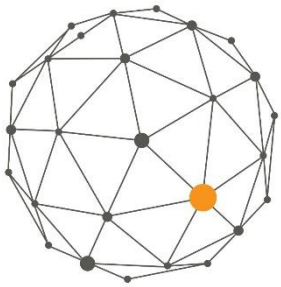

Instituto 17

Sustainable Manufacturing and Environmental Pollution: A Case Study of Textile and Apparel Sector in Bangladesh

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Environmental Perspective: RMG Sector of Bangladesh

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1 Context

The ready-made garments (RMG) sector is the biggest employment generation and foreign exchange earning industry in Bangladesh. About 4 million workers are directly and 10 million workers are indirectly employed in RMG sector. Contribution of RMG sector in national export in 1983-1984 was 3.89% but now the contribution is 83.9% in 2017-2018. The contribution of RMG in national GDP is 12.26% and it was 2.47% in 1990-1991. RMG sector is the main contributor of Bangladesh's economy, especially in the export of the country. Along with the opportunities created, RMG sector has a lot of challenges like unskilled workers, insufficient infrastructure, raw materials, energy crisis, safety issue, political crisis etc.

According to the National Industrial Policy 2016 of Bangladesh, the MSMEs are defined as follows: the Micro Industry will include enterprises with either the value of fixed assets, excluding land and building, of less than Tk one million, or with less than 15 workers. The 'Small Industry' will correspond to enterprises with either the value of fixed assets between Tk. one million and Tk. 20 million, or with 16-50 workers. The 'Medium Industry' will correspond to enterprises with either the value of fixed assets between Tk 20 million and Tk 300 million, or with 51-120 workers [48].

In the year 2018 Bangladesh had 6821 RMG and textile factories [47]. Average number of workers per RMG factory is 949. However, data is not available on how many are Micro, Small, Medium and large enterprises.

2 Environmental Management Challenges for RMG Sector

Globally fashion industry is known as the most polluting industry only after oil and gas. It requires thousands of chemicals and many sophisticated processes to give the fast fashion industry the colours it has. There is always a negative correlation between economic growth and environmental sustainability. Big global brands come up with pledges to their customer to provide fashion with lesser environmental impact, global policy leaders, environmental watch dogs and civil society organization found very vocal about the impact of fashion industry. But clothing is one of the basic needs of human being and we cannot stop wearing fashion able items (BGMEA).

2.1 The Paradigm Shift

Bangladesh, particularly its RMG industry is in the stage of pollution prevention. Increasing industrialization and lack of waste treatment are leading to major water pollution problem in many parts of Bangladesh, impacting on aquatic ecosystems and the population who depend on them for

their livelihood activities. However, Bangladesh has a well-developed set of environmental policies, acts and rules that deal with industrial pollution of water, soil and air [15].

Buyers and sometime the government are trying to push the factories to adopt environmentally friendly technologies and practices for preventing pollution, like use of exhaust gas boilers.

As stated earlier, some large RMG industries have taken the environmental management initiative as their business strategy. They are adopting the environmental management initiative to reduce cost as well as to attract new buyers.

The adoption of environmental management initiatives in RMG industries of Bangladesh was initiated due to buyers' demand for sustainable production. This necessity also came from civil society organizations, pressure from donor organization and government (through legislation). The private sector also plays an important role to adopt these environmental management initiatives to increase their business competitiveness in the global market.

The private sector is willingly accepting the sustainable manufacturing and environmental pollution control measures mainly to attract buyers. Low operational cost from adopted environmental management initiative is another motivation to the RMG factories. Institutional capacity for providing technical services regarding sustainable manufacturing has also increased many folds in last 15 years. To promote this change government in coordination with donor or international lending organization – like World Bank, Asian Development Bank – providing soft loan with low interest rate.

Global markets exert pressure to boost Bangladeshi enterprises to adopt sustainable manufacturing practices. These pressures come from external bodies, international organizations, international society, foreign buyers. In most cases, if the sustainable manufacturing technique are not adopted, buyers will stop buying or reduce order quantity and the lender will stop lending money.

After the Rana Square occurrence in April 2013, worldwide safety platforms – ACCORD, ALLIANCE, and National Action Plan – were lunched [1]. There are number of industrial facilities, particularly little ones (more precisely, MSMEs) were not able to invest in fire, electrical and structural security up-gradation as per benchmarks prescribed by the security stages, which driven to closer of those production lines [2].

The ACCORD and ALLIANCE have contributed positively to upgrade the electrical, fire and structural safety in RMG sector. After their interventions the frequency and intensity of industrial disasters havereduced drastically.

External bodies, international organizations, international society, foreign buyers do not provide substantial financial or technical support for this kind of changes. They mostly supported the RMG facilities with relevant training and conducted fire, electrical and structural safety assessment.

Importing countries or importing companies require that Bangladesh export enterprises should be compliant with home country's environmental regulations, importing countries' or importing organization's regulations and other international standards.

In RMG sector, buyers periodically audit the supplier factory to check the compliance with the local regulation as well as with their code of conduct. In an audit from buyer or third party, they always first look at the compliance with the local laws.

At the most basic level, factories must comply with the country's own environmental requirements. RMG factories of Bangladesh already has implemented basic safety features in their factory like alternative stairs, basic fire equipment, approved layout plan from concerned authority for ensuring safe building construction, group insurance for workers, hygienic sanitation facility and first aid appliance, as well as ensuring minimum wages and flexible jobs for the workers [3].

Sometime the buyers or international agencies provide some technical assistance but not the financial assistance to implement environmental pollution control initiative.

2.2 Drivers and Barriers Towards Sustainable Manufacturing

Enterprises want to adopt sustainable manufacturing to enhance their competitiveness with the other factories at home and abroad. Most of the factories will not spend the extra money on sustainable manufacturing, if it is not legal or buyers' requirement.

Health safety, environmental and social compliance in RMG sector are advancing issues for Bangladeshi businesses after Tazreen and Rana Plaza disaster. The key drivers for sustainability in RMG businesses of Bangladesh are primarily the requirements from buyers for a sustainable environment (wastewater release, solid and hazardous discharge, air emission and nuisances). Civil society, donor and other international organizations are also pushing RMG industry to adopt sustainable manufacturing process.

Legislative compliance is another major driving force for adopting sustainable manufacturing process.

Most of the enterprises have implemented environmental management and sustainable production to comply with buyer's requirements. The main driving force for reducing pollution beyond legal requirement is the pressure from buyer. Sometimes RMG factories also implement sustainable option to get bank loan with low interest rate. Most of the RMG factories would not go beyond fulfilling legal and buyer's requirement for environmental sustainability.

However, there are few industries who want to compete with the global market, especially with the Vietnam and Chinese markets; and those factories go for sustainable options for their facilities without pressure from buyer.

To sustain this highly competitive market RMG factories are now more concern to cut operational and maintenance cost. Many RMG factories are now investing to the sustainable manufacturing processes because of the low operational cost of those process.

New investment and operational cost for implementing environmental management initiatives have always been a barrier, especially for MSME as well as for the large RMG factories. However, the compliance issues have interfered with profit margins. The Micro, Small and Medium enterprises

(MSMEs) always face difficulties to meet the safety and environmental compliance requirements due to technical and financial in capabilities. Many time MSMEs do not get enough financial assistance from the government to adopt new technology regarding sustainable manufacturing.

Government has imposed high taxes on many technology, service and equipment which are necessary for implementing good environmental management practices. For many technologies (Zero Liquid Discharge) and equipment, local expertise is not available.

Bangladeshi RMG factories are poor in management, efficient management would improve their performance and will cut operational cost [4].

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Government should promote technology transfer and developing local expertise to ensure sustainable manufacturing.

2.3 Private Sector Led Initiatives for Environmental Management

In the RMG sector of Bangladesh, most of the pollution prevention and environmental management initiatives are client or buyer's requirements. For pollution prevention and environmental management, there are some globally or regionally recognized tools like GOTs, ZDHC, Higg Index FEM 3.1 etc. Some of these tools are:

2.3.1 Sustainable Sourcing

In recent years sustainable sourcing is getting attention among brands and suppliers. There are different standards for sourcing various types of materials from a sustainable source in terms of both social and environmental sustainability. Some of those standards are ZDHC, GOTS, SAC, Material Sustainability Index (Higg MSI), BSCI, SEDEX, etc.

Most of the spinning, knitting, and knit dyeing mills in Bangladesh are GOTS certified which ensure that their yearn or fabric made from organic cotton. Use of the organic cotton is increased 29% in 2019 compared to the previous year and globally Bangladesh is 2nd in terms of the number of GOTS-certified factories [5]. In Bangladesh, there are 689 GOTS certified facilities in Bangladesh.

Another emerging standard for ensuring sustainable material sourcing is SAC's Higg Material Sustainability Index (Higg MSI) and Higg Product Module (Higg PM). Higg MSI measures and scores the environmental impact of a material like cotton, nylon, polyester, etc. On the other hand, Higg PM measures the environmental impact of a product from cradle to gate [6]. With these tool brans itself source sustainable material and product; and also ensure that their supplier source sustainable material for their product. Recently few brands are implementing BHive app for checking chemical sourcing as well.

Use of alternative or sustainable chemicals is another way for sustainable RMG production. With the assistance of ZDHC getaway factories, source alternative and sustainable chemicals for their production which are less harmful or toxic to the environment.

In Bangladesh both brands and the factories are working together to reduce environmental impacts by sourcing those materials or products which has less environmental impacts. In the RMG sector of Bangladesh, sustainable sourcing has just started, factories are getting acquainted with new tools and sourcing techniques.

2.3.2 Eco Efficiency and Cleaner Production Measures

In the RMG sector of Bangladesh, there are some initiatives and projects on the cleaner production. The most significant project on the cleaner production is the Partnership for Cleaner Textile (PaCT) by International Finance Corporation (IFC). PaCT is working with 338 factories in Bangladesh and has contributed significantly in increasing energy, water and resource efficiency [7][8].

PAcT has established TTBC and it is knowledge hub for energy efficient technologies for textile industry, which is located at BGMEA premises and run by PaCT Bangladesh program. It provides advocacy services to the textile industry on energy efficiency measure, financing option for energy efficiency, provides training water efficiency, energy efficiency and effluent treatment. It also provides a B2B platform with reliable domestic and foreign supplier for energy efficient technologies and equipment.

Other than PaCT, some brands have their own initiative for cleaner production like Green to Ware (GTW). Some brands are pushing their supplier factories to go for ISO 14001 or other environmental certification which also contributes to cleaner production.

Bangladesh Has not adopted any kind of market-based solution for GHG emissions trading.

2.3.3 By products and waste recycling and reuse (on-site and off-site)

Brands now have started to promote recycled materials. Some denim brands encourage the factories to produce fabric with recycled content like cotton from recycled denim or recycled pet bottles.

The leftover fabrics from the RMG sector are now the source of raw material in Bangladesh. A number of factories are locally producing sleeping mattress from those leftover fabrics. Bangladesh also exports some leftover fabrics and in the fiscal year 2017-18 Bangladesh has exports about USD 65 million [9].

Bangladesh has good opportunity for industrial symbiosis at cluster level as any Economic Zone will be established within next 5 years. BEZA already allocated 500 acres of land at Mirsarai economic zone in Chittagong for developing a garment park. Backward and forward linkage industries related to RMG can cluster in some economic zones for having efficient industrial symbiosis.

2.3.4 Extended product responsibility (EPR)

In EPR, factories are obliged to take operational and financial responsibility to manage their waste in a sustainable way. Most of the textile factories in Bangladesh have their own Waste Water Treatment Plant (WWTP) and they bear the cost for the treatment. Some factories also send sludge from WWTP to cement factory for incineration at their own cost. However, for the other type of wastes, ERP is not evident in Bangladesh.

2.3.5 Life cycle assessment (LCA).

LCA is a new concept in Bangladesh and most of the factory do not have the technical capability to conduct LCA for their product. Now some factories are getting LCA from various tools like Higg MSI and Higg PM [6]. On the other hand, many brands are rigorously conducting LCA for the raw materials of their products.

Another life cycle assessment standard is Cradle to Cradle, many brands like Inditex, C&A are promoting this certification in RMG factories of Bangladesh.

2.3.6 Green Building

Design of Environment is a trending concept in Bangladeshi RMG sector. Most of the extension and new RMG project are increasingly going for the LEED certification [10].

As per the USGBC [10] there are currently 151 LEED certified (platinum, gold, silver or certified) buildings in Bangladesh and 90 [11] of the certified buildings are RMG factories. Bangladesh has some of the top scored LEED certified buildings. The reason for this trend is facilitation of low interest loan with relaxed condition for the LEED building. Brands also encourage the factories for such kind of certification. Many LEED RMG factory buildings already applied for and are waiting for the LEED certification.

2.3.7 Eco Labelling

RMG factories of Bangladesh are certified with various types of eco labeling or eco scoring system. Most prominent eco labels are OEKO-TEX and GOTS.

2.3.8 Environmental Management System – EMS (certification)

Many RMG factories specially the large ones have gotten the ISO 14001 (EMS) certification for their facility. Many brands encourage their supplier factories for ISO 14001 certification. However, there is no specific data on how many RMG factories are certified with ISO 14001.

Higg FEM 3.1 also an EMS platform and currently in Bangladesh about 700 factory are using this EMS platform.

2.3.9 Green Button Certification

Green Button Certification is a state-owned initiative of Germany. It is not known that how many factories are certifies with Green Button in Bangladesh. There is a project of GIZ in Bangladesh, with the assistance of this project 32 factories already got the certificate.

2.3.10 OEKO-TEX Certification

OEKO-TEX is a registered trade mark, representing the product labels and company certifications issued and other services provided by the International Association for Research and Testing in the Field of Textile and Leather Ecology.

Many brands require OEKO TEX certification for their product and many RMG manufacturing factories are OEKO TEX certified.

2.3.11 Sustainability Reporting

Sustainability Reporting is not very popular among the RMG industry of Bangladesh. As per the GRI database [12], till now only 4 factories have published their sustainability reports, among them only

one has regularly published their sustainability report. With the PSES program of GIZ, they are supporting 6 RMG and Leather Factories and 5 appeal related Trade Associations to prepare their sustainability reports. However, the sustainability reports prepared with the assistance of this project has not published yet in GRI database.

In Bangladesh disclosure practices are mostly guided by the Companies Act 1994 (Government of Bangladesh, 1994), Securities and Exchange Rules 1987 (Government of Bangladesh, 1987), and the Accounting Standards adopted by the Institute of Chartered Accountants of Bangladesh (ICAB). Disclosure practices are also affected by a number of other statutes e.g. Bangladesh Industrial Enterprises Nationalization Order 1972, Banking Companies Act 1991 (Government of Bangladesh, 1991), Insurance Act 1938 (Government of Bangladesh, 1938), Income Tax Ordinance 1984 (Government of Bangladesh, 1984), etc [46].

Only 1.3% annual reports of the listed companies disclose its environmental information in the report [45].

2.3.12 Industrial Symbiosis and Echo Industrial Parks

During the development period of the RMG sector in Bangladesh, industrial symbiosis was not in focus for both the government and industry owners. There are some symbiotic industries which process the leftover fabrics into different materials.

The demand of eco industrial park is increasing rapidly worldwide. It is also a scheme to attract FDI in Bangladesh. Till now Bangladesh did not establish or transform its existing industrial cluster like EPZs in to echo industrial park.

A recent World Bank project in Bangladesh aimed to develop a roadmap for low carbon growth and design an optimal policy framework to facilitate it for Chittagong Export Processing Zone (CEPZ) [13]. A yearly 244 tCO2 in GHG reduction and 331 megawatt-equivalent energy consumption avoidance are expected as an outcome of this project.

2.3.13 Adoption of Circular Economy

The Bangladeshi garment industry has already announced to the world that it is ready to embrace the idea of the circular economy in textile manufacturing. A partnership between the Global Fashion Agenda (GFA), Reverse Resources, P4G and the Bangladesh Garment Manufacturers and Exporters Association (BGMEA)—known as the Circular Fashion Partnership—has been initiated to reduce waste and depletion of natural resources caused by textile manufacturing through supporting the development of the recycling industry in Bangladesh. The Circular Fashion Partnership, which has currently united more than 30 international brands such as H&M, Marks & Spencer, OVS, Bershka, C&A, Kmart Australia, garment manufacturing companies and recycling firms in Bangladesh, can prove to be the epitome of sustainability in fashion for other leading garment-producing nations such as Vietnam and Indonesia [14].

2.4 RMG MSME and Pollution Pretension Practices

RMG industry has started in Bangladesh as MSME, but they are facing severe problems to survive. In 2012-13 BGMEA has around 6000-member factories and in the year 2013-14 the number has plummeted to around 4000 [14]. As per a recent study of CPD the active member of BGMEA in 2018 is 3856 [15]. MSME RMG factories mainly relied on the subcontracting from larger factories, but now-a-days sub-contracting has got a bad name. Buyers are discouraging subcontracting and the large factories are increasing their capacity. Another big reason of closing down the MSME RMG factories is that they are not technically and financially capable to manage the new and stringent requirement of compliance imposed by buyers. After Rana Plaza collapsed in 2013 and advent of ACCORD, ALLIANCE and national action plan in 2014, small factories could not further invest in safety upgradation and subsequently closed down.

2.5 Local Environmental Requirements and Initiatives

Initially Bangladesh has inherited its environmental laws and regulations from British and Pakistan ruling. After independence, Bangladesh has had some really good environmental policies and laws. After the independence of Bangladesh, the overarching environmental policy was "Environmental Policy of Bangladesh – 1992", in 2018 government has amended the previous policy as "National Environmental Policy 2018". This policy addresses 24 broad sectors to address overall environmental issues. Bangladesh has also passed "Environmental Conservation Act – 1995" and "Environmental Conversation Rules – 1997" and these are two basic environmental regulations for Bangladesh. Other environmental policies and regulations are "National 3R Strategy", "Bangladesh Clean Air Rules – 2019 (draft), "Bangladesh Bio Diversity Act – 2017", "Bangladesh Bio Security Rules – 2012" and etc.

Bangladesh is also a signatory number of international conventions and protocols; and has taken nationwide initiatives to achieve goals of those conventions like Montreal Protocol on Ozone Depleting Substances (ODS) that deplete Ozone layer, United Nations Convention to Combat Desertification (UNCCD), Stockholm Convention on the Control of Persistent Organic Pollutants (POPs) [16] and etc.

Bangladesh also has prepared a national five-years plan and in the 8th Five Years Plan (July 2020 to June 2025), climate change, environment, water conservation, energy management and other environmental issues got due importance.

2.6 RMG Industry of Bangladesh and Climate Change

Recently (2019) BGMEA has signed "Fashion Industry Charter for Climate Action". By joining this initiative, BGMEA has pledged to support implementation of the principles enshrined in the Fashion Industry Charter for Climate Action, in line with the goals established by the Paris Agreement of 2015 [17].

Except some large enterprise, most of the RMG facilities are not very much aware about the physical and economic impacts of climate change to their business. Those factories are also not aware about the upcoming changes in the supply chain due to climate change.

On the other hand, most of brands working in Bangladesh are signatory of "Fashion Industry Charter for Climate Action" and the science-based target initiative will verify the Brand's commitment of reducing GHG from its supply chain. To meet their science-based target, brands are now pushing RMG factories of Bangladeshi to reduce their GHG emission to a substantial level.

Many factories also measure their annual GHG emissions with the help of GHG protocol tools. Many factories also report their GHG emissions in Higg FEM 3.1. Few factories started to disclose their GHG emission data at Carbon Disclosure Project (CDP) Platform.

2.7 Law of the Land on Environmental Protection and Its Enforcement

Department of Environment (DoE) is the authority to enforce the environmental laws, mainly the Environmental Conservation Act – 1995 (ECA) and Environmental Conservation Rules – 1997 (ECR). Along with ECA and ECR, DoE also enforces other environmental acts, laws and other directives [18].

DoE has their offices in all the divisional cities and at 22 districts out of 65. As a technical arm of the Ministry of Environment, Forest and Climate Change, DoE is responsible for environmental planning, management, monitoring and enforcement. DoE has shortage of trained and adequate manpower to perform all of its duties appropriately [18]. DoE regularly visits industries to enforce relevant laws, but the frequency of visit and evaluation is far less then what it should be due to man power shortage.

For the dyeing mills, DoE requires to test the water air samples in every quarter. The sampling frequency is determined by the authorized officers of respective DoE office.

Monitoring data is shared with the respective factories. Any citizen can apply to know the monitoring information from DoE under the "Right to Know Act – 2009".

To comply with the legal requirement, for the air and effluent emission, industries of Bangladesh have a good control monitoring and reporting system against existing standard. For effluent, most of the industries maintain an in-house record for the conventional parameters (pH, COD, TDS and TSS) and for the air emission the factories conduct air quality test with a third party in periodic interval stated in the environmental clarence.

For the solid waste like sludge or leftover fabrics, chemical contaminated rags, polythene, drum – most of the factories do not have any monitoring and reporting system.

DoE has a very robust system to calculate the amount of penalty, in case of noncompliance with the regulation. DoE, in its website regularly publishes the list of organizations who were penalized. Meeting minute for granting environmental clearance is also published in the DoE website.

Non-compliance with the Environmental Conservation Act – 1995, Environmental Conservation Rules – 1997 and license condition is subject to penalty. DoE follows a structured process for calculating the amount for penalty.

Any organization which was penalized is eligible to appeal as per section 10 and Section 11 of Environmental Conservation Rules – 1997. However, no organization prefers a pollute pay fine, rather they will always go for the best available technology to avoid the fine.

It can be said that DoE has a transparent process of environmental clearance, monitoring data and penalty.

2.8 Role of Civil Society in Environmental protection

The neighboring population of a polluting industry or an industrial cluster often complaint to the mass media reporters on their suffering due to pollution.

On the other hand, various civil society organizations like BAPA (Bangladesh Environmental Movement), Bangladesh Environmental Lawyers Association, Bangladesh Environment and Development Society and similar other organizations are highly aware and vocal about the environmental degradation due to unregulated industrialization.

2.9 Case Study on Environmental Initiative

Processing operations in the textile industry consume a lot of water. the water required for textile processing varies from factory to factory, depending on the fabric they produce, the equipment they use, and the dyestuff they prefer. The longer the processing sequences, the more water they need. According to recent PaCT assessment reports, average water consumption in Bangladesh's Washing, Dyeing, and Finishing (WDF) factories is 100 to 150 liter/kg of fabric production.

To reduce water consumption in a WDF (Washing, Dyeing and Finishing) factory, a PaCT expert team identified several opportunities including reducing, reusing, and recycling water. For example, countercurrent flow in a continuous washing machine is a proven technology that significantly reduces water consumption in fabric washing. It allows clean water to enter at the final wash box and flow counter to the movement of the fabric along the wash boxes. Recovery and reuse of blanket cooling water in a sanforizer—a shrinking machine—is another option for water saving.

Countercurrent washing is the most popular and successful way to reuse wash water, saving both water and energy. A sanforizing machine is used to stretch cotton and mix cotton fabric before it is washed.

PaCT team recommended recovering the blanket cooling water and using it in any hot water application in the wet processing section. Another option was to reuse it after filtering and cooling down with a small cooling tower and the right circulation pump. Following these recommendations, ETL (Evince Textile Limited) implemented the two water-saving options by rearranging the existing piping and water flow direction. This required an investment of $3,899 (BDT 328,697) along with training and awareness raising sessions on using countercurrent flow in continuous washing machine, which saves 169,920 m3 of water per year. In addition, an investment of $475 (BDT 40,000) in blanket cooling water recovery saves 56,640 m3 of water per year. These two water-saving options reduce ETP load by 226,560 m3/yr [19].

3 Labour and Social Issues

In today's fast changing global market, it is not only the quality of garments which cherished the retailers and manufacturers but also the working environments of the organization wherein the products were produced. Those are equally important to gain and strengthen consumer confidence and to build-up more reliable relationships with vendors. In other words, specific code of conduct that protects the basic human rights of the workforce engaged in the trade is to be respected to satisfy consumers and to add social value to the product. Basic awareness of the social accountability helps to understand and monitor the compliance part of it in protecting the image of a particular brand of product [20].

In order to do so, the reputed and leading market players in the garment trade have imposed compulsion on the related factories to achieve those objectives as a condition of the export contract. Even the exports were either withheld or cancelled elsewhere in the event of non-compliance to such issues [20].

3.1.1 Labor and Social Laws of Bangladesh and its Enforcement

There are labor laws in Bangladesh and a major part of this regulations are social regulation. Those regulations are "Bangladesh Labor Act – 2006", "Bangladesh Labor Rules – 2015", "National Occupational Health Safety Policy – 2013", "National Child Labor Elimination Policy 2010" and "National Labor Policy – 2012".

The Department of Inspection for Factories and Establishments (DIFE) and Department of Labor (DoL) under the Ministry of Labor and Employment are two departments to enforce the social regulations [21].

Brands are conscious to source their product from a compliant factory in terms of labor and social regulation. Because labor and social issue are very sensitive both in home and at the consumer end. Most of the factories follow fare labor practices in Bangladesh. Bangladesh is either a signatory or rectifier of 35 ILO conventions and most of them are in force. The conventions which are not in force, will be in force very soon.

Many brands require RMG factories to follow some internationally recognized social and labor standards like SA 8000, BSCI ,SEDEX etc.

Labors are very much aware about their right and in case of violation they may directly complaint to the buyer(s) of that factory.

The state of social regulation compliance is good in Bangladesh, especially in the export-oriented industries and RMG. In RMG sector, buyers audit the factory on a regular basis to ensure that factory is complying recommended as well as local labour and social regulations. Moreover, many RMG factories are certified with BSCI and SEDEX, and are being audited by a third party in regular interval. One of the major requirements of these labour and social standards is to ensure compliance with the

law of the land. Some of the important feature of "Bangladesh Labor Act – 2006" and "Bangladesh Labor Rules – 2015" are

3.1.2 Health and Safety

Health and safety are an important part of the "Bangladesh Labor Act – 2006" and "Bangladesh Labor Rules – 2015". Apart from those regulation other standards which RMG factory has to follow e.g., ZDHC, BSCI or SEDEX also have Health and safety part [22].

Brands are very concern about the Health and Safety condition of the factories and conduct audit to assess the OHS situation of their supplier factories. Also, there are many projects from better work, RMG Sustainability Council (RSC) of BGMEA, GIZ and other international organization on health and safety.

3.1.3 Working conditions

Working condition is also part of "Bangladesh Labor Act – 2006" and "Bangladesh Labor Rules – 2015". Both the government agencies (DIFE and DOL) and brands are very much keen to ensure decent working condition specially at the RMG sector [22].

Labors are also aware about the working condition. In case of any grievance workers first can complaint to the factory authority and then the brands or to the labor court.

3.1.4 Child labor

Now, child labor is not an issue for the RMG sector and it can be said confidently that RMG sector is almost free of child labor. With the concerted effort of trade association (BGMEA, BKMEA, etc.), buyers, donors, the Government of Bangladesh and NGOs, child labor has been eradicated from the RMG sector of Bangladesh. Since 2000 child labor has been eradicated from the RMG sector of Bangladesh. May be there are some unintentional child labor recruitments, which are considered as an incident, factory immediately conduct root cause analysis and take corrective actions [14].

3.1.5 Forced Labor

Bangladesh is a rectifier of the International Labor Organizations (ILO) Convention CO19: "Forced Labor Convention". Both the Bangladesh Labor Act 2006 and Bangladesh Labor Rules 2015 have strict requirement to stop forced labor [14]. In RMG sector force labor is not an issue now a days.

3.1.6 Violation of Law and Penalty

As discussed, earlier Department of Inspection for Factories and Establishments (DIFE) and Department of Labour (DOL) under the Ministry of Labour and Employment are two departments to enforce the social regulations. DIFE and DOL try to visit factories regularly to enforce the regulations, however both of the department has man power shortage.

In case of violation of regulation DIFE and DOL file case as per section 313 of Bangladesh Labor Act – 2016, at Labor Court and the court gives the verdict.

Trade partners, international buyers/brands or international agencies conduct periodic audits by them self or by a third-party organization to be sure that their partner RMG factory is in compliance with their recommended international standard and with the local laws.

In case of noncompliance with the buyer's/lander's recommended international standard - like BSCI or SEDEX - the RMG factory will not be certified or will not get satisfactory grade during third party audit for the respective standard. If the factory is not able to obtain certificate or satisfactory grade for the recommended standards brands may reduce their order quantity or cancel the affiliation of that factory.

3.1.7 Case studies: focused on social initiatives

Dulal Brothers Limited (DBL) a renowned RMG group in Bangladesh has started a fair price shop named "Bandhan" as a part of its CSR activities. Usually, the workers do their grocery from the neighbouring shops. There are some problems with these small shops like many times they sale bad product, sale date extorted product, do not want to lend the workers etc. Workers also spend significant leisure time to purchase their grocery.

To overcome this problem DBL group started a fire price shop at their factory premises. At "Bandhan" a worker is able to purchase items through credit but without bearing any interest. Price of goods are also lower than the outside shop as DBL is not making any profit from it. The credit is adjusted from their salary every month. "Bandhan" was initially launched in DBL Group's Jinnat Complex where Garments and Knitting operations are taking place. With its success, today five complexes now have their own Fair Price Shop. What started with transactions worth BDT 1,217,444 (US$ 15,583) in 2008 expanded in 2015 to transactions amounting to BDT 51,287,477 (US$ 656,471). [23].

4 Capacity Building

Textile Education can be divided into three levels; (a) Entry level, (b) Mid-level & (c) High level Textile Education in Bangladesh. Entry level is for Textile Vocational Education, Mid-level is for Diploma in Textiles & High level includes B.Sc. as well as M.Sc. in Textiles [24].

For Entry level textile education, currently, there are a total of 41 textile vocational institutes throughout Bangladesh under the Department of Textiles, government of the People's Republic of Bangladesh. The department is planning to set up 12 more textile vocational institutes in the coming years [2].

There are about 20 public and 40 private institutions offering diploma in various discipline of textile engineering. Every year almost 5000 students are getting enrolled in those diploma institutions [1].

About 4 textile collages, several public universities and 27 private universities are offering textile related bachelor of science degree. Total intake capacity of these institutions is 5000 new student every tear [25].

Some institutions are offering non-formal education in the field of textile trade. Currently Asian Development Bank (ADB), Swiss Agency for Development and Cooperation (SDC) and government of Bangladesh funded Skills for Employment Investment Program (SEIP) is the largest provider of this kind education in textile sector [25].

Unfortunately, industry and academia integration are very rare in Bangladesh. However, for textile sector industry academia interaction is a bit better than the other discipline. Bangladesh university of Textile (BUTEX) has several projects in association with foreign universities which are integrated with local industries. Employers are not keen about the capacity building of their employees at their own cost.

For 20 years there was only one institution (BUTEX) providing higher education in textile engineering, now there are about 50 public and private institutions has textile engineering department [26].

Factories are not very interested to invest in the skill upgradation program or training for their labor force. Most of the skill upgradation program are offered by government, international agencies or buyers and most of them are free of cost. The industries allow their workers or personnel to attend those training and allow them for on payment education leave.

Sometime factories also arrange in house training at their own cost but those are mostly productivity improvement training like 5S, TQM etc. Factories rarely arrange training for technical skill upgradation [27].

Women entrepreneurship in RMG sector in Bangladesh is not common like in many other sectors. For many instances women entrepreneurs get loan with low interest rate. Many NGOs and organization line "Women Chamber of Commerce and Industries" assist women entrepreneurs to set up their business.

4.1 Case study: focused on capacity building and women entrepreneurship initiative

Over half of the 4 million Bangladeshi RMG workers are women. However, the positions available to women remain mostly limited to the machine-operator level. Leading factories are realizing that moving women into management roles is not only beneficial from an image perspective, but increasingly important from a business perspective [5].

DBL designed an in-house training program for its female workers to upgrade their skills and choose female supervisor from those skilled workers.

When interviewed, this is what Ms. Khadiza Begum had to say. A former Junior Sewing Operator, Khadiza is now one of the 22 Female Supervisors of DBL Group.

Khadiza joined DBL in March 2014 and she got promoted as Supervisor in February 2015 after the in-house Female Supervisor Leadership Program training completion. Her last earning as Junior Sewing Operator was BDT 8,144 including over time. On becoming supervisor her salary is BDT 12,000 which is an increase of 47.35%.

5 Governance

There are little or no coordination between agencies having roles in preventing industrial pollution. Department of Environment (DoE) is the main government body for monitoring and regulating industrial pollution.

Since 2010 Bangladesh is highly stable interior of political disturbance. Political stability is one the key issues for business and government in Bangladesh. Moreover, stability of a democratic government largely depends on the economic development. For this reason, it is predictable that, there will be stable political environment for the industrial development in Bangladesh.

For an example, Bangladesh Bank (Central Bank of Bangladesh) approve a soft loan for energy efficient or less polluting technologies and equipment, but they do not have the capacity to verify whether the equipment is less polluting [28]. A third-party organization, or expert from Bangladesh University of Engineering and Technology (BUET), Bangladesh University of Textile Engineering (BUTEX) or other engineering universities or organization verify whether the equipment is less polluting. However, the coordination among the agencies is poor for this verification.

Government generally provide financial support to the MSME or large RMG industries through soft loan. Bangladesh Bank has a loan scheme with relaxed condition and low interest rate to finance safety retrofit and environmental upgradation. This loan is sponsored by AFD. Bangladesh bank disburses this loan through the scheduled banks and some non-banking financial institutions.

Sometime government or other international agencies like world bank group or brands provide limited technical assistance in the form of training, regarding implementation of environmental management initiatives.

If salary increases, the country will not lose its competitive advantage, if the RMG industry upgrades its productivity. As per the Asian Productivity Organization (APO) per hour productivity in RMG sector is USD 3.4 which is the lowest among Myanmar, Vietnam, India, Philippines, Sri Lanka, Indonesia and China. Except Myanmar, salary of RMG workers are higher in other competitors [30]. So, the increased salary can be compensated with the increased productivity [29].

On the adoption of more stringent pollution control measures will hamper the MSME or large RMG industry if government does not provide subsidies for purchasing new technology for pollution prevention.

Strengthening the environmental legislation, especially when the economy and industry are adversely affected by COVID – 19 will have negative consequences on the business. Many MSMEs will not be able to invest to comply with the new regulations and will shut down. Closing down of the MSMEs will led massive job cuts.

6 Infrastructure Conditions

From the colonial era Bangladesh inherited underdeveloped and unevenly distributed infrastructure and transportation networks. Poor and inefficient infrastructure undermined the economic development in the country, and only recently has the government been able to address the problem systematically and channel investments towards expanding its highways, railroads, seaports, and airports [31].

6.1 Electric Supply and Power Generation

Bangladesh has 20,383 MW of installed capacity. Majority of the electricity came from gas fired (53%) power plants, furnace oil-based power plants produce 27%, Diesel based plants produce 6.3%, Coal based plants produce 5.6%, hydro power plant produce 1.6% of total generated power and 5.6% power is imported from neighbouring countries [32].

95% of Bangladesh has electricity coverage [33]. Most of the RMG factories are connected to grid with Rural Electrification Board's (REB) transmission line. The quality of transmission is not very good. It suffers for issues like power outage, load shedding, voltage fluctuation etc. These issues of electricity supply led the RMG industries to install own captive power capacity.

6.2 Information technology

Since 2010 government started to build IT and ICT infrastructures for both public and private sectors. All the government agencies have their own website and those are updated regularly. Most of the government information are available through website. Application for electricity connection, gas connection, environmental clearance, company formation etc. are digitized.

Logistic system is quite in good condition in Bangladesh. There are efficient and reliable logistics companies providing logistics support to the export-oriented industry.

6.3 Communication system

All the RMG factories are connected to the internet through fiber optic or wireless connection. Internet connection in Bangladesh is affordable and uninterrupted. 165 out of 200 million people are connected to the mobile network in Bangladesh [34].

6.4 Transportation and Logistics

Most of the roads and highways are free of congestion, security in the highway is adequate, sea ports are in good condition. Moreover, Bangladesh is going to start a new deep-sea port at Matarbari, Chittagong and it already has two sea ports (Chittagong and Mongla). Bangladesh has total 22,419 km of road and national highways [35].

Bangladesh has total 4341 km of railway line with 103 train station access Bangladesh. 44 out of 65 districts are connected with railway network [36].

Bangladesh has 8 operational domestic airports among then 3 are international (Hazrat Shahjalal, Shah Amanat and Osmani International Airport at Dhaka, Chittagong and Sylhet respectively). [37].

Bangladesh has 1048 km of high-pressure gas transmission line [38].

Logistic system is quite in good condition in Bangladesh. There are efficient and reliable logistics companies providing logistics support to the export-oriented industry.

6.5 Water Availability and Sanitation

Ground water is abundant in Bangladesh, till now. Groundwater withdrawal from the shallow alluvial aquifer (depth <150 m) is the country's source of the waters [39]. The industries, specially the textile dyeing industries use huge amount of water and are depleting the ground water rapidly. All over Bangladesh the water quality is good with little contamination with iron, arsenic and manganese. In the coastal area salinity is a problem in the ground water.

Though Bangladesh has for many years enjoyed almost universal access to drinking water, arsenic contamination of 22 percent of the country's tube wells lowered the service coverage to below 80 percent.

Bangladesh has made significant progress in reducing open defecation, from 34 percent in 1990 to just one percent of the national population in 2015.However, the current rate of improved sanitation is 61 percent, growing at only 1.1 percent annually [39].

7 Introduction to BGMEA, BKMEA and BTMA

BTMA: Bangladesh Textile Mills Association or BTMA is the national trade body for textile mills, manufacturers, and mills in Bangladesh and is located in Dhaka, Bangladesh. It is the national trade body representing the country's yarn, yarn manufacturers and textile product processor mills under the private sector.

For promoting sustainable manufacturing BTMA had some projects with the donor organization. Generally, BTMA's activities in promoting sustainable manufacturing are not significant.

BGMEA: The Bangladesh Garment Manufacturers and Exporters Association (BGMEA) is one of the largest trade associations in the country representing the readymade garment industry, particularly the woven garments, knitwear and sweater sub-sectors with equal importance [9].

BGMEA is very much in line with the climate change mitigation and environmental pollution control activities. BGMEA recognizes that, environmentally sustainable production will attract more buyers in RMG sector and will contribute to the growth of export.

BGMEA has several projects for promoting sustainable manufacturing and pollution control measures. Usually BGMEA participates with government, NGO, international organizations and brands for such kind of project. Some of the projects BGMEA had actively participated are PaCT, Green Factory, Green Button, Green Climate Fund, Technology upgradation fund etc [10].

BKMEA: Bangladesh Knitwear Manufacturers & Exporters Association, BKMEA; the Apex Trade Body to represent solely the Knitwear Sector of Bangladesh stands out in the global panorama with distinct identity and stature. BKMEA adheres to innovation and creativity so that the sector-based policy-making process becomes realistically and strategically perfect and gives off the result that expedites its developmental phase [11].

BKMEA has established a separate department named "Green Industry Development Cell" to promote sustainable manufacturing and environmental pollution control measures. BKMEA also provides consultancy to its member factories on LEED green building certification, productivity improvement, energy efficiency and water & waste management.

8 EPZs, EZs and Tread Liberalization

Bangladesh Economic Zone Authority (BEZA) is responsible for establishing Economic Zones (EZ) in Bangladesh. On the other hand, Bangladesh Hi-Tech Park Authority (BHTPA) is responsible to establish high tech parks and its mission is to establish IT/ITES based Industrial ecosystem and ensure all services for IT/ITES business & industries through One Stop Platform [40].

The major difference is, BEZA promote manufacturing-based industries and BHTPA IT/ITEs based industries. BEZA's objective is "BEZA wants to establish 100 Economic Zones on 30000 hectares of land in the next 15 years with an employment generation for 10 million people".

Environmental performance of the industrial clusters like EPZ is always efficient than the concentrated industrial areas. Many of the EPZs have their central ETP and all have robust environmental monitoring from BEPZA (Bangladesh Export Processing Zone Authority). BEPZA also supports their factories with training and technical assistance for preventing environmental pollution. Most of the EPZs have their own laboratory to test the effluent sample from factories.

BEZA will promote ease of doing business and will provide one stop service– from land leasing to environmental clearance – to the investors. BEZA would provide multiple incentives, to the developers of the Economic Zones as well as to the investors. Benefits are range from income tax exemption to reduction in registration fees. The incentive structure for investment such as exemption of Taxes, custom/excise duties to non-fiscal incentives such as no FDI ceiling, issuance of work permits and recommendation for resident ship /Citizenship [41]. BEZA is providing good incentives and one stop service to the foreign investors to attract investment. A total USD 25,331 million investment were proposed till date in the established economic zones [42].

The Economic Zones (EZ) will have positive impacts on to decrease regional disparities. When the EZ will be established in the agrarian regions of the country, it will provide significant number of decent and formal jobs in that particular area. Before establishing economic zone, the zone owner has to conduct Environmental Impact Assessment (EIA) and get it approved by DoE. Moreover, environmental monitoring or enforcement in industrial cluster is easier and more efficient. Government is establishing EZs to promote controlled industrialization in the country.

At Uttara Export Processing Zone (EPZ) at the north of Bangladesh, majority investment in this EPZ is from China and the Chinese companies want to be in close proximity. Benefits from this kind of cluster include increased berganing power to the authority, help employees to socialize in a foreign environment, there is a cultural harmony between industries and many more.

All type of EPZs are strictly regulated for pollution control. EZs are obliged not to pollute the environment and take appropriate action to manage its waste. In the cluster of industries pollution prevention could be central which can save cost and increase effectiveness.

Bangladesh is industrializing rapidly and the industrialization is not very controlled. Industries are growing up haphazardly without following appropriate permissions and without having appropriate facilities to handle waste in that particular area.

Definitely the choice for Bangladesh is to become an industrialized country. But it also need to take immediate action to prevent the pollution for the growing number of industries. With the EZs, Bangladesh is taking holistic - awareness, financial and legislative - measures to prevent, control and manage environmental pollution from the industries.

As part of its growth strategy, Bangladesh instituted a trade liberalization process in the early 1990s which gained momentum in later years. Trade grew from 24.4 to 45% of GDP between 1980–81 and 2007–08, an indicator of increased liberalization as well as the growing importance of the external sector in Bangladesh [43].

As per the ILO report “Employment Effects of FTA Agreement” predicted that employment opportunity of skilled and unskilled manpower of Bangladesh will increase with FTAs. Bilateral trade agreements will always increase the market access to those countries. Empirical evidence has shown diverse results of the impacts or welfare gains of Bangladesh is involvement in different trading arrangements [44].

The industrial development is haphazard in Bangladesh and previously government had no control on where an industry should be developed. This uncontrolled industrialization created problems like waste management, effluent treatment, service deliver etc.

To overcome this problem government is now establishing Economic Zones to establish industries in a cluster for better land, environmental and service management.

The demand of eco industrial park is increasing rapidly worldwide. It is also a scheme to attract FDI in Bangladesh. Till now Bangladesh did not establish or transform its existing industrial cluster like EPZs in to echo industrial park.

A recent World Bank project in Bangladesh aimed to develop a roadmap for low carbon growth and design an optimal policy framework to facilitate it for Chittagong Export Processing Zone (CEPZ) [49]. A yearly 244 tCO2 in GHG reduction and 331 megawatt-equivalent energy consumption avoidance are expected as an outcome of this project.

References

1. Hossain R., (2017). BGMEA offers new platform 'Shonman' to replace ACCORD & ALLIANCE, pressure from international bodies continued. Textile Today, Bangladesh. August 22
2. How can Micro, Small and Medium garment units survive during recent crisis? The Textile Today, 2019

   https://www.textiletoday.com.bd/can-micro-small-medium-garment-units-survive-recent-crisis/

3. Rahman M. A & Hossain M S., (2010). Compliance Practices in Garment Industries in Dhaka City. Journal of Business and Technology (Dhaka)
4. Hossain, L., Sajib, M., & Hafiz, E. (2017). Readymade garment industries going green. The Financial Express. International Publications Limited. http://www The financial express-Bd. Com/2017/08/06/ 79126/Readymade-Garment-Industries Going-Green
5. Alam, M. N. (2019). Bangladesh has 2nd most GOTs-certified factories. Textile today, Bangladesh. September 19
6. Make better choices at every stage of a product's development

   http://apparelcoalition.org/Higg-product-tools/

7. Partnership for cleaner textile. In association with international finance corporation (IFC). http://www.textilePaCT.net/
8. Hasan, R. And Leonas, K. K. (2018). Collaborative approach for water & energy conversion: clothing industry of Bangladesh
9. Khan, S R. (2019). The story of waste fabric (Jhoot): positioning Bangladesh. Textile today, Bangladesh. March 24.

   http://www.textiletoday.com.bd/the-story-of-waste-fabric-jhoot-positioning-Bangladesh/

10. USGBC projects certification.

    http://www.usgbc.org/projects?certification=%5b%22platinum%22%2c%22gold%22%2c%22silver %22%2c%22certified%22%5d&country=%5b%22Bangladesh%22%5d

11. The Green Button helps with purchasing sustainable textiles. GIZ (deutsche gesellschaft für internationale zusammenarbeit)
12. GRI, sustainability disclosure database.

    http://database.globalreporting.org/

13. Kechichian. E., and Jeong. M. H., (2016). Mainstreaming Eco-Industrial Parks. https://openknowledge.worldbank.org/bitstream/handle/10986/24921/Mainstreaming00020150event0in0Seoul.pdf?sequence=5&isAllowed=y
14. BGMEA sustainability report 2020. http://download.BGMEA.com.bd/BGMEA%20sustainability%20report%202020.pdf
15. Moazzem, K. G. And Radia, M. A. (2018). 'data universe' of Bangladesh's RMG enterprises: key features and limitations. CPD working paper 123. Dhaka: Centre for policy dialogue (CPD). http://cpd.org.bd/wp- content/uploads/2019/01/cpd-working-paper-123-data-universe%e2%80%99-of-Bangladesh%e2%80%99s-RMG-enterprises.pdf
16. Alam, Mahbubul Rashid, A.Z.M. Manzoor Furukawa, Yasushi (2008). Policy Implications and Implementation of Environmental ICTPs in Developing States: Examples from Bangladesh. Electronic Green Journal, 1(26). http://escholarship.org/uc/item/8mt001zf
17. BGMEA joins UN Climate Charter. The Bangladesh Garment Manufacturers and Exporters Association, 2020. http://www.bgmea.com.bd/index.php/page/BGMEA_joins_UN_Climate_Charter
18. Country Environmental Analysis Bangladesh. Asian Development Bank, July 2004.http://www.adb.org/sites/default/files/institutional-document/32179/ban-cea-jul2004.pdf
19. Cleaner Production Case Study: Water Saving; Evince Textiles Limited. PaCT, Partnership for Cleaner Textile. https://www.textilepact.net/wp-content/uploads/2021/03/case-study-water-saving.pdf
20. https://www.fibre2fashion.com/industry-article/2071/social-compliance-issues-in-the-apparel-sector-of-bangladesh
21. Rahman T., (2019). Employee Rights & Labor Law in Bangladesh – All you need to know about Employment Law
22. Islam. N., Afrin. S., Tasnim. T., Biswas M. P., Shahriar. T., (2018). Application of Labor Laws and Other Compliances in Readymade Garment Industry of Bangladesh.
23. "Bandhan" Fair Price Shop. DBL Group. https://www.dbl-group.com/bandhan-fair-price-shop/
24. Siddique. M. A. R., (2017). Structure of Textile Education in Bangladesh. https://www.textiletoday.com.bd/structure-of-textile-education-in-bangladesh/
25. Textile schools in Bangladesh. Wikipedia, the free encyclopedia. https://en.wikipedia.org/wiki/Textile_schools_in_Bangladesh#:~:text=Currently%2C%20there%20are%20a%20total,institutes%20in%20the%20coming%20years.
26. Bangladesh University of Textiles. Wikipedia, the free encyclopedia. https://en.wikipedia.org/wiki/Bangladesh_University_of_Textiles
27. Background. SEIP, Skills for Employment Investment Program. https://seip-fd.gov.bd/about-us/background/
28. Hasan. A. S. M. M., Rokonuzzaman. M., Tuhin. R. A., (2019). Drivers and Barriers to Industrial Energy Efficiency in Textile Industries of Bangladesh. Energies 2019, 12, 1775;
29. APO Productivity Databook, 2019. Asian Productivity Organization. https://www.apo-tokyo.org/publications/wp-content/uploads/sites/5/APO-Productivity-Databook-2019_light.pdf
30. Peata T. N., (2021). Garment Manufacturing Productivity & Bangladesh. https://textilefocus.com/garment-manufacturing-productivity-bangladesh/
31. https://www.nationsencyclopedia.com/economies/Asia-and-the-Pacific/Bangladesh-INFRASTRUCTURE-POWER-AND-COMMUNICATIONS.html#ixzz6swlEYH9N

32. Annual Report (2019-20). Bangladesh Power Development Board. https://www.bpdb.gov.bd/bpdb_new/resourcefile/annualreports/annualreport_1605772936_AnnualReport2019-20.pdf
33. Electricity sector in Bangladesh. Wikipedia, the free encyclopedia. https://en.wikipedia.org/wiki/Electricity_sector_in_Bangladesh#:~:text=Bangladesh's%20total%20installed%20electricity%20generation,the%20commercial%20and%20agricultural%20sectors.
34. Number of mobile cellular subscriptions in Bangladesh from 2000 to 2019 (in millions). Statista. https://www.statista.com/statistics/497091/number-of-mobile-cellular-subscriptions-in-bangladesh/
35. Key Data. Roads and Highway Department. https://www.rhd.gov.bd/KeyData/KeyData.asp
36. Annual Report (2019-20). Ministry of Railway, Government of Bangladesh. https://mor.gov.bd/sites/default/files/files/mor.portal.gov.bd/annual_reports/76265db8_f240_466c_a127_7babe3433380/Annual%20Report%202020_Rail%20Ministry%20(2).pdf
37. Airports in Bangladesh. Civil Aviation Authority of Bangladesh. http://caab.portal.gov.bd/site/page/30210b33-66b8-4c1c-bc43-bff614005bbe
38. Sarwar. M. M., (2008). Presentation on Gas Infrastructure in Bangladesh. SARI / Energy Global Energy Markets Trade Program Delhi, 27th February 2008. https://sari-energy.org/oldsite/PageFiles/What_We_Do/activities/GEMTP/Gas_Infrastructure_in_PETROBANGLA.pdf
39. Haque S.E. (2018) An Overview of Groundwater Quality in Bangladesh. In: Mukherjee A. (eds) Groundwater of South Asia. Springer Hydrogeology. Springer, Singapore. https://link.springer.com/chapter/10.1007/978-981-10-3889-1_13#:~:text=Groundwater%20is%20abundant%20in%20Bangladesh,(BGS%20and%20WaterAid%202001).
40. Vision & Mission. Bangladesh Hi-Tech Park Authority. http://www.bhtpa.gov.bd/site/page/9a0a5817-03e3-4ad2-a2b3-1bab300bbdc5/%E0%A6%AE%E0%A6%BF%E0%A6%B6%E0%A6%A8-%E0%A6%93-%E0%A6%AD%E0%A6%BF%E0%A6%B6%E0%A6%A8
41. Bangladesh Economic Zones Authority (BEZA). https://www.beza.gov.bd/
42. Mala D. A., (2021). China top investor in Bangladesh's economic zones. https://thefinancialexpress.com.bd/economy/bangladesh/china-top-investor-in-bangladeshs-economic-zones-1610506680
43. Bangladesh Bureau of Statistics. http://www.bbs.gov.bd/
44. Raihan. S., (2017). Review of Bangladesh's Engagement in Preferential Trading Arrangements. Ninth Tranche of the Development Account Project Enhancing the Contribution of Preferential Trade Agreements to Inclusive and Equitable Trade. https://www.unescap.org/sites/default/files/DA9-01%20Bangladesh%20PTA%20review%20-%20Raihan%20&%20Ashraf.pdf
45. https://core.ac.uk/download/pdf/234630824.pdf
46. Hasan. M. T., and Hosain. M. Z., (2015). Corporate Mandatory and Voluntary Disclosure Practices in Bangladesh: Evidence from listed companies of Dhaka Stock. Research Journal of Finance and Accounting,
47. Moazzem, K. G. And Radia, M. A. (2018). 'data universe' of Bangladesh's RMG enterprises: key features and limitations. CPD working paper 123. Dhaka: Centre for policy dialogue (CPD). http://cpd.org.bd/wp-content/uploads/2019/01/cpd-working-paper-123-data-universe%e2%80%99-of-Bangladesh%e2%80%99s-RMG-enterprises.pdf

48. Abdin J. (2019). MSMEs - both a choice and a reality for Bangladesh. The Financial Express, August 2017. https://www.thefinancialexpress.com.bd/views/msmes-both-a-choice-and-a-reality-for-bangladesh-1566055028
49. Kechichian. E., and Jeong. M. H., (2016). Mainstreaming Eco-Industrial Parks. https://openknowledge.worldbank.org/bitstream/handle/10986/24921/Mainstreaming00020150event0in0Seoul.pdf?sequence=5&isAllowed=y