of the terrestrial fauna are amphibian, reptile, birds and mammals.

Fisheries: Fresh water fish habitat such as river, pond and ditches exist in and around the cluster, which provide shelter, feeding, and spawning ground for different types of fresh water fish species. Large-scale human intervention for catching fresh water fishes from their natural habitat/Turag River has been observed. The reproduction, breeding and multiplication of aquatic fishes are very finely tuned and adjusted to the rhythm and amplitude of monsoon flooding in and around the proposed cluster. There are many fishermen within the cluster whose income source is mainly fishing from the Turag River as well as natural canals.

Social and Cultural Profile: Social & cultural profile of this cluster is similar to other parts of Bangladesh. Muslims represent about 90% of the local population, Hindus & other religion represent about 10%. Muslims observe big festivals of End-all Azha & Eid-ul Fitre and Hindus observe Durga Puja, Kali Puja etc.

Population and Community Characteristics: The population of the district as per 2001 Census is 2,026,244 with male 51.77%, female 48.23%; Muslim (91.9%) is the dominant religion and other are Hindu (7.5%), Christian (0.4%) and Others (0.2%). Ethnic nationals are Rajbangshi (Koch), Garo and Mandi. The population of the areas where the CETP siting is proposed is about 62,772 in konabari and about 48,272 in Kashimpur, totaling 111,044.

Socio-Economic Conditions: The Average literacy is 36.25% (male 43.2% and female 29.3%). The major sources of income within the population of this cluster are agriculture, agricultural labour, wage labour, industrial labour, commerce, small shops, small shops in the markets, service, transport, construction, fisheries, hawker, house renting out, land renting out for the Brick field and others.

Physical Cultural Resources: There are many physical cultural resources within Gazipur District, e.g. Bhawal National Park, Bhawal National Forest, Bhawal Rajbari, Natural beauty of Pirojali, Shitalakkhya River, Turag River, Old Brahmaputra, Bangshi, Balu & Banar Rivers.

6 POSSIBLE ENVIRONMENTAL IMPACTS AND THEIR MITIGATIONS

General Impacts of DEW Project: The construction and operation of any wastewater treatment plant and accompanying wastewater collection system may result in potential negative impacts including air, soil and water pollution associated with the following: (a) construction of CETPs; (b) treatment of wastewaters; (c) management of waste sludge from the treatment plants; (d) operations; and (e) decommissioning of CETPs. The following impacts are to be especially considered: odors, noise, spreading of insects, and potential health hazards in the vicinity of discharge, exploitation of the nearby water bodies, potential changes in flora and fauna due to the discharge of treated wastewaters, decline in land value, and disposal of sludge from the treatment plant. In general, the environmental impacts will be observed in 3 phases: i) site development phase; ii) construction phase; and iii) operation phase.

Site Development Impacts

Loss of Natural Habitat and Biodiversity: The clearing of existing vegetation during construction and the development of the facility may result in the complete loss of associated ecological habitats and their fauna, within the footprint of the development. Noise, vibrations, and intrusive activities related to preparation and construction works may tend to scare away any animals remaining on the site after vegetation clearance. These are the environmental trade-offs for the anticipated improvement in the water quality and surrounding ecosystem of the clusters.

Common Mitigation Measures: The purpose of the wastewater treatment project is to reduce the current amounts of untreated sewage that enters into natural ecosystem, thereby allowing for recovery of the inherent natural productivity of the water bodies and restoration of the economic benefits to be derived from a healthy ecosystem. In addition, clearing and construction activity should be restricted to within the footprint of the development. There should be no side-tipping of excavated material or cleared vegetation unto areas outside the footprint.

Dust: It can be anticipated that a certain amount of air borne particulate matter (dust) will be generated by earth moving activities during site development and construction. This situation may be worse during the dry season. Air borne particulates may pose a hazard to residents in the vicinity or downwind of the construction site that suffer from upper respiratory tract problems. Otherwise it may only be a nuisance. The impact of dusting is short-term, lasting for the duration of the construction activity, but it may be severe if it causes significant health problems.

Common Mitigation Measures: Access roads and exposed ground should be regularly wetted in a manner that effectively keeps down the dust. Stockpiles of fine materials should be wetted or covered with tarp especially during windy conditions. Workers on the site should be issued with dust masks during dry and windy conditions.

Noise: The use of heavy equipment and labor activities during site clearance, land filling and road construction works will inevitably generate noise. However, the proposed CETP sites are sufficiently far away as to not be affected. The remoteness of the site should help to ameliorate noises.

Common Mitigation Measures: The communities that may be affected by noise should be consulted in advance to reduce degree of annoyances. No noise creating equipment should be used during night time. Workers operating equipment that generates noise should be equipped with noise protection gear. Workers operating equipment generating noise levels greater than 80 dBA continuously for 8 hours or more should use earmuffs. Workers experiencing prolonged noise levels of 70 – 80 dBA should wear earplugs.

Construction Impacts

Construction Material Sourcing: The construction materials such as sand and brick are normally obtained from the local vendors. Sand is collected from quarry operations to nearby rivers. Bricks are produced using clay and firing by coals. Conscious or unwitting purchase of these materials from unlicensed operations indirectly supports, encourages and promotes environmental degradation at the illegal quarry sites, creates air pollution from using energy inefficient technologies and causes medium to long-term negative impacts at source.

Common Mitigation Measure*s*: Construction materials must be obtained from officially licensed and approved quarries and brick fields. The copies of the relevant licenses made available for inspection at the site by the Contractor.

Transportation of Materials: The various materials required construction will be obtained from sources elsewhere and transported to the site. Transportation of these materials, typically in over-laden and sometimes uncovered trucks, usually results in undue road wear-and-tear. Special note is made here of the unpaved road surfaces in the area. In the case of fine earth materials, dusting and spillages occur on major roadways between source and site. Dusting degrades local air quality and material spillages worsen driving conditions and increase the risk of road accidents. These occurrences represent indirect, short-term, reversible, negative impacts on public health and safety.

Common Mitigation Measures: All fine earth materials must be enclosed during transportation to the site to prevent spillage and dusting. The cleanup of spilled earth and construction material on the main roads should be the responsibility of the Contractor and should be done in a timely manner (say within 2 hours) so as not to inconvenience or endanger other road users. These requirements should be included as clauses within the contracts made with relevant sub-contractors. The transportation of lubricants and fuel to the construction site should only be done in the appropriate vehicles and containers, i.e. fuel tankers and sealed drums. As far as possible, transport of construction materials should be scheduled for off-peak traffic hours. This will reduce the risk of traffic congestion and of road accidents on the access roads to the site. Appropriate traffic warning signs, informing road users of a construction site entrance ahead and instructing them to reduce speed, should be placed along the main road in the vicinity of the entrance and main Gazipur town. Flagmen should be employed to control traffic and assist construction vehicles as they attempt to enter and exit the project site.

Materials Storage: The improper sitting of stockpiles and storage of sand, gravel, cement, etc., at the construction site could lead to fine materials being washed away, during heavy rainfall events, into rivers and nearby agricultural lands. This would not only represent a waste of materials but would also contribute to turbidity and sedimentation with consequent negative impacts. Refueling and maintenance of large vehicles and earth moving equipment will take place at the construction site and therefore fuel and lubricants will have to be stored on the site. This will increase possibilities for accidental spills of hydrocarbons and contaminants could be washed into the river and adjacent areas.

Common Mitigation Measures: The stockpiling of construction materials should be properly managed and controlled. Fine-grained materials (sand, marl, etc.) should be stockpiled away from surface drainage channels and features. Covering of open piles stored materials should be considered to prevent them from being washed away during rainfall. Safe storage areas should be identified and retaining structures put in place prior to the arrival and placement of material. Hazardous chemicals (e.g. fuels) should be properly stored in appropriate containers and these should be safely locked away. Conspicuous warning signs (e.g. 'No Smoking') should also be posted around hazardous waste storage and handling facilities.

Construction Waste Disposal: Solid waste generated during site preparation and construction work would include cutting of vegetation and typical construction waste (e.g. wasted concrete, steel, wooden scaffolding and forms, bags, waste earth materials, etc.). This waste would negatively impact the site and surrounding environment if not properly managed and disposed of at an approved dumpsite. Cleared vegetation burnt onsite would generate smoke, possibly impacting negatively on ambient air quality and human health. Vegetation and solid waste, if allowed to accumulate in drainage ways, could cause localized pooling and flooding. Pooling of water, in turn, would create conditions conducive to the breeding of nuisance and health-threatening pests such as mosquitoes. Poor construction waste management constitutes a short-term negative impact.

Common Mitigation Measures: A site waste management plan should be prepared by the contractor prior to commencement of construction works. This should include designation of appropriate waste storage areas, collection and removal schedule, identification of approved disposal site, and a system for supervision and monitoring. Preparation and implementation of the plan must be made the responsibility of the building contractor with the system being monitored independently. Vegetation and combustible

waste must not be burned on the site. Reusable inorganic waste (e.g. excavated sand) should be stockpiled away from drainage features and used for in filling where necessary. Unusable construction waste, such as damaged pipes, formwork and other construction material, must be disposed of at an approved dumpsite.

Other Waste Management: Inadequate provision of toilets for workers can lead to ad hoc defecation in secluded areas on the site, thus creating unsanitary conditions and sources of odor and fly infestation. Improper disposal of food cartons and other domestic forms of construction camp garbage could lead to littering of the site and pollution of adjacent areas.

Common Mitigation Measures: Sanitary latrine facilities with adequate water facilities should be constructed for the workers. Provisions should be made for waste bins/cans and erecting 'no liter' signs. Arrangements should be made for the regular collection of litter and for its disposal.

Drainage Congestion: CETP site development may lead to drainage congestion and water logging if the design does not consider the changes of drainage pattern in whole area.

Common Mitigation Measures: Appropriate design of drainage facilities need to be designed and implemented.

Operation Impacts

Sludge Leachete: During the drying process of the sludge on the drying beds, there is high possibility for pollution of the groundwater due to infiltration of drying beds leachate. As the drying bed generally covers a large area, the possible negative impact is also assessed (affecting a wider surface/groundwater aquifer area). There is high possibility for groundwater and soil pollution with substances due to leakages and infiltration of the leachate from the sludge with hazardous substances disposed on temporary storage at the WWTP site.

Common Mitigation Measures: Proper treatment facilities for sludge should be recommended by analyzing alternatives for sludge treatment and reduction of the quantities of sludge and to propose optimal solution according to the local conditions. In addition, regular a ground water monitoring program should be designed.

Odor: Whereas one of the main sources causing odor is scum, overloading will also result in odor problems because the treatment capacity will have been exceeded. Wind action can also cause odors. The size of the plant may also result in some degree of wave action.

Common Mitigation Measures: Odor is best controlled by proper design and the nuisance risk is reduced by proper alignment of the treatment plant. Proper sizing and alignment of the plant should be ensured. Scum needs to be appropriately disposed of or properly stabilized. It is also important that the effect of wave action be carefully considered in the design.

7 POSSIBLE SOCIAL IMPACTS

Resettlement due to Land Acquisition Issues: Involuntary resettlement may occur because project activities such as the construction of common effluent treatment plants, can result in temporary or permanent loss of land, crops, and other means of income generation.

Social Dimensions of project Beyond Safeguards: Success of the project is, among other factors, also a function of public pressure on polluters to behave more responsibly. Educating citizens living in the areas affected by heavy pollution loads is critical to continue to put pressure on polluters. The same rationale is

valid in educating local institutions and local government officials. Water pollution carries a heavy cost in terms of public and individual health – costs that are externalized by polluters but internalized by citizens (via their health) and public institutions (via the cost of maintaining public health and paying for damages). To that effect, the project may produce significant positive impacts by improving the overall water quality in the selected areas, both in terms of access to water as well as in terms of reduction of water borne diseases (especially skin-related).

8 ENVIRONMENT AND SOCIAL MANAGEMENT FRAMEWORK

Objectives of ESMF: The purpose of the ESMF is to prepare a Framework for Environmental and Social Assessment and Management describing brief details of potential Environmental and Social issues typically associated with the planning, designing, implementation and post implementation activities envisaged under the DEW project and provide guidelines on how to carry out Initial Environmental Examinations (IEE), Environmental Impact Assessment (EIA) and prepare Environmental Management (Mitigation and Monitoring) Plan (EMP) to mitigate project induced negative environmental impacts and enhance positive environmental and social impacts due to the project interventions. The project will ensure that environmental considerations are given sufficient attention, weight and influence over design decisions of CETPs. To this end, it will carry out Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) for all CETPs and pipe collection networks supporting the CETPs.

The ESMF highlights the general polices, guidelines, codes of practice and procedure to be taken into consideration for integration of environmental and social aspects into the project design. Adhering to the principles and guidelines and using the potential environmental issues layout in ESMF will help the implementing agencies (viz. PMUs) to ensure compliance with the related Government Polices and associated rules regulations and also with the environmental and social safeguard polices of World Bank.

9 ENVIRONMENTAL ASSESSMENT, REVIEW AND MONITORING IN DEW PROJECT

The environmental assessment of the subcomponents (cleaner production and CETPs) will require analysis of different environmental parameters for different activities in pre-construction, construction and Operation & Maintenance phase. These are:

Physical Environment

Soil – Erosion risks, Soil quality/contamination

Resources – Fuels/Electricity, Construction materials – stone, bricks, aggregates, Land specially undeveloped and/or agricultural land

Water – Interpretation or alteration of river beds, alteration of aquifer, water quality/contamination

Air and Noise – Air quality, noise pollution

Biological Environment

Terrestrial Fauna – Effect on grass and flower, trees and shrubs, farmland, endangered species, fragmentation of terrestrial habitats, disturbance of habitats by noise or vibration, reduction of biodiversity

Aquatic biota – Habitat removal, contamination of habitats, reduction of aquatic biota

Social Environment

***Economy* –** Creation of new economic activities, commercial value of properties, generation of temporary and permanent jobs, effects on crops, reduction of farmland productivity, savings for consumers and private entrepreneurs, savings in foreign currency

***Occupational Health* –** Accidents, temporary health effects, chronic health effects, acute health effects

***Cultural* –** Land use, recreation, aesthetics and human interest

Under component 2, the international consulting firm hired for environmental auditing of factories for cleaner production will also screen/assess the environmental impacts of the cleaner production initiatives and proposed the mitigation and monitoring measures. The report prepared by the consultant in cooperation with the entrepreneurs/factory management. Then, it will be the responsibility of the individual factory management to get their own yearly Environmental Clearance Certificates from DOE to join in cleaner production process.

Environmental assessment of CETPs will be carried out in 2 stages. In parallel to the 'Transaction Consultant' for the detail design of the Public Private Partnership (PPP) model, feasibility study and technical design, an International Firm will be hired to carry out detailed environmental assessment of the selected CETP options in potential sites and prepare the environmental management plan with costing. The DBO contractor will further carryout the environmental assessment on the selected option.

The review of environmental and social assessments (EAs) is essential to assess the adequacy of the EA for decision making on project proposals and to ensure that its conclusions and implications are taken forward into the implementation stage. The review will be carried out at 2 stages: first, at the implementing agency level i.e., Local Government Engineering Department (LGED) and second at the Department of Environment (DOE), the regulatory body. LGED management unit will hire the services of one National Environmental Specialist during the project period to review the detail design, environmental assessment, and adequacy of environmental management plan. In addition, an International Environmental Specialist will be recruited at LEGD to independently review the EA carried out by Design, Build and Operate (DBO) contractor and ensure that the environmental concerns are adequately addressed in the final design. The DOE, as the final environmental review authority for issue of Site and Environmental Clearance Certificates will review to confirm the screening categorization, to agree and approve the IEE and EIA (where applicable) conclusions and – if these are satisfactory - to issue the project site and Environmental Clearance Certificate. The management unit of the DOE will also supported by an Environmental Specialist. All the environmental assessment documents will require the World Bank's clearance before implementation. The monitoring of the implementation of the EMP will be carried out in different levels. The detailed program including parameters to be monitored will be designed and finalized during the Phase 1 of project implementation. The followings stakeholders will be involved in monitoring of cleaner production and CETPs.

Individual factory owners – Daily basis for cleaner production
DBO contractor –Daily basis for CETPs
LGED (including consultant) – Weekly basis for CETPs and monthly basis for Cleaner production
DOE (including consultant) – Quarter basis for both CETPs and Cleaner Production
Local Communities – Monthly basis for CETPs
Industry Association – Monthly basis for both CETPs and Cleaner Production
World Bank/Third Party – Half yearly basis for both CETPs and Cleaner Production

10 SOCIAL ASSESSMENT AND RESETTLEMENT POLICY FRAMEWORK

Before taking possession of acquired lands and structures and before the start of civil works construction, Project Affected People (PAPs) will be paid compensation and other assistance in full. Where PAPs are entitled to relocation, the relocation site will be fully developed before the PAPs are displaced. LGED, the implementing agency will ensure that the standard of living of all affected persons is restored to the level enjoyed before the commencement of the project, and, if possible, improved.

This Resettlement Policy Framework (RPF) seeks to address the inadequacy of the existing legal provisions to meet the requirements of the project funded by the World Bank as discussed in the previous section. Three important elements of involuntary resettlement are: (i) compensation for loss of assets, loss of livelihood and income, (ii) assistance for relocation, including provision of relocation sites with appropriate facilities and services, and (iii) assistance for rehabilitation to achieve at least the same level of well being with the project as without it. This can be ensured through the following basic objectives:

(i) Avoid involuntary resettlement where feasible and minimize resettlement where population displacement is unavoidable,
(ii) Ensure that displaced people receive compensation, assistance and rehabilitation so that they would be at least as well off as they would have been in the absence of the project,
(iii) PAPs will benefit from the project, and
(iv) Project stakeholders, including PAPs are consulted and given the opportunity to participate, as practicable, in the design, implementation, and operation of the project.
(v) Additional assistance should be provided to vulnerable groups.

Following basic categories of issues/impacts are foreseen under this entitlement framework: (i) Loss of land; (ii) Loss of structure; (iii) Loss of source of livelihood; (iv) Loss of access to common resources and facilities; (v) Loss of standing crops, trees and perennial trees; and (v) Loss of public infrastructure.

Despite best efforts to arrive at fair rewards in project involving involuntary resettlement, there shall always be a few unsatisfied citizens. The LGED will make efforts at project level to resolve grievances through negotiations *involving community leaders and PAP's representatives.*

LGED will appoint adequate full time staff, supported by a social safeguards specialist consultant, to monitor the process of resettlement. In order to assist with this monitoring, LGED shall obtain and maintain appropriate baseline data prior to the resettlement impacts. The monitoring staff will prepare periodic progress reports for submission to the Project Director. The main objective of the monitoring reports is to determine whether the resettlement is effective and to make the needed recommendations for change.

11 INSTITUTIONAL ASPECTS

Environmental capacity assessment and staffing needs: Given DOE's limited capacity to implement its core regulatory functions, technical assistance will be provided to develop its institutional capacity in monitoring pollution and enforcing environmental compliance. In contrast, LGED is one of the leading government agencies who have incorporated environmental assessment within their project planning and is familiar with both IDA project implementation and Bank safeguard policies. Nevertheless, since this project is a category A and LGED has limited experience overseeing the establishment of wastewater treatment facilities, a full time international environmental specialist will be hired by the LGED PMU. Moreover it should be noted that both (i) the CP consultant firm hired under component 2 to deliver

cleaner production audits and implement basic pre-treatment systems in factories and (ii) the CETP operator under the DBO contract will be required to have an environmental specialist on their teams.
Social safeguard capacity building and staffing needs: The Involuntary Resettlement (OP/BP 4.12) Policy will be triggered because activities associated with the construction of the CETP under component 3 can result in temporary or permanent loss of land, crops and other means of income generation. As the exact location of the project site(s) is not known at this stage, project implementer(s) will need to prepare a Land Acquisition and Resettlement Policy Framework (RFP) as well as a specific Social Impact Assessment (SIA) and Resettlement Action Plans (RAP). In addition to benefiting from recent Bank led capacity building, the LGED PMU will include a social safeguards specialist. Finally, as with environmental considerations, both the CP consultant firm and the CETP operator will also hire respective social safeguard specialists.

Other project arrangements. The DOE and LGED PMUs will be responsible for *inter alia*: (i) the proper implementation of the ESMF; (ii) expediting the land acquisition process; compensating Project Affected Persons (PAPs); and implementing the Resettlement Action Plan (RAP); and (iii) liaising with appropriate government institutions / stakeholders.

Community participation is both an essential criteria and important strategy for an integrated environmental and social analysis process; as well as effective project design and implementation. Consultations initiated during project preparation will be continued during implementation, in line with the requirements set out in the ESMF, including the establishment of a comprehensive framework for participatory consultation. Consultations will be undertaken at the minimum at the selection of sub-projects; during environmental screening and assessment; and while formulating EMPs.

Since the project's success will, in large part, also be a function of public pressure on polluters to behave more responsibly, the following activities also form an intrinsic part of project design: (i) information and awareness raising campaign on pollution costs and clean up options for all local stakeholders; (ii) collaborative monitoring of water quality, including involvement of local community in monthly monitoring of river quality / CETP effluent; (iii) establishment of grievance procedures within DOE; (iv) periodic public dissemination of water quality monitoring data; (v) national media led debates on pollution.

The total project costs include funds to carry out (i) the environmental assessment; (ii) EMP & resettlement plan design and implementation (including adequate contingency for RAP/PAP costs); and PMU safeguards specialists hiring and training. In case of overruns due to unforeseen circumstances or delays, the MoEF will allocate additional funds as necessary. The project also has provisioned for unallocated funds which could be utilized for this purpose.

12 PUBLIC CONSULTATIONS AND DISCLOSURE

The limited ESA and ESMF has been prepared in consultation with the relevant stakeholders, including government agencies, local government bodies, industry associations, individual factory owners and managers, ETP/CETP experts and operators, local communities, quality assurance companies, NGOs and other development partners. The full ESA and ESMF report, as well as a summary Bangla version will be posted on the DOE and LGED websites. Hard copies will be retained within LGED's local offices for further stakeholder comment and input. The environmental and social screening/assessment to be carried out during phase I will also be available in the LGED and DOE websites. All these documents will require at least 2 times consultation with affected people, local community and other stakeholders.