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Bangladesh Industrial Energy Efficiency Opportunities Assessment

Task 1: Industry Opportunities and Profile Report

March 23, 2012

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1.0 Introduction

This report is prepared under USAID's "**Industrial Energy Efficiency Opportunities Assessments in Bangladesh" project,** a project under ICF International's Leader with Associates Cooperative Agreement with USAID, entitled "Energy Efficiency for Clean Development Program, No. AID-OAA-L-11-00003-00. The report summarizes the project team's findings from its initial screening and early assessment efforts for export-oriented, high energy-consuming industrial sectors that have opportunities for energy savings. It provides a snapshot of energy production in Bangladesh, selected industry data, energy consumption profiles for eight of the top energy consuming industries, and early analysis of industry opportunities. Four of these industry sectors were selected for further detailed analysis, where the team will propose specific interventions to improve energy efficiency during the remainder of the project.

Background

Bangladesh currently faces energy shortages caused by rapid economic growth over the past ten years. While the demand for natural gas, which is the primary domestic energy resource, has increased to sustain growth, actions to increase its generating capacity have lagged behind. The situation is exacerbated by demand from the power sector, which uses natural gas to generate electricity. In addition, the current low price of natural gas has contributed to its rapid and inefficient consumption across all sectors and diminishing its supply. With declining natural gas resources and the inability for generation to meet demand, industries and the power sector, which are the primary consumers, have started experiencing shortages. Reduced availability of gas for power generation leads to frequent power outages across the country, which become prolonged during the peak summer months. Among its many impacts, this adversely affects the agriculture sector which requires power for irrigation, as well as small and medium industries that do not have an alternate power supply.

To address the frequent power outages on the grid, various consumer sectors have resorted to back-up or captive power generation in the form of gas engines. This has further exacerbated the problem of insufficient gas availability, where the textile sector alone has 1,200 MW of aggregate captive power generation capacity to meet its energy requirements. Acute shortages of natural gas have been experienced since 2009. As the Bangladesh government and industries look for ways to overcome the situation, efficient energy end-use emerges as a viable option to sustain the growing demand.

Objectives

The many industry sectors in Bangladesh collectively represent one of the major consumers of natural gas and electric energy in Bangladesh. This project is therefore focusing on industry contributions to energy consumption and seeks to achieve the following objectives:

- Identify, analyze, and prioritize opportunities for energy efficiency (EE) improvements in private industrial sectors;

- Determine the industrial sectors with the greatest opportunities for EE.
- Identify the key interventions within the selected sectors to advance improvement in EE; and
- Identify options and strategies for donor assistance and existing credit facilities to help industries implement these interventions and realize EE potential.

Project Status

Since the project's start-up in January 2012, the project team has conducted the following activities:

- Developed a profile template for industry (Task 1)
- Conducted early research on broad industrial sectors
- Compiled information on eight key sectors
- Developed early profiles of eight sectors and selected four sectors for further analysis
- Conducted consultations with key stakeholders in Bangladesh, including government entities, energy companies, industry associations, multi-lateral and bi-lateral agencies, and academic institutions.

The project team gathered early data through desktop research and by conducting outreach to key stakeholders in Bangladesh, shortlisting eight industry sectors to profile that are export-oriented and privately-owned, two criteria established as part of the scope of this project. To document energy use patterns in production/manufacturing and develop profiles for these eight sectors, the project team conducted a literature review of publicly-available reports and other sources, which included reports published by international agencies (e.g. World Bank, Asian Development Bank (ADB), the International Energy Agency (IEA), United Nations, GIZ, and others). Detailed profiles developed for these eight industrial sectors include the following information:

- General operating statistics – number of plants, capacity, productive output, etc.
- Demography of plants – geographical location, member of industrial association etc.
- Total exports, GDP contribution, and related economic indicators.

Following this initial research, the team traveled to Bangladesh in February and March 2012 to meet with key stakeholders, collect additional data and verify early information from the desktop review. This stakeholder outreach included visits to industry associations such as the Bangladesh Textile Mills Association, Bangladesh Jute Mills Association, Bangladesh Fertilizer Associations, Bangladesh Fisheries Development Corporation, Bangladesh Steel Mill Owners Associations, and Bangladesh Frozen Food Exporters Association. In addition, the team held meetings with the Titas Gas Transmission and Distribution Company Limited (Titas Gas) and donor organizations such as GIZ, IFC and USAID. The team also met with the Center for Energy Studies at the Bangladesh University for Engineering and Technology (BUET). Follow-up visits to Bangladesh are planned in April 2012 to support development of detailed energy consumption assessments for the four targeted sectors.

Industry Profiles – Sector Selection Process

The first of six key tasks for this project is to develop broad profiles for the top energy-consuming industrial sectors within Bangladesh, from which four sectors are to be selected for more detailed analysis on energy-saving opportunities. The completed industry sector profiles are presented in this report in terms of productive output, percent of GDP, number of facilities, number of employees, ownership, presence of industrial associations, and geographic location of facilities. The sectors are ranked in the order of their contribution to export, as well as energy consumption. This report also presents the project team's selection process for the export-oriented industry sectors that this assessment will target over the next few months.

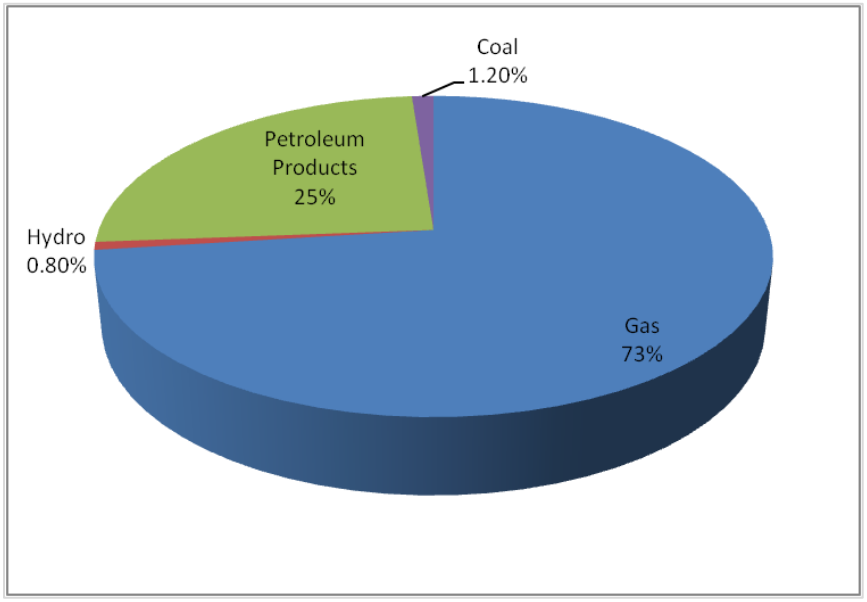
The report is organized as follows:

- Section 2.0 provides summary information on the current energy supply situation and challenges in Bangladesh.
- Section 3.0 discusses the consumption of energy in different sectors in Bangladesh, with emphasis on total energy consumption by industrial sectors.
- Section 4.0 presents the findings from the initial research on the export-oriented sectors of Bangladesh and explains the basis for shortlisting eight sectors for further detailed profiling.
- Section 5.0 profiles the eight selected industrial sectors.
- Section 6.0 presents the rationale for selecting four sectors for detailed energy assessments to estimate their energy savings potential.
- Section 7.0 contains a list of industrial associations of the eight sectors.
- Section 8.0 contains the summary and next steps of the project.
- Annex I lists of contact persons consulted during the initial assessment visits to Bangladesh.

2.0 Energy Overview in Bangladesh

Bangladesh has large natural gas reserves but potentially small reserves of coal. Industrial energy consumption is predominantly natural gas, which was about 73% of the total energy consumed in Bangladesh during 2008-09. The remaining energy demand from all sectors was met by petroleum products such as diesel and furnace oil, hydro-power, and coal. The overall energy mix of Bangladesh is illustrated in Exhibit 1 below.

Exhibit 1: Energy mix in Bangladesh in 2008-09 (Source GIZ)

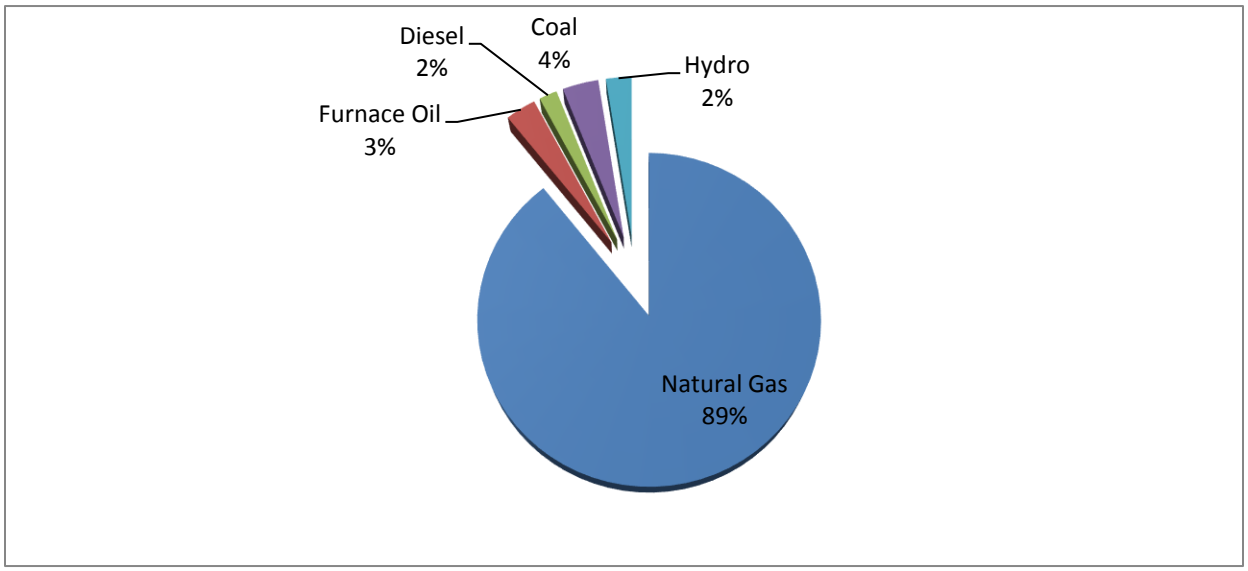


Natural Gas is the main source of energy in Bangladesh driving its economy. The total gas supply for the country comes from domestic gas fields. The consumption of natural gas has increased at a compounded annual growth rate of 7.3% during the past 10 years. Petrobangla is the apex organization under the Ministry of Energy, Mineral and Resources responsible for gas supply and distribution in the country. Petrobangla and its subsidiary companies play a pivotal role in supplying natural gas to all categories of consumers. Availability of natural gas as a low-cost energy resource has helped to establish a competitive edge for Bangladeshi products internationally. However, the increased consumption of natural gas has resulted in a growing mismatch between its supply and demand. According to Petrobangla sources, 23 gas fields have been discovered in the country to date. The proven recoverable reserve has been estimated at 15.04 trillion cubic feet (TCF). As of June 2010, 8.55 TCF gas has been consumed, leaving only 6.49 TCF of recoverable gas. Therefore, the continued availability of gas into the future has become a serious concern for the Government and gas utilities. Currently, the country's gas supplies come from 17 fields with 100 active gas wells. Due to the combined efforts of the Government and the gas companies, the production growth rate of gas has risen from 6.8% to 8.9% between 2006 and 2010, although this is still short of demand levels.

Electric Power also faces a demand-supply mismatch, with demand far greater than the supply due to insufficient capacity. Bangladesh Power Development Board (BPDB), established in 1972, is the authority for planning, construction and operation of power generation and transmission facilities throughout Bangladesh. According to BPDB, the total installed generation capacity in Bangladesh as of June 2011 was 6,727 Mega-Watt (MW), of which 53% is owned by public sector and the remaining 47% is owned by the private sector. The highest recorded level of generated electricity was 4,890 MW (BPDB, June 2011) – a capacity utilization of 73%.

The net energy generated during FY 2010 by public and private sector power plants combined was 29,247 GWh. Out of this, 89.2% was gas-based, 4.8% came from furnace oil and diesel combined, approximately 4% from coal, and 2% from hydro, as depicted in Exhibit 2. In addition, there are about 2,200 MW of captive power plants in the country, most of which use gas as a fuel.

Exhibit 2: Fuel Mix for Power Generation in FY 2010 (Source: BPDB)



Petroleum products constitute about 23 percent of the commercial energy used in the country; the next largest fuel source behind natural gas. About 35% of the requirement for petroleum products in the country is met by a refinery located near Chittagong. The remaining demand for petroleum products is met through imports. Bangladesh Petroleum Corporation (BPC), a statutory organization of the Government under the Ministry of Energy & Mineral Resources Division, is engaged to supervise, co-ordinate and control all the activities relating to import, storage, marketing, and distribution of petroleum products in the country. According to BPC reports, Bangladesh imported about 1.41 million metric tons (MMT) of crude and 2.73 million tons of refined petroleum products in 2010-11. Total imports of petroleum products, including lubricants, were 4.2 MMT in 2010-11. The imports primarily meet the energy demand of industries, transportation, and agriculture sectors.

Coal consumption in Bangladesh is limited to electricity generation and use by the brick-making industry. In recent years, the government has been considering increasing the use of coal for

electricity generation and as a fuel for industry in order to reduce dependency on natural gas. Petrobangla reports that five coal fields have been discovered in the Northwest region of the country with estimated coal reserves of 3.3 billion tons. However, the coal resources have remained underutilized due to various domestic reasons. At present, about 4,000 metric tons of coal are being extracted per day to be used in a 250 MW (2 x 125 MW) coal-fired power plant (Petrobangla 2010).

Energy Deficit

There has been a growing reliance on natural gas for many important end uses, including for power generation. The country is currently facing natural gas supply shortages, which have started to impact the growth of various industrial sectors. It is understood that the economic growth witnessed in past years cannot be sustained without significant new domestic production, diversification of energy mix, or access to imported fuels. As reported by Petrobangla, the current average daily production of gas is about 2,000 million metric cubic feet (MMcf) while the actual demand is 2,500 MMcf – a deficit of around 500 MMcf per day. The potentially more serious gas production shortfall will emerge in the medium term when there will be a need to begin importing gas, or products such as fertilizer which are produced using natural gas as a feedstock. Against this backdrop, Petrobangla has developed programs to enhance gas production by 2015. Considering the prevailing shortages of gas particularly in the Chittagong region, steps have been taken to add about 500 MMcf per day through liquefied natural gas imports.

Bangladesh also faces a power crisis as a result of insufficient efforts to build energy capacity in recent years, aggravated by gas supply shortages. Inadequate generation capacity means demand cannot be met. The maximum demand served in FY 2010 was 4,606 MW while the forecasted demand was 6,454 MW (BPDB 2010); a deficit of 30%.

3.0 Industrial Energy Consumption

This section presents the overall energy usage pattern of various sectors in Bangladesh that contribute to the country's gross domestic product (GDP). During the past two years, the Bangladesh economy grew by about 6% per year. The main factors contributing to steady growth were the increase in industrial production to meet export demand and increased domestic consumption driven by remittances from overseas.

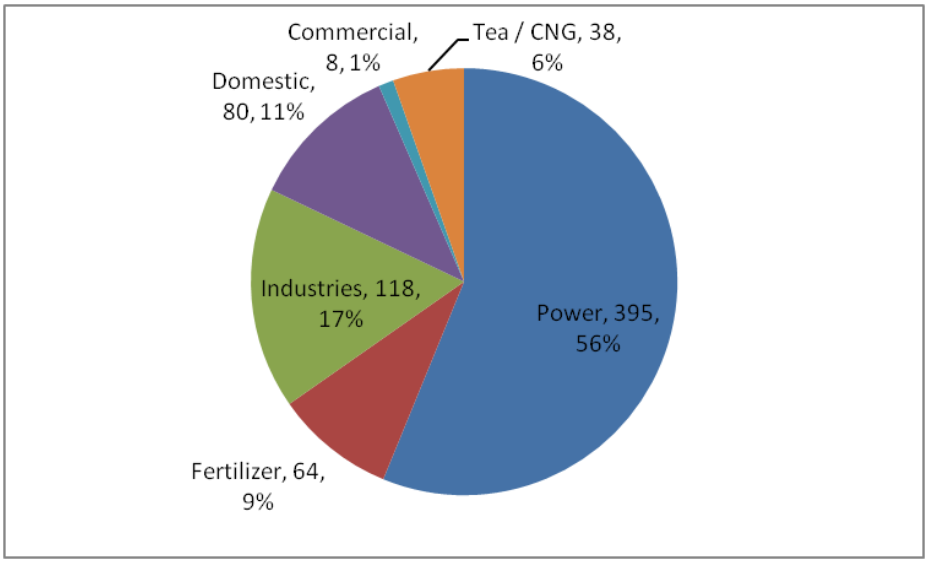
The principal industries in Bangladesh are readymade garments, textiles, chemical fertilizers, pharmaceuticals, tea processing, paper & newsprint, cement, light engineering, sugar, leather, and ceramic. The main use of energy in these industries is for meeting electrical power requirements, heating purposes, and for processing, such as chemical production. Textile mills are the leading energy consumers in the industrial sector.

The other large gas-consuming industries are steel re-rolling mills, ceramic and glass industries, and paper mills. The use of different energy sources in industries is described in the following sections.

Consumption of Natural Gas

Overall demand for natural gas to generate power rose sharply from 2007-08 onwards. Demand for gas in the fertilizer sector rose until the middle of 1990s and then leveled off as no new capacity building took place. All other sectors exhibited rising trends in gas consumption with the fastest growth in demand for natural gas coming from other industry sectors, with an annual increase of about 13%. Exhibit 3 below shows consumption of natural gas by sector in Bangladesh for 2009-10.

Exhibit 3: Natural Gas use in Bangladesh, 2009-10 (Source: Petrobangla)



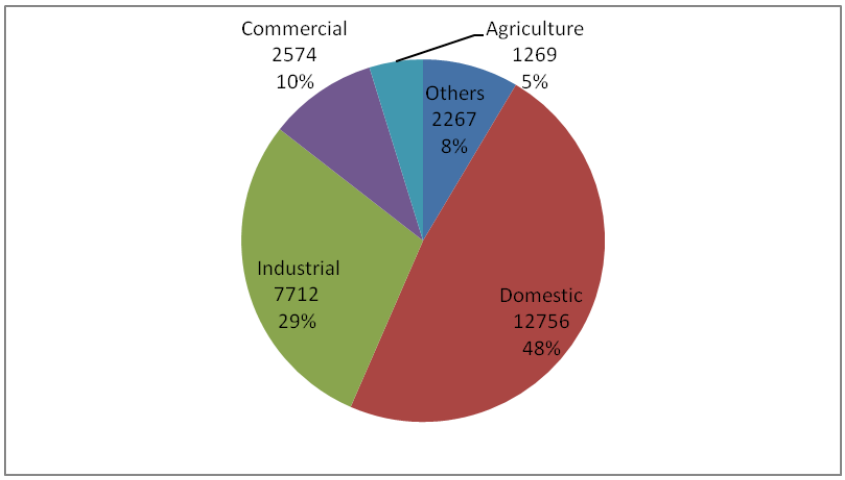
In 2009-10, total consumption of natural gas stood at 703 billion cubic feet. The power sector was the biggest consumer at 56% of the total consumption. This figure includes gas consumption for power generation from the grid, as well as from captive power plants. A further break-down of gas consumption by grid-connected power plants and industry-owned captive power plants is not available. According to a GIZ report, in 2008-09, about 15% of total natural gas consumption was for captive power generation. It follows that of the 56% of gas consumed by the power sector, 41% is utilized for grid power and the remaining 15% is used by the industrial sector for captive power generation. Of the total gas consumption, 17% (118 billion cubic feet) is consumed by industries mainly for meeting process requirements such as heating and feedstock. Since most of the captive power plants are used by industries, total gas usage by the industrial sector in 2009-10 can be estimated at 32% (225 billion cubic feet).

Consumption of Electricity

Total consumption of grid-supplied electricity in 2010-11 was 26,578 GWh; a breakdown of use is shown below in Exhibit 4. Consumption by industrial consumers was 7,712 million KWh, which is 29% of the total electricity consumption (BPDB, 2010-11). In addition, a large number of industries use gas to generate the electricity required in their facility, therefore, mostly small and

medium industries contribute to electricity demand from the grid. These small and medium industries largely rely on back-up generation that mostly runs on diesel.

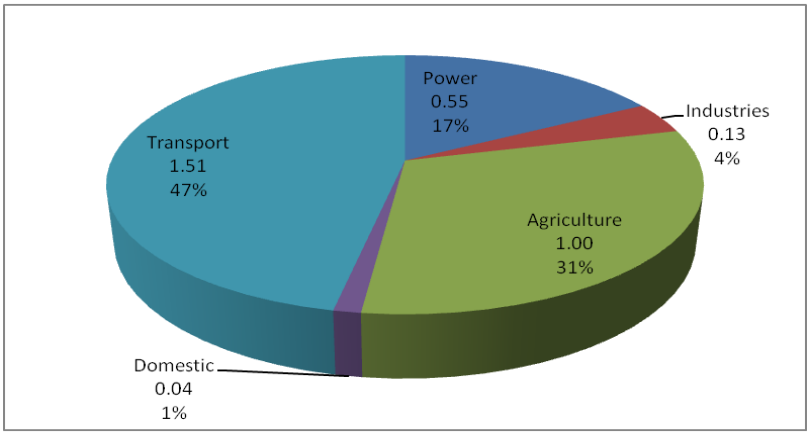
Exhibit 4: Electricity use in Bangladesh, 2010-11 (Source: BPDB)



Consumption of Petroleum Products

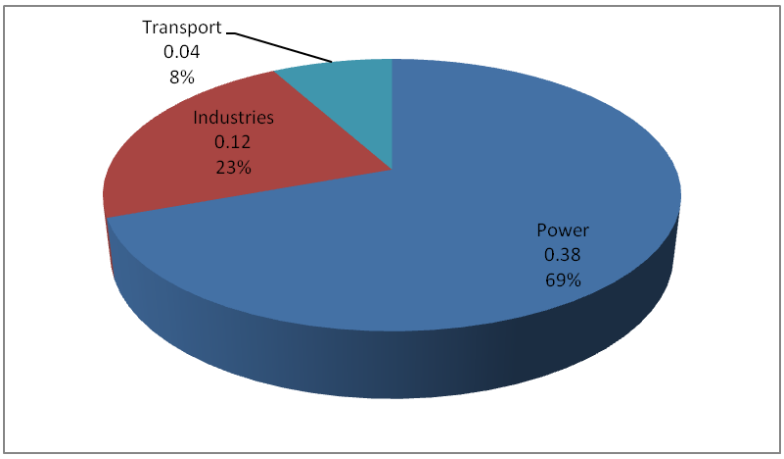
Total consumption of diesel in 2010-11 was 3.22 million tons. Diesel consumption is predominantly by the transportation sector with a 46.8% share (0.13 million ton), followed by agriculture sector with a 31% share of the total. Consumption by industries is low at only 4%, as shown in Exhibit 5.

Exhibit 5: Diesel use in Bangladesh, 2010-11 (Source: BPC)



Total consumption of furnace oil in 2010-11 was 0.55 million tons. Furnace oil is mainly consumed by the power sector, followed by industries as the second largest group of consumers. Sector-wise consumption of furnace oil is shown in Exhibit 6.

Exhibit 6: Furnace Oil use in Bangladesh, 2010-11 (Source: BPC)



Consumption of Coal

The power sector uses 80% of the domestic coal produced. At present, 4,000 – 5,000 metric tons of coal is extracted per day for use in a 2 x 125 MW coal-based power plant. The remaining coal is mostly used by brick kilns which are also dependent on imported coal. Apart from these instances, there is no other usage of coal in the industrial sector. A summary of total energy consumed by the industrial sector is presented below. This analysis demonstrates that major energy usage in industries is in the form of natural gas and grid-supplied electricity.

Consumption Summary

Fuel Type	Annual Fuel Usage in Industries
Natural Gas	225 Billion cubic feet estimated in 2009-10
Electricity	7,712 GWh in 2010-11
Diesel	0.13 million ton in 2010-11
Furnace oil	0.12 million ton in 2010-11
Coal	Negligible

Initiatives on Energy Efficiency

In view of the growing energy deficit due to demand supply mismatch, the government has set up a task force to look into energy efficiency at the national level. The power division in the Energy Ministry has been designated as a focal agency for promotion of energy efficiency-related activities in the country. The ministry has plans to create a Sustainable and Renewable Energy Development Agency (SREDA) through an act of Parliament and has taken the required steps to present the Energy Conservation bill in the upcoming session. The ministry is receiving technical assistance from GIZ on energy efficiency, including assistance in drafting the Energy Conservation Act.

Other multi-lateral donors interested in supporting energy efficiency in Bangladesh are the World Bank, International Finance Corporation (IFC), Asian Development Bank and UNDP. During the last few years, GIZ and IFC have carried out studies on energy efficiency and demand side management across industrial sectors and also conducted pilot demonstrations of energy conservation technologies in textile and steel sectors.

Additionally, there have been initiatives undertaken by local organizations to sensitize consumers to energy efficiency. In July 2011, Titas Gas, which is the country's largest gas transmission and distribution company, created an Energy Efficiency Cell under the Vigilance department with 14 full-time staff. The energy efficiency team has a mandate to carryout energy audits with an aim to reduce wasteful use of natural gas in industrial sectors.

4.0 Review of Bangladesh Industries

This section presents industry sector data compiled from a variety of government and other sources, including the Bangladesh Bureau of Statistics within the Ministry of Commerce, the Bangladesh Bank, the Export Promotion Bureau and others. This data was used by the team as part of the criteria for selection of the four focal sectors for further assessment.

Ministry of Commerce Data. Major export-oriented sectors (2009-2010 data) arranged by contribution to exports

SL No.	Exports of selected principal commodities	Exports in Million BDT (2009-2010)	Exports in Million USD*
1	Readymade Garments (RMG)	790,042	11,368
2	Jute Goods (except carpet)	41,440	596
3	Fish	26,514	381
4	Footwear	16,366	235
5	Raw Hides, Skins & Leather	15,665	225
6	Naphtha & Furnace Oil	13,891	200
7	Raw Jute	12,760	184
8	Terry Towels	10,527	151
9	Pharmaceutical Products	2,761	40
10	Fertilizer	2,667	38
11	Vegetables, fresh/chilled	2,492	36
12	Hats and other Headgear	2,329	34
13	China/Ceramic Table Ware	1,961	28
14	Tea	391	6
	Total	**939,806**	**13,522**
** 1 USD = 69.5 BDT (Average Exchange rate for 2009-10, South Asian Microfinance Network)*			

Export Promotion Bureau, Bangladesh – Export Data

SL No.	Export of Principal Commodities	Value in USD (2010-2011)
1	Knitwear Garments	9,482,061
2	Woven Garments	8,432,397
3	Other Sectors	2,530,211
4	Jute Goods	757,650
5	Frozen Foods	625,041
6	Raw Jute	357,284
7	Agri-Products	333,943
8	Leather	297,832
9	Chemical Products	104,760
10	Tea	3,201
	Total	**22,924,380**

Bangladesh Bank – Exports during April to September 2011

SL No.	Commodity group	Amount in Million BDT	Amount in million USD	% of total export
1	**Readymade garments**	616,926	8,428	79.1%
1.1	Knitwear	378,086	5,156	48.5%
1.2	Woven garments	238,840	3,263	30.6%
2	**Jute manufactures**	23,708	324	3.0%
3	**Fish, shrimps and prawns**	22,190	303	2.8%
3.1	Fish	5,536	76	0.7%
3.2	Shrimp and prawns	16,654	228	2.1%
4	**Leather and leather manufactures**	20,069	274	2.6%
4.1	Leather	12,243	167	1.6%
4.2	Leather manufactures	7,826	107	1.0%
5	**Home Textile**	19,876	272	2.5%
6	**Raw jute**	10,095	138	1.3%
7	**Petroleum & petroleum products**	5,635	77	0.7%
8	**Terry Towel**	4,026	55	0.5%
9	**Bicycle**	1,697	23	0.2%
10	**Pharmaceutical products**	1,589	22	0.2%
11	**Handicraft**	195	2.7	0.0%
12	**Tea**	102	1.4	0.0%
13	**Fertilizer**	621	8.5	0.1%
14	**Others**	52,971	724	6.8%
	A. Sub-total	779,700	10,652	100%
	B. Exports from Export Processing Zones	130,317	1,780	
	Total:(A+B)	**910,017**	**12,432**	

Various Sources- Industry Sectors. The table below presents information compiled from various sources and serves as the initial pool for the short-listing of the eight industry sectors.

SL No.	Bangladesh Bureau of Statistics	Export Promotion Bureau	Bangladesh Bank	Main sectors from different reports	List of thrust[1] (priority) manufacturing sectors in Sixth five year plan (2011-2015)
1	Readymade garments (RMG)	Knitwear Garments	Readymade garments	Textiles, RMG	Agro-based and agro-processing industry
2	Jute goods (except carpet)	Woven Garments	Jute manufactures	Footwear	Ship building
3	Fish	Others	Fish, shrimps and prawns	Glass	Basic chemicals/dye and chemicals
4	Footwear	Jute Goods	Leather and leather manufactures	Ceramics	Readymade garments industry
5	Raw hides, skins & leather	Frozen Foods	Home textile	Food products	Pharmaceuticals
6	Naphtha & furnace oil	Raw Jute	Raw jute	Pulp and paper	Polymer industry
7	Raw Jute	Agri-Products	Petroleum and petroleum products	Sugar	Jute and jute products
8	Terry towels	Leather	Terry towels	Fertilizer	Leather and leather products
9	Pharmaceutical products	Chemical Products	Bicycles	Plastic forming and recycling	Light engineering industry (LEI)
10	Fertilizer	Tea	Pharmaceutical products	Paper and board	Plastic
11	Vegetables, fresh/chilled		Handicraft	Foundry	Frozen fish
12	Hats and other headgear		Tea	Raw jute and Jute goods	Tea
13	China/Ceramic Table ware		Fertilizer	Tea	Home Textiles
14	Tea		Others	Frozen foods	Ceramics
					Energy efficient appliances and electronic goods

[1] Thrust Sectors –mentioned here and elsewhere in the report – is the term used in the local government reports and refers to priority or focus sectors

Eight Selected Sectors and Selection Criteria

Sectors highlighted below have been selected for detailed profiling.

SL No.	Sectors	Export Oriented	Ownership	Rationale for Short listing / Rejection
1	**Textile (textiles, RMG, home textiles)**	Yes	Mainly Private	Highest contribution in exports (about 79% of total export). Major consumer of natural gas among industrial sectors.
2	**Jute (raw jute and jute products)**	Yes	Mainly Private	Ranks second in exports after textiles (about 3% of total export). Process similar to textile (spinning, weaving, etc.) and assumed to be energy consuming. Power shortage is a major problem for attaining desired level of production
3	**Frozen Foods (primarily fish and shrimp)**	Yes	Mainly Private	Features 3rd in exports after textile and jute sectors, with 2.8% of total annual exports. Fish processing plants, ice plants and cold storage are energy intensive. Different reports suggest inefficiency in existing ice plants. "Thrust Sector" for development under sixth 5- Year Plan for Development (2011-15). Lack of electricity leads to poor refrigeration and quality.
4	**Steel Re-Rolling Mills**	No. Supports domestic construction and Light Engineering Industry (LEI)	Private	Steel re-rolling mills are highly energy intensive. They support machinery and light engineering industries which are identified as "thrust sector" under sixth Five Year Plan.
5	**Fertilizer**	No. Overall net importer. One plant is export oriented.	Mainly Government. Two plants are private held	Major consumer of gas after power sector. Gas reserves are declining and need to be addressed. Plants are of old vintage. Three plants are temporarily shut down due to gas shortage.
6	**Leather and Leather Goods**	Yes	Private	1.4% contribution to exports; identified as a "thrust sector" under the sixth Five Year Plan, which would be given priority for growth, incentives, and others.
7	**Tea Industry**	Yes	Mainly Private	Small contribution to exports but many industries consume natural gas. Some processes are inherently energy intensive.
8	**Ceramics**	Yes	Mainly Private	Inherently energy intensive. Gas supply is becoming a concern. Thrust area for export under sixth Five Year Plan.
9	Pulp and Paper	No	Public and Private	There are few plants in Bangladesh. No contribution to exports.
10	Sugar	No	Public and Private	Already targeted for energy efficiency under GIZ program.
11	Ship Building	No	Public and Private	Priority in future for export.
12	Pharmaceuticals	Yes	Private	0.2% contribution to exports; not energy intensive.

5.0 Sector Profiles

For the eight sectors selected for broad profiling – textile, jute, frozen foods, steel re-rolling mills, fertilizer, leather and leather goods, tea, and ceramics – the project team gathered early data through desktop research to prepare general sector profiles. The early research relied on publicly available documentation, including internet and published information. The following reports were among those reviewed and analyzed while preparing the profiles:

- Reports published by international agencies such as World Bank, Asian Development Bank (ADB), the International Energy Agency (IEA), United Nations.
- Reports by the Bangladesh Government, such as the Planning Commission; Ministry of Power, Energy and Mineral Resources, Ministry of Environment and Forests, Bangladesh Bureau of Statistics.
- Annual reports of gas and power companies such as Petrobangla, BPDB, BPC.
- Annual reports of industry associations of the shortlisted sectors.

Following the initial research, the team traveled to Bangladesh in early 2012 to meet key stakeholders, collect additional data, and verify information collected during the desktop review to further develop the profiles. During the visit, the following information was collected:

- Recent energy consumption data with break-down by different industry categories
- Feedback on the selected industries to understand energy use patterns in production/manufacturing
- Feedback on the selection of four sectors for detailed assessment
- Detailed information about the four selected sectors through engagement of their industry associations

Detailed profiles for eight shortlisted sectors are presented below. The profiles include information such as:

- Number of plants, capacity, productive output
- Demography of plants – geographical location, member of industrial association
- Total exports, GDP contribution, and related economic indicators

Textile Sector

The textile sector has emerged as the prime mover of the Bangladesh economy by earning foreign exchange and generating employment opportunities for millions of local people. The sector has significantly contributed towards the government's poverty alleviation program and to the social empowerment of women. The textile sector can be categorized in two segments:

- Primary textile sector consisting of spinning, weaving and textile processing activities
- Ready-made garments sector consisting of knitwear and woven garments manufacturing

As a fast growing sector, the future employment opportunity of textiles is expected to increase rapidly to cater to growing domestic and export demands. Details of the textile sector are presented in the table below.

Type of Products Produced (segmentation of the sector)	Yarn, fabric, knitwear garments, woven garments
Main Export Oriented Product	Knitwear garments (jacket, sweater, t-shirt), woven garments (shirt, trouser), textile clothing
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Contribution to GDP – 12% (Source BTMA)
Export Market Characteristics (including export as portion of total industrial export)	Total ready-made garments (RMG) export in 2010-11: 17.91 billion USD (US Dollars) Ready-made garments – 79.1% of total export from Bangladesh in 2010-11 (41.4% knitwear, 36.8% woven)
Ownership (including local versus international ratio)	Local: 95%, International 5%
Geographic Location of Facilities (including description of clusters)	Dhaka, Chittagong, Narayanganj
Employment Characteristics (including number of employees and male to female ratio)	*Source*: BTMA director's report Textile spinning – 400,000 employees Textile weaving – 80,000 employees Knitting knit dyeing – 324,000 employees Dyeing and finishing – 33,000 export oriented ready-made garments (RMG) – 2 million employees 80% female
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	*Source:* BTMA Yarn Manufacturing (textile spinning) – 385 facilities (production capacity 1,932 million kg p.a.) Fabric Manufacturing (textile weaving) – 743 facilities (2,327 million meter p.a., 5,772 million kg) Textile Processing – 238 facilities (1521 million meter woven, 596 million kg knit, 361 million kg yarn)
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	According to different reports, there is high gas use in this sector. The garments, dyeing, knitting, spinning and textile mills together comprise the leading consumer of gas within the industrial sector. The textile processing units are energy intensive and offer several energy savings opportunities; therefore, this sector is targeted for energy efficiency assessment under the project. Energy consumption is in the form of electricity and steam, and natural gas is primarily used for captive power generation and for raising steam in the boilers. Almost 98% of units are generating captive power based on natural gas.

	According to the BTMA, the textile sector alone accounts for about 10% of the total natural gas consumption in the country. The industry has 985 gas-based generators with installed capacity of 879 MW and 242 diesel generators with installed capacity of 422 MW. The textile industry is estimated to suffer from a production loss of about 35-40% due to energy shortages.
Environmental Impact (including contribution to GHG emissions, water use, and wastewater and waste generation)	Major environment issues – effluent discharge pollution.
Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	Growth – 13.1% average annual growth projection from FY 2010 to FY 2015 (Source: Planning Commission) Challenges – competition from neighboring countries, cotton price volatility.
Industrial Association(s) (presence and strength)	Bangladesh Textile Mills Association Bangladesh Garment Manufacturers and Exporters Association Bangladesh Knitwear Manufacturers and Exporters Association Bangladesh Textile Dyeing & Printing Industrial Association
Opportunity Summary	Important industry – vital to Bangladesh's export earnings Recent rapid growth expected to continue Energy intensive Large number of facilities leads to significant consumption levels (10% of all natural gas consumption) Large number of captive power

Jute Manufacturing Sector

Jute manufacturing is one of the oldest manufacturing sectors in Bangladesh. It accounted for a major share of national income and employment during the 1960s and 1970s and export of jute and jute goods were the two most important sources of foreign exchange. Bangladesh is one of the leading exporters of jute goods in the world. However, the share of jute and jute goods in the Gross Domestic Product (GDP) and exports declined as the preference for synthetic fibers increased. For many decades prior to the emergence of ready-made garment exports, jute and jute goods dominated the export sector making up 70 percent of exports until 1981.The sector accounted for only about 3% of the country's total export in 2010-11. Due to growing environmental concerns, the jute sector in Bangladesh is on a revival path to meet increasing global demand. Details of the jute sector are presented in the table below.

Type of Products Produced (segmentation of the sector)	Raw jute, jute goods (hessian, sacking, yarn/twine, carpet backing cloth)
Main Export Oriented Product	Raw jute, yarn/twine
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Total production in 2010-11 : 729,069 tons Total export in 2010-11: 594,423 tons

Export Market Characteristics (including export as portion of total industrial export)	Raw Jute – 1.6% of total exports from Bangladesh in 2010-11 worth 0.357 billion USD dollars Jute Goods – 3.0% of total exports from Bangladesh in 2010-11 worth 0.757 billion USD dollars. Total export earnings from Jute –in 2010-11 is1.1billion USD.
Ownership (including local versus international ratio)	205 facilities (27 under public sector company Bangladesh Jute Mills Corporation, 178 under private sector) Out of 178 mills under private sector, 81 under Bangladesh Jute Mills Association members and 97 under Bangladesh Jute Spinners Association members
Geographic Location of Facilities (including description of clusters)	Dhaka, Khulna, Chittagong
Employment Characteristics (including number of employees and male to female ratio)	Bangladesh Jute Spinners Association: 55,868 employees Bangladesh Jute Mills Association: 39,000 employees Bangladesh Jute Mills Corporation: 61,681 employees
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	205 facilities. 175,114 installed spindles in jute spinning mills out of which 147,124 are operated; Looms in jute mills: BJMC: 7,320 installed, 5,805 operated BJMA: 12,861 installed, 4,334 operated
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	Energy use figure not available. Through various discussions, it was learned that the jute sector consumes significant energy. Power shortages are a major problem for attaining the desired level of production. Machinery used in jute mills are of aged; most of the mills were set up in the1960s – 1970s. As a reference point, jute production in India (the largest jute producer) consumes 3.75 – 8.02 GJ/ton energy.
Environmental Impact (including contribution to GHG emissions, water use, and wastewater and waste generation)	Not available
Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	Future Growth – identified as a thrust sector for development Challenges – Competition from man-made fibers, power shortage
Industrial Association(s) (presence and strength)	Bangladesh Jute Association, Bangladesh Jute Goods Association Bangladesh Jute Mills Association(108 members) Bangladesh Jute Spinners Association
Opportunity Summary	Important industry – vital to Bangladesh's export earnings Recent rapid growth expected to continue and increase Large consumers of natural gas and furnace oil Efficient and "environmentally friendly" operations are vital to the global competitiveness of the industry

Frozen Foods Sector

Frozen food, comprised of shrimp and fish, is one of the leading export sectors in Bangladesh. The availability of natural resources in Bangladesh make this sector promising for investors looking to supply international as well as in domestic markets. Commercial aquaculture of shrimp has increased rapidly in the coastal belt of Bangladesh. During the last ten years, Bangladesh's seafood industry has earned international recognition by responding to the food-safety and quality requirements of its destinations, mostly, U.S. and the European Union. The frozen food industry has been identified as a focus sector which will give it priority in receiving favorable treatment in regard to taxes, subsidies, credit facilities, land allotments, and foreign exchange allocations. Details of the frozen food sector are presented in the table below.

Type of Products Produced (segmentation of the sector)	Shrimp, fish
Main Export Oriented Product	Frozen shrimp & prawn, frozen fish, fresh and chilled fish, value-added shrimp and fish products
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Total Production: 2,899,198 M Tons in 2009-10
Export Market Characteristics (including export as portion of total industrial export)	2.8% of total export; total export earnings in 2010-11 was 611million USD Shrimp exported in 2010-11 = 144.80 million lbs Fish exported in 2010-11 = 35.14 million lbs Export earnings from shrimp in 2010-11 = 477.83 million USD Export earnings from fish in 2010-11 = 133.53 million USD
Ownership (including local versus international ratio)	Mostly owned by domestic (local) players
Geographic Location of Facilities (including description of clusters)	Chittagong, Khulna, Cox's Bazar, Jessore, Dhaka
Employment Characteristics (including number of employees and male to female ratio)	More than 1 million employees
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	- 149 shore-based export oriented fish processing plants most of which are privately owned. - Out of 148 plants, 74 plants are approved by the EU to supply frozen seafood to its member states. - 4 fish processing plants and 12 freezing plants are owned by BFDC (a public sector company).
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	Energy is used in chillers/freezing plants/frozen storage. The primary energy source is electricity in fish processing plants. Plants also have diesel-based generators which are used regularly due to erratic grid power supply.
Environmental Impact (including contribution to GHG emissions, water use, and wastewater)	Solid waste generation, waste water generation, during the production, exhaust emissions from diesel generators The environment policy of Bangladesh covers the fisheries sector.

Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	Identified as thrust sector for development. BFFEA has set a target of 1.5 billion dollars from export of shrimp and fish by 2015.
Industrial Association(s) (presence and strength)	Bangladesh Frozen Foods Exporters Association (BFFEA)
Opportunity Summary	Important industry – vital to Bangladesh's export earnings Recent rapid growth expected to continue Depends on liquid fuel to generate power Increased power reliability will increase productivity

Steel Re-rolling Sector

The steel re-rolling industry has developed during the last few years and this sector is serving as the backbone of the Bangladesh economy. However, it is one of the most energy intensive industries. During the last seven years, a few steel re-rolling mills have been modernized, but the vast majority is still continuing with old processes. Details of the steel re-rolling sector are presented in the table below.

Type of Products Produced (segmentation of the sector)	Process steel ingots into rods and bars, etc. These products are used in construction and also by the light engineering industry to produce machinery/components.
Main Export Oriented Product	Auto parts, bicycle, pumps, etc.
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Not available
Export Market Characteristics (including export as portion of total industrial export)	Not available
Ownership (including local versus international ratio)	Not available
Geographic Location of Facilities (including description of clustering)	Re-rolling mill cluster near Narayanganj, Chittagong
Employment Characteristics (including number of employees and male to female ratio)	Not available
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	Re-rolling mills - 250 plants, 2.5 million ton capacity per year 25 plants are modern, 5 are large automatic units, 15 plants are medium size, 150 plants are small Capacity of big and medium plants ~ 50% of total capacity Capacity of smaller plants ~ 50% of total capacity Bangladesh re-rolling mill association has 146 members
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	Energy use data not available Furnaces and motors in re-rolling are energy intensive. Natural gas is primarily used as fuel

	All big plants have captive generation According to GIZ report, specific energy consumption of steel re-rolling mills in cubic-meters of gas per ton of steel are 75-90 for classical mills, 45-60 for mills with recuperators, 30-40 for modern mills.
Environmental Impact (including contribution to GHG emissions, water use, and wastewater and waste generation)	Not Available
Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	6.75% annual average manufacturing sector growth projected; light engineering industry is a priority sector for export oriented growth.
Industrial Association(s) (presence and strength)	• Bangladesh Re-rolling Mills Association • Bangladesh Steel Mill Owners Association
Opportunity Summary	Important industry for Bangladesh's domestic infrastructure development Important sector for the growth of light engineering industries Recent rapid growth expected to continue Energy intensive Large number of facilities leads to significant consumption levels

Fertilizer Sector

The major chemical fertilizers used in the agriculture sector are urea, triple super phosphate (TSP), single super phosphate (SSP), and di-ammonium phosphate (DAP). Consumption of these chemical fertilizers in Bangladesh has steadily increased while domestic production has drastically decreased due to the low availability of gas. Nevertheless, the fertilizer sector is the second largest gas user after the power sector. Bangladesh Chemical Industries Corporation (BCIC), is a government-owned company with the vast majority of fertilizer factories, all of which are more than 20 years old. The one privately held factory is an export-oriented urea plant owned by the Karnaphuli Fertilizer Private Limited. An overview of the fertilizer sector is presented in the table below.

Type of Products Produced (segmentation of the sector)	Urea, Ammonium sulphate, TSP (triple super phosphate) and DAP (diammonium phosphate) MOP (muriate of potash) fertilizer is 100% imported
Main Export Oriented Product	Bangladesh is a net importer of fertilizer. Average annual export of fertilizer from 2006-07 to 2009-10 was 0.5% of total export from Bangladesh, but it is not clear which fertilizer type was exported.
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Urea demand in 2010-11 is 2.83 million tons Total domestic production in 2010-11 is 0.7 million tons Total Import in 2010-11 is 1.8 million tons

Export Market Characteristics (Including Export as Portion of Total Industrial Export)	Net importer
Ownership (including local versus international ratio)	8 plants owned by Bangladesh Chemical Industries Corporation (BCIC) which is fully owned by the government. Single plant owned by KAFCO (joint venture between government (47%) and foreign companies) 1 TSP plant owned by the private sector (Hussain Chemicals)
Geographic Location of Facilities (including description of clustering)	Plants located at Fenchugonj, Ghorasal, Ashugonj, Polash, Chittagong, Rangadia, Tarakandi. Of the total six plants, three fertilizer plants are about 40 years old. The remaining three urea plants were established in the late 1980s. BCIC plants at Polash, Ghorasal and Chittagong have been temporarily shut due to a gas shortage.
Employment Characteristics (including number of employees and male to female ratio)	Not Available
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	BCIC – 8 plants (6 urea, 2 DAP, 1 TSP) Private Sector – 1 urea, 1 TSP Urea capacity – 2,895,700 tons per year , Ammonia – 1,886,700 tons per year, Ammonium Sulphate – 10,000 tons per year, DAP – 489,600 tons per year TSP capacity – 697,000 tons per year
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	Fertilizer is a major consumer of natural gas. This sector is given gas at a very cheap price. Fertilizer sector consumed about 11.85% of total gas production in 2009-2010.
Environmental Impact (including contribution to GHG emissions, water use, and wastewater and waste generation)	Not Available
Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	Average 7% growth per year in next 5 years as per the sixth Five Year Plan Challenges – gas availability
Industrial Association(s) (presence and strength)	Bangladesh Fertilizer Association. BFA membership is compulsory for fertilizer manufactures, importers and dealers for better monitoring of performance.
Opportunity Summary	Large energy consumer but public sector industry

Tea Processing Industry

The tea industry in Bangladesh dates back to 1840 in Bangladesh. Damages suffered during the Liberation War resulted in poor management, high staff vacancies, insufficient inputs and funds, and inadequate maintenance of tea plantations. This led to low yield and poor quality tea and the

industry received government attention through a development program. Details of the tea sector are presented in the table below.

Type of Products Produced (segmentation of the sector)	Tea leaves, powdered tea
Main Export Oriented Product	Tea leaves, powdered tea
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Not Available
Export Market Characteristics (including export as portion of total industrial export)	3.2 million USD in 2010-2011
Ownership (including local versus international ratio)	Private companies: Sterling Companies – 28 estates Bangladeshi Private Limited Companies – 61 estates Bangladeshi Proprietors – 58 estates Public companies: National Tea Company – 13 estates Bangladesh Tea Board - 3 estates
Geographic Location of Facilities (including description of clustering)	Clusters of tea estates: Maulvibazar (90), Habiganj (23), Sylhet (19), Chittagong (22)
Employment Characteristics (including number of employees and male to female ratio)	
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	Number of tea estates - 163, number of tea factories -116 Total garden area – 115820 ha, Total tea area – 54106 ha, area suitable for tea – 61334 ha
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	About 0.1% of total gas consumption. From different reports it is found that tea manufacturing has high specific energy consumption. SEC for orthodox tea: 4.3 – 6.9 kWh/kg, for CTC tea: 6.5 – 7 kWh/kg Type of energy source use – mix of biomass, gas and electricity. Major energy use process – withering, rolling/sieving, drying, sorting and grading
Environmental Impact (including contribution to GHG emissions, water use, and wastewater and waste generation)	Rejected green leaves, flue gas, waste fibers, noise
Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	Not available
Industrial Association(s) (presence and strength)	Bangladesh Tea Association
Opportunity Summary	Lower energy consumption than other industrial sectors analyzed (0.1% natural gas)

Leather and Leather Goods Sector

Bangladesh produces around 2% to 3% of the world's leather. Most of the livestock base for this production is domestic. The country is also an established and attractive location to source and outsource the manufacture of finished leather products. The leather industry is ideally suited to Bangladesh with its abundance of labor and natural resources at internationally competitive rates. The government is in the process of setting up a separate Leather Zone, relocating the existing industry sites to a well-organized environment. Details of leather sector are presented in the table below.

Type of Products Produced (segmentation of the sector)	Leather, leather products (footwear, carry bags, wallets etc)
Main Export Oriented Product	Leather, leather products (footwear, carry bags, wallets etc)
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Not Available
Export Market Characteristics (including export as portion of total industrial export)	1.3% of total export from Bangladesh in 2010-2011
Ownership (including local versus international ratio)	Majority by local private companies, about 4 tanneries by multinational companies, few by government
Geographic Location of Facilities (including description of clustering)	Tanneries - Hazaribagh (in Dhaka city) has more than 80% of tanneries; government is trying to move tanneries to Savar (outskirt of Dhaka city) Leather footwear – Dhaka city (Siddique bazaar, Bongshal)
Employment Characteristics (including number of employees and male to female ratio)	Not Available
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	Leather Tanneries – 214 tanneries (about 100 are modern) 15 export oriented shoe units in and around Dhaka. More than 2000 shoe making units
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	Energy use information not available
Environmental Impact (including contribution to GHG emissions, water use, and wastewater and waste generation)	Soaking and liming, tanning, post tanning and processing – solid and liquid wastes. For the purpose of granting Environmental Clearance Certificates, industrial units are classified into four categories depending upon their potential environmental impact. The Red category requires a gradually higher level of regulatory compliance and environmental mitigation measures. Leather processing is in Red category and detailed EIA is required along with effluent treatment plant and environment management plant before getting environment clearance certificate from Department of Environment

Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	Average annual growth of 9.9% per year is projected in next 5 years for leather products
Industrial Association(s) (presence and strength)	Leather Goods and Footwear Manufacturers and Exporters Association of Bangladesh (LFMEAB)
Opportunity Summary	Energy use unknown

Ceramics Manufacturing Industry

Ceramics manufacturing is a fast growing sector in Bangladesh. Bangladesh is well positioned to dominate the market for high quality ceramic products. The sector has deployed the latest technological advancements in ceramics. Bangladesh produces high quality bone china, transferring technology from Japan. It is identified as a thrust manufacturing sector and is likely to grow at a much faster rate in the future. Major ceramic products from Bangladesh include glass, earthenware, porcelain, and white-ware, porcelain enamels, brick tiles and terracotta, refractories, cement, lime and gypsum and certain abrasives. Bangladesh ceramic tableware has a good reputation in the international markets like North America and EU countries. Sanitary ware and insulators have a strong domestic demand as well as international market demand.

Type of Products Produced (segmentation of the sector)	Tableware, sanitary ware (standard toilet and bathroom accessories) and Insulators (used in high-voltage electrical equipment)
Main Export Oriented Product	Tableware
Economic Impact (including production output in terms of volume and value, and percent of GDP)	Not Available
Export Market Characteristics (including export as portion of total industrial export)	The export of ceramic products registered an average growth of 20% during the last decade.
Ownership (including local versus international ratio)	Exact number not known. Recent plants are internationally-owned.
Geographic Location of Facilities (including description of clustering)	Not Available
Employment Characteristics (including number of employees and male to female ratio)	About 500,000 workers 40% women
Sector Demographics (including number of facilities, and ratio of large versus medium/small plants)	40 plants in operation 5-6 new plants planned There are over a dozen of ceramic factories in Bangladesh, which produce over 40,000 tons of ceramic products a year
Energy Use (in terms of volume, portion of total industry energy use, and profile of energy use by source)	Energy use not available. Sector is energy intensive and gas is used in kilns.
Environmental Impact (including contribution to GHG emissions, water use, and wastewater and waste generation)	Not Available

Expected Future Growth of Sector (short, medium and long term, and drivers/challenges)	Growth – emphasis on ceramics for export in 6th five year plan Challenge – uninterrupted power supply and gas availability at desired pressure
Industrial Association(s) (presence and strength)	Bangladesh Ceramic Ware Manufacturers Association
Opportunity Summary	Energy intensive (existing interventions for energy efficiency in place)

6.0 Criteria and Selection of Four Industry Sectors

Textiles, jute, frozen foods, and steel re-rolling mills, listed in the table on the following page, are industry sectors that have been shortlisted for more detailed analysis based on consultations with USAID/Bangladesh, government agencies, industry associations, and academic institutes such as the BUET's Center for Energy Studies. For the textile manufacturing sector, the team will focus primarily on the textile dying and processing activities, which are higher in energy consumption than the ready-made-garment, home textiles and other aspects of the industry. For each of these four sectors, an energy savings opportunity assessment will be carried out for these four selected sectors under this project.

Together, textile, jute and frozen foods constitute more than 85% of total exports from Bangladesh and are vital to Bangladesh's export earnings. Though steel re-rolling mills are not direct export contributors, they are important for domestic infrastructure development and growth of the country's light engineering industries. These four sectors have seen rapid growth in the past few years and are expected to continue on their present growth trajectories.

Both textiles and steel re-rolling mills are energy intensive and consume a major portion of industrial energy consumption by virtue of having a large number of facilities. The textile sector alone has more than 1,200 MW of captive power plants and consumes about 10% of the country's total natural gas. Jute mills are also large consumers of natural gas and furnace oil. The local jute industry is witnessing a revival due to increased global demand arising from increased focus on organic and environment friendly products. Efficient operation of jute mills is, therefore, critical for the industry to stay competitive globally. The frozen food sector mainly depends upon liquid fuel to generate power since a lack of grid electricity will lead to poor refrigeration and loss of quality, adversely affecting the business.

Due to declining natural gas production, erratic power supply and increasing price of liquid fuels, energy efficiency improvements in the four identified sectors will provide benefits including increased productivity and reduced stress on the existing domestic energy resources and imports.

The four sectors highlighted below have been selected as focus sectors for this assessment.

SL No.	Sectors	Export Oriented	Information on Number of Plants	Ownership	Energy Consumption	Industry Association	Focus segment for detailed study
1	**Textile (dying and processing)**	Yes (largest exporter)	Yes. Recent information available.	Mainly Private	High due to large number of plants. Textile processing plants are energy intensive (primarily natural gas)	Association exists. Maintain information on website. Publishes reports.	Textile Processing Plants – Dyeing, Bleaching, Printing
2	**Jute Manufacturing**	Yes (second largest exporter, after textile)	Yes. Recent information available.	Mainly Private	Composite mills – Spinning, weaving, processing etc. are energy consuming (primarily natural gas and electricity)	Association exists.	Composite Jute Mills
3	**Frozen Foods (Fish and Shrimps mainly)**	Yes (third largest exporter)	Yes. Recent information	Mainly Private	Energy use in cooling/freezing (primarily electricity and diesel)	Association exists. Information available	Fish Processing Plants
4	**Steel Re-rolling mills**	Yes	Information gathered from previous study reports	Private	Highly energy intensive due to use of furnaces and motors (primarily natural gas and electricity)	Association exists. Website not available	Steel Re-rolling Mills
5	Leather & Leather Goods	Yes	Dated information available	Private	Labor intensive	Association exists. Limited information	
6	Tea Processing	Yes (low contribution)	Yes. Recent information available.	Mainly Private	Inherently energy intensive. Primary energy source is natural gas or biomass	Association exists. Updated information on website	
7	Ceramics Manufacturing	Yes (low contribution)	Dated information available	Mainly Private	Energy Intensive, uses natural gas	Association exists. Limited information	
8	Fertilizer	No	Yes. Recent information available.	Public and Private	Energy Intensive. High consumption of natural gas	Association exists. Companies maintain websites	

7.0 Industrial Sectors and their Associations

In Bangladesh, there is an association for practically every industry sector, though some are better organized, structured, and funded than others. The table below lists the associations of the eight sectors profiled under this project. The four associations **highlighted** are the most active and effective in those sectors selected for further analysis, and have been approached by ICF to engage in the project's detailed energy consumption assessment. They all serve as important means to access industry data and contacts. The project team continues to conduct outreach to them as part of this assessment.

Textile sector
1. Bangladesh Textile Mills Association 2. Bangladesh Textile Mill Owners Association 3. Bangladesh Garment Manufacturers' and Exporters Association 4. Bangladesh Knitwear Manufacturers and Exporters Association 5. Bangladesh Terry Towel & Linen Manufacturers and Exporters Association 6. Bangladesh Textile Dyeing & Printing Industrial Association 7. Bangladesh Grey & Finished Fabrics Mills Association 8. Bangladesh Specialized Textile Mills & Power loom Industries Association 9. Bangladesh Twisting Mills Association 10. Bangladesh Weavers Products & Manufacturers Business Association 11. Bangladesh Dress Makers Association 12. Bangladesh Hosiery Association
Jute Manufacturing Sector
1. Bangladesh Jute Association 2. Bangladesh Jute Goods Association 3. Bangladesh Jute Exporters Association **4. Bangladesh Jute Mills Association** 5. Bangladesh Jute Spinners Association
Fertilizer Sector
1. Bangladesh Fertilizer Association
Frozen Food Sector (Cold Storage/Ice Plants)
1. **Bangladesh Frozen Food Exporters Association** 2. Bangladesh Cold Storage Association 3. Bangladesh Marine Fisheries Association 4. Sea Food Export Buying Agents Associations of Bangladesh
Leather Tannery
1. Bangladesh Tanners Association 2. Bangladesh Leather Goods Manufacturers Association 3. Bangladesh finished Leather, Leather goods & Footwear Exporters Association
Steel Re-rolling Sector

1. Bangladesh Re-rerolling Mills Association **2. Bangladesh Steel Mill Owners Association** 3. Bangladesh Auto- Re-rerolling & Steel Mills Association
Scrap Steel Sector
1. Foundry Owners Association of Bangladesh 2. Bangladesh Ship Breakers Association
Ceramic Sector
1. Bangladesh Ceramic-ware Manufacturers Association

8.0 Summary and Next Steps

Based on the team's data gathering and research under Task 1, and in consultation with key stakeholders, the team recommends the following four industry sectors for detailed energy efficiency opportunities assessments under this project: (1) Textile (textiles dying and processing,); (2) Jute Manufacturing Industry; (3) Frozen Foods (primarily fish and shrimp), and (4) Steel Re-Rolling Mills.

The selection process focused on privately-owned, high energy consuming, and export-oriented industrial sectors. For the remainder of Phase I of this assessment, the project team will: (1) continue to engage industry to obtain commitment from a representative sample of plants in each of the four sectors to participate in the remote and/or on-site data collection efforts; (2) analyze energy consumption at plants and benchmark their performance; (3) analyze energy savings potential; and (4) prepare a cost-benefit analysis for the opportunities ranked in the top third of the identified set of potential opportunities. The team will then prepare a consolidated Phase I Report that will include:

- Industry profiles of the eight sectors developed in Task 1
- Energy use profiles of the four selected sectors
- Aggregated preliminary results of the best practices implementation benchmarking of the four sectors. (This will provide an indication of the opportunities within each sector.)
- The technical energy savings potential analysis and an identification of the top-ranked energy efficiency opportunities.
- Cost/benefit analysis of the opportunities with greatest technical potential.
- A specific, detailed work plan for Phase II based on findings and recommendations stemming from the above Phase 1 activities.

Phase II will include targeted follow-up with industries to identify barriers and challenges and develop potential solutions to adopt and implement opportunities identified during Phase I. This will lead to the development of a framework and strategies for financing options and potential donor intervention. A combined Phase I and Phase II report will be developed and submitted for review by USAID as a final deliverable for this assessment.

Annex 1 – List of Contacts

Name of the Organizations	Name of the person contacted
USAID/Bangladesh	• Ms Ramona El Hamzaoui, Director Economic Growth Office • Mr. Sher Khan, Senior Energy Advisor, Economic Growth Office
Bangladesh Ministry of Power, Energy and Mineral Resources. Energy and Mineral Resources (EMR) Division	• Mr. Sefaul Alam, Joint Secretary • Mr. Md. Aminur Rehman, Senior Assistant Secretary
Bangladesh Jute Mills Association	• Mr. Nazmul Haq, Chairman • Mr. Sefaul Alam, Joint Secretary • Mr. Md. Aminur Rehman, Senior Assistant Secretary
Bangladesh Fertilizer Association	• Mr. Kamrul Ashraf Khan, Chairman • Mr. Riaz Uddin Ahmed, Executive Secretary
Bangladesh Textile Mills Association	• Mr. Jahangir Alamin, President • Mr. Feroz Ahmad, Secretary General • Mr. Md. Monsoor Ahmed, Secretary I
Bangladesh Fisheries Development Corporation	• Mr. Pius Costa, Chairman • Mr. Nasir Uddin Khan, Director
Sustainable Energy for Development, Power Division	• Mr. Siddique Zobair, Senior Advisor
Centre for Energy Studies, Bangladesh University of Engineering and Technology (BUET)	• Dr. Zahurul Haq, Director • Dr. Shahidul Islam Khan, Professor • Dr. Ijaz Hossain, Professor • Dr. Md. Ehsan, Professor
GIZ	• Mr. Eric Otto Gomm, Programme Coordinator • Mr. Khurseed-Ul-Islam, Senior Advisor
American Chamber of Commerce in Bangladesh	Mr. A. Gafur, Executive Director
Bangladesh Frozen Food Exporters Association	Mr. Md. Abul Bashar, Executive Director
Titas Gas	• Mr. Md. Abdul Aziz Khan, Managing Director • Mr. Mozibul Haque, General Manager • Mr. Animesh Chakma, Deputy General Manager • Mr. Ariful Islam, Deputy Manager • Mr. Habibus Subhan, Assistant Engineer Vigilance
Bangladesh Steel Mill Owners Association	Mr. Harun Rashid, Information Director
International Finance Corporation (IFC)	Ms. Naureen Chowdhury