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Environmental Compliance Opportunities in the Bangladeshi Ready Made Garments Industry: Lessons from the Green High Achievers

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Adam Smith International

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Acronyms

APL	Apex Holdings Limited	**HVAC**	Heating, Ventilation, and Air Conditioning
BB	Bangladesh Bank	**HVLS**	High-Volume Low-Speed
BDP	Bangladesh Delta Plan	**IEE**	Initial Environmental Examination
BDT	Bangladeshi Taka	**IESNA**	Illuminating Engineering Society of North America
BEZA	Bangladesh Economic Zones Authority	**IFC**	International Finance Corporation
BGMEA	Bangladesh Garment Manufacturers and Exporters Association	**ISO**	International Organization for Standardization
BKMEA	Bangladesh Knitwear Manufacturers and Exporters Association	**KEMA**	Keuring Van Elektrotechnische Materialen Te Arnhem
CAFTA	Central America Free Trade Agreement-Dominican Republic	**LED**	Light-Emitting Diode
CETP	Central Effluent Treatment Plant	**LEED**	Leadership in Energy and Environmental Design
CoC	Codes of Conduct	**LIBOR**	London Inter-Bank Offered Rate
CP	Cleaner Production	**MEP**	Mechanical, Electrical and Plumbing
CPD	Centre for Policy Dialog	**MFI**	Micro Finance Institution
CRP	Caustic Recovery Plant	**MoEF**	Ministry of Environment, Forests and Climate Change
CSR	Corporate social responsibility	**NGO**	Non-Governmental Organization
CWASA	Chattogram Water Supply and Sewerage Authority	**PACT**	Partnership for Cleaner Textiles
DoE	Department of Environment	**PFL**	Plummy Fashions Limited
DWASA	Water Supply and Sewerage Authority	**RMG**	Readymade Garments
ECA	Environmental Conservation Act	**SMART**	Sustainable, Measurable, Accountable, Replicable, and Time Sensitive
ECC	Environmental Clearance Certificate	**SME**	Small and Medium sized Enterprises
EDGG	Economic Dialog for Green Growth	**SREDA**	Sustainable and Renewable Energy Development Authority

EGB	Exhaust Gas Boiler	**STWI**	Swedish Textile Water Initiative
EIA	Environmental Impact Assessment	**TAL**	Tarasima Apparels Limited
EPZ	Export Processing Zone	**TDS**	Total Dissolved Solids
ERV	Energy Recovery Ventilation	**TPP**	Trans-Pacific Partnership
ETL	Envoy Textiles Limited	**US-EPA**	United States Energy Policy ACT
ETP	Effluent Treatment Plant	**USFI**	United States Fashion Industry
FAL	Fakir Apparels Limited	**USGBC**	U.S. Green Building Council
FI	Financing Institutions	**VFD**	Volatile Organic Compound
FY	Fiscal Year	**VRF**	Variable Refrigerant Flow
FYP	Five Year Plan	**WDF**	Washing, Dyeing and Finishing
GDP	Gross domestic product	**WHR**	Waste Heat Recovery
GNI	Gross National Income	**WRAP**	Worldwide Responsible Accredited Production
GoB	Government of Bangladesh	**WTO**	World Trade organization
GSCM	Green Supply Chain Management		
GTF	Green Transformation Fund	**ZZFB**	Zaber and Zubair Fabrics Limited
HGL	Hams Garments Limited		

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Executive Summary

Bangladesh's Ready-Made Garments (RMG) industry remains the backbone of its industrial growth in the coming decades. This paper sought to examine its environmental compliance landscape in terms of the incentives and barriers RMG entrepreneurs face. The paper in particular looked at the high achievers in greening, which includes some of the factories who have the most eco-friendly RMG factories, as certified by the US Green Building Council (USGBC); and some of the factories that partnered with the International Finance Corporation's Partnership for Cleaner Textiles (PACT) project, which is the world's largest initiative for resource efficient apparel manufacturing (Daily Star 2017 a). This approach was taken to demonstrate three things: is cost recovery possible in the medium to long term for investments that go beyond mandatory government and basic buyer requirements; what kind of barriers did the high achievers face and what lessons are there for other RMG companies who may benefit from greening; and what kind of policy and institutional changes are needed to spread greening from the high achievers to the rest of the industry. The key points of the paper are given below.

Cost recovery calculations for the Leadership in Energy and Environmental Design (LEED) green factories broadly align with the market studies conducted in the USA. While some LEED points are more cost intensive than others (please see section 4.6 for details), cost recovery in the medium to long term is achievable. The main challenge for LEED certification remains strategic planning from the initial construction design phase, and metering/monitoring after certification. Cost recovery for the PACT partner factories is well documented (sections 4.8, 4.9, and 4.10) as yielding financial returns in the form of reduced water, electricity and chemical use. The main internal and external challenges and enablers that these high achieving companies face are detailed in the table below. A key finding from the interviews is that the top-performers in the RMG sector are professionally managed corporate organisations, and 'greening' is a sensible investment that keeps them ahead in their business and enhances public perception regarding themselves.

Table A: Key enabling factors and barriers in greening in the RMG industry

Internal Factors	**External Factors**
- Top management commitment - Corporate vision (down to floor level) - Current organizational structure/functions - Current fiscal health of company - Proper measurement system in place - Green compliance training plan in place - Regular allocation of budget for operations and maintenance of green initiatives - Proper communication regarding green practices - Employee involvement - Alignment of company's strategies with greening	- Government policies and incentives - Buyer demands - Market demand for low cost clothing - Pressure from competitors - Collaboration with suppliers - Technology availability/constraints - Pressure from investors (which is missing in Bangladesh, as overwhelmingly, most companies are family owned) - Consumer behavior - Global pressure groups like Clean Clothes Campaign, and various environmental groups.

- Existing compliance management strategy for other standards (product quality, building safety, etc.) - Position of the RMG firm in graduating to a higher tier of suppliers (e.g. graduating from a silver band to a gold or platinum rated supplier for an important buyer) - Desire for branding	

For greening to be attractive to the medium and low performers in the industry (the segments where perhaps the buyer pressure has not been the same, or perhaps their production process does not call for heavy investments into pollution management), the paper finds that the following are needed:

- **Strong regulatory signals** from the government (through a combination of policy review, regulations review, revised target setting, and regulatory measures suited to the medium and low performers);
- **Economic and non-economic incentives** from the government, commercial banks and financial institutions (such as simplified access to green financing, recognition of green actions through ease of business, etc.);
- **Increase in absorptive capacity** (skills building on cleaner production at RMG management and floor supervisors at the medium and low green performing companies, skills building in government stakeholder agencies, etc.); and
- **Expert knowledge sharing** and public relations management.

The high achievers' greening business case reveals an important lesson that should not be ignored while considering scaling up greening among the medium and low performers: company management will only prioritize greening investment as long as it is not in conflict with the company's overall goals of remaining profitable. It is not usually the goal of RMG companies to invest in green technologies, and their yearly turnover and profit margins remain a key factor. The paper recommends the following measures:

Table B: Key measures to encourage scaling up of greening in the RMG industry

Action and Actors	Barriers Addressed
Review of policies and institutional structures around environmental and water quality regulations. Actors needed: Ministry of Environment, Forests and Climate Change, Ministry of Water Resources, Ministry of Local Government and Engineering, Ministry of Industries, etc.	Lack of clear analysis on what resource pricing would incentivize expense conscious RMG firms to reconsider resource used
Compliance mapping along RMG clusters, regular monitoring (involving DOE and municipalities and local government), and capacity building for cleaner production monitoring.	Lack of updated and transparent pollution data for regulatory use only; lack of monitoring capacity

Actors needed: Ministry of Environment, Forests and Climate Change, Ministry of Water Resources, Ministry of Local Government and Engineering, Ministry of Industries, BGMEA, BKMEA etc.	
Review of economic incentives and duty structures. Actors needed: Ministry of Industries, Ministry of Commerce, Bangladesh Bank, National Board of Revenue, BEZA, etc.	Lack of clarity on conflicting price signals to RMG companies on greening
Review of Green Transformation Fund and the Green Refinancing Fund. Actors needed: Bangladesh Bank, Commercial Banks, Non-banking Financial Institutions, BGMEA, BKMEA, RMG representatives from medium and smaller companies etc.	Lack of clear understanding on what green financing products are available to medium and smaller RMG companies; lack of streamlined access to finance for locally procured green tech solutions
Regional Cleaner Production Hubs (TTBC style "one stop solution centers" but with additional participation from the DOE on monitoring and compliance assistance). Actors needed: Private Sector (trainers, auditors) and the DOE etc.	Lack of in depth and "just in time" information/solution options to RMG compliance teams
Knowledge Management and Network Building. Actors needed: DOE, BGMEA, BKMEA, Buyers, Development Partners, Academia, International Experts, etc.	Lack of sustained dialogue at the topmost level on the achievements of scaled up greening, especially at the international level

Chapter 1: Introduction

1.1 Bangladesh's Ready-Made Garments (RMG) Industry

The export-oriented garments, apparel and textile industry, generally known as Ready Made Garments (RMG) has been the driving force of the Bangladeshi economy for decades. The sector operates about 4482 factories in Bangladesh (BGMEA 2018), and it contributed around USD 30.61 billion to the economy in the last fiscal year, and employs around 4 million workers, most of whom are women. Bangladesh is the world's second largest apparel exporter after China, and competing with India, Vietnam, Sri Lanka and Pakistan for its share of the global apparel market. The Bangladesh Garments Manufacturers Association (BGMEA) has set an aspirational goal of reaching USD 50 billion by 2021, which is Bangladesh's 50th year of independence. According to the Export Promotion Bureau (EPB), the RMG export target for FY 2017-18 was USD 30.16 billion.1 By May 2018, apparel exports grew by 9.7% (year on year) to reach USD 28.12 billion (knitwear USD 13.94 billion, and woven USD 14.18 billion). Projections by the EPB suggest that at the current rate, Bangladesh will export around USD 31.12 billion at the end of 2017-18.

Continued relevance of the RMG sector to Bangladesh's economic growth means that the environmental footprint of the industry will also stay relevant. Environmental regulation and implementation of said rules continues to be critical to the path of continued RMG growth. In addition, it is also important is to conceptualise greening in a realistic framework that acknowledges the supply chain pressures and the imperative of the suppliers to keep the prices as low as possible. Remarkably, a growing number of Bangladesh's RMG entrepreneurs are demonstrating the "win-win" case for greener apparel production, even in a highly cost-competitive environment. Some of Bangladesh's largest and most successful RMG firms have achieved the highest Leadership in Energy and Environmental Design (LEED) certification in the world. 'LEED Platinum' ratings are awarded to factories designed and built using strategies aimed at reducing energy and water usage, promoting better indoor air quality, and improving quality of life – standards significantly higher than required by domestic laws. Another positive development has been the impact of buyers' Codes of Conduct (CoCs) which has led to the voluntary adoption of cleaner production (CP) measures by selected RMG factories who are benefitting through an integrated strategy to maximize profits by making more efficient use of inputs (such as energy, water, or chemicals), while maintaining or increasing production and minimizing waste and pollution at source. RMG companies that have partnered with the International Finance Corporation (IFC) in their Partnership for Cleaner Textiles (PACT) project, and other donor and buyer assisted CP projects are examples of such high achievements.

Important questions now arise:

- What are the triggers and barriers to exceptional voluntary compliance?
- What are the lessons from the LEED certified and CP companies, and how can those lessons translate to the whole industry?
- What kind of policy incentives do we need from the GoB regulators to enable transformational greening of the RMG sector?

This paper is structured as follows: chapter two details our research methodology, while chapter three provides an introduction to the RMG sector's growth challenges vis-à-vis its environmental pollution

[1] Source: https://www.textiletoday.com.bd/10-reasons-bangladesh-will-not-able-achieve-50-billion-apparel-export-2021/

footprint; discusses compliance costs with respect to buyer benefits; and outlines buyer concerns regarding compliance costs and apparel prices in the global markets. Chapter four presents the high achievers in greening by looking at two groups of companies –the LEED platinum rated group, and the PACT group. Both groups' greening achievements, investment costs and savings are presented. Chapter five provides an overview of sustainable financing options available to the RMG industry. Chapter six is the Conclusion and Recommendations, based on the paper's findings, including concrete project actions, and possible funding sources.

The paper argues that the way we think about compliance incentives must change in the increasingly complicated and competitive apparel supply chain. Costs must be recovered through resource savings, and the benefits must be thought of as continued participation in an increasingly environmentally conscious global industry. A re-examination of incentives, challenges and new partnerships has to extend to policy makers, buyers, RMG companies and regulators.

Chapter 2: Research Methodology

2.1 Research Approach

The industry is characterized by a tightly controlled network of buyers, raw materials suppliers, apparel manufacturers, accessories manufacturers, logistics companies, financial institutions, auditors, and regulators. Governance in a value chain is of importance while trying to understand product standards or compliance. Governance in value chains is not a static concept, and global value chain literature has shown two distinct types of governance – buyer-driven and supplier-driven (Gereffi2001). The supply chain governing the international apparel trade is labelled as buyer-driven, because the orders, product specifications, and delivery specifications are all set by the international buyers. Buyers also control participation in the supply chain.

What does compliance mean in a global apparel supply chain? Compliance means acting according to a set of rules, and in the apparel chain, the rules are set by a mixture of stakeholders with their own jurisdiction and agenda – it can range from government regulations, international standards for various aspects (e.g. fiduciary, human resources, worker safety, social issues, etc.), to the buyer's requirements. Having a compliant supply chain means that every actor along the supply chain must fulfill their obligations or requirements. This can be challenging for an international apparel company as they depend on tight control over the end products they purchase. This is done through the establishment of buyer codes of conduct, or compliance standards that buyers require from all current and prospective suppliers. The supplier must fulfill all requirements and maintain compliance through audit cycles.

The figure below depict the different components of compliance requirements in the RMG industry:

Figure 1Compliance Issues in the Bangladeshi RMG Industry

Compliance standards and audits commonly applicable to the Bangladeshi RMG industry covers the areas shown in the Figure 1. Environmental compliance is one of the many requirements that a manufacturer has to fulfill. Although environmental pollution generated by this industry is a significant problem, there is little academic literature on Bangladesh. In Figure 2 (below), we have further unpacked Environmental compliance according to its "push factors" as below:

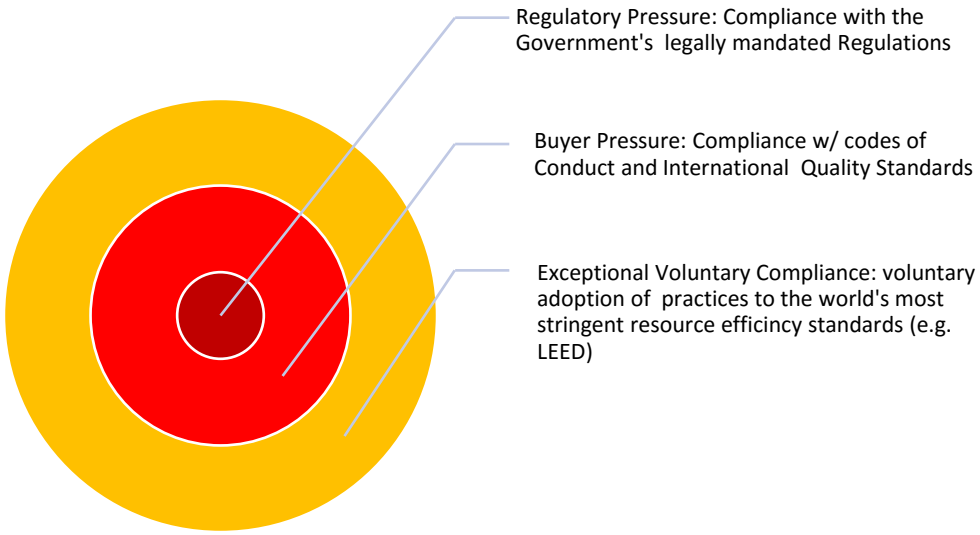


Figure 2Levels of Environmental Compliance Requirements (Mandatory and Voluntary)

At the most basic level, factories must comply with the country's own environmental requirements (See Annex 1 for details on the requirements and the emissions standards applicable to the industry); the next level higher is the one driven by buyers who demand regulated codes of conduct before placing orders; and the highest level of compliance is where entrepreneurs go beyond the requirements set by governments and buyers. Needless to say, the spheres are ever expanding outwards in terms of requirements and achievements.

2.2 Analytical Framework

Greening of the textiles sector is described in supply chain literature as Green Supply Chain Management (GSCM), which is broadly defined as managing the supply chain activities in an environmentally-friendly manner, which requires RMG suppliers to adhere to local pollution control and environmental management laws (as pertains to the country of manufacturing), and often includes voluntary measures beyond legal compliance, often reflecting environmental values of the country of the consumer or buyer. It covers a product's entire life cycle from sourcing, design, product development, manufacturing, packaging, storage and transportation to disposal, recovery and post sales services including end-of-product life management. This is sometimes known as "closing the loop". It should be noted here that the idea of green supply chain management is only slightly different from (and is a part of) the wider concept of sustainable supply chain management.

For the purposes of this paper, we define 'greening' by Bangladeshi RMG factories in the apparel supply chain as taking actions in coordinated, efficient and effective ways, through the integration of economic, environmental (and social) considerations into in-factory management procedures and business systems. These systems need to be designed to manage material, capital and information flows associated with procurement of raw materials, utilities, production and shipping of apparel, in order to meet government, buyer and other stakeholder requirements related to environmentally benign production. Green manufacturing should contribute to improved competitiveness, resilience and profitability of the firm in the supply chain over the short, medium and long-term.

Supply chain management literature describes various categories of factors that impact the operation of a green supply chain, and these factors also apply to the RMG sector in Bangladesh. These are: cost, pollution control, quality and resource consumption (Wu and Barnes, 2015). Greening in a supply chain is done using existing resources that a firm has (including human resources, financial resources and time) keeping costs at a minimum, while meeting environmental performance indicators, reducing natural resources consumed, and meeting product quality requirements. Consequently, supply chain literature envisions these factors in terms of 'barriers and drivers', and we use this framework in this paper to understand 'greening' in Bangladeshi RMG.

Supply chain research suggests that 'barriers and drivers' are a result of conflicts between different stakeholders, including customers, employees, suppliers, regulators, governmental agencies, and shareholders and their reactions towards green initiatives (Tay et al. 2015). Some important drivers are government support, government legislation, easy access to green financing, easy availability of greening knowledge and expertise, competitive pressure (Wu et al. 2011). Interestingly, some of the barriers and drivers arise from the same source – for example, government regulation on greening might help urge a factory owner along, but poorly designed banking regulations could be a disincentive.

In the tables below, a snapshot of internal and external barriers and drivers are presented as they apply on the case studies selected for this paper.

Table 1 Internal Factors

Factors	**Internal Drivers (ID)**	**Internal Barriers (IB)**
People	Top management commitment Middle management commitment Employee involvement Commitment of individual "green leaders"	Lack of top management commitment
Organizational factors	Company culture On the job training on green issues Cross departmental communication	Organizational reluctance Lack of training
Resource	Larger organizations Knowledge of environmental issues Long term investment in technology Capabilities within purchasing and supply function	Smaller organizations Lack of access to professional environmental knowledge/advisory services that are affordable Lack of information and technological systems
Strategic vision	Gaining competitive advantage	Non alignment with the main management principles of cost competitiveness

Technology	New 'green' technology can drive change in production processes	Worries about cost recovery after making heavy investments in technology often are a disincentive

Table 2 External Factors:

Factors	**External Drivers (ED)**	**External Barriers (EB)**
Legislative/regulatory	Government policies that require mandatory clearances and license renewals that are contingent on green performance	Government policies that provide perverse incentives to greening (e.g. water pricing, subsidies on non-ecofriendly technology)
Supply chain pressures / apparel consumers	Buyer pressure for greening	Poor supplier commitment to greening
Suppliers (backward linkages)	Collaboration from suppliers on purchasing	Unclear information from suppliers on their eco-footprint
Competitors/ peers	Collaboration and information sharing on best practices	Lack of collaboration
Banks	Clear banking information on financial products and smooth processing	Unclear banking products, rules and procedures. Lack of flexible terms and conditions favoring green technologies over usual technologies
Other actors	Availability of technical assistance on greening that is affordable	Limited availability of local experts
Culture	Greening-friendly culture in the industrial sector outside of RMG/textiles	Limited emphasis on greening outside of this sector
Technology	Increased global partnerships and favorable government policies can facilitate technology transfer	

2.3 Methodology

This paper combines literature review and a qualitative data collection through semi-structured interview design where respondents answered questions on factors they perceive as most important GSCM drivers and barriers. The results are presented in Chapter five and analysis is given in Chapter six.

An exploratory research approach has been chosen for this report since very few studies about the barriers and enablers of implementing Green Supply Chain Management in Bangladeshi textile supply chains have been conducted. The relationship between theory and research of this study is mainly deductive because the theory guides the research; meaning that the design of the empirical studies is built on the findings of the literature study.

Interviews:

The interviews with key stakeholders have been conducted in a semi-structured manner because it leaves room for spontaneous and individual answers, but at the same time allows a certain degree of standardization. The interviewees were emailed the questions in advance upon request.

Case studies:

Besides the greening data available from the IFC, companies' own CSR reports have been studied to increase the study objectivity. The information has been analyzed to deepen the understanding of how textile companies perceive their incentives of implementing a greener production strategy and to learn why and how certain factors influence a company's GSCM implementation more than others.

2.4 Limitations

RMG stakeholders tend to treat compliance issues as highly confidential because of implications on company reputation and buyer evaluations. Not all companies responded to interview requests, and some declined after having agreed. The sample size of factories interviewed is small. While the secondary data used in the paper has been vetted for accuracy, the in-depth interviews yield data that are subject to personal opinions of the key informants, and their professional experiences, and the individual circumstances of the companies.

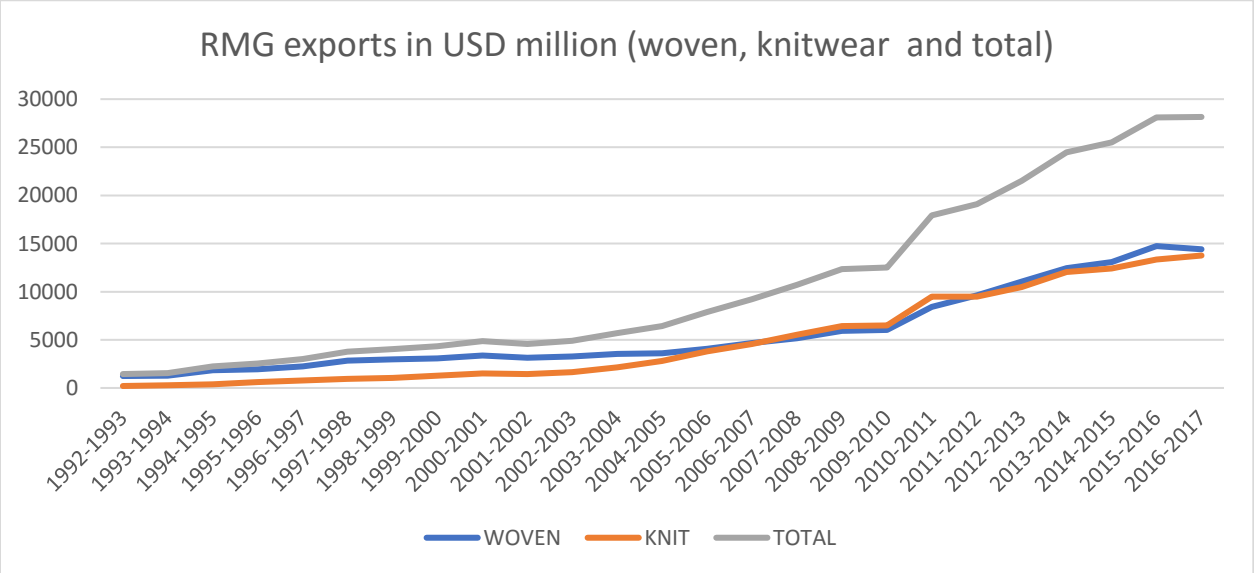
Chapter 3: The Bangladesh Readymade Garments Sector and its Environmental Compliance Landscape

3.1 The Readymade Garments Sector and its Challenges

Since its birth in the late 1970s, the Bangladeshi garments sector has been driving the country's industrial development. Bangladesh had a GDP of USD 274.5 billion in 2017-18 (an increase from USD 249 billion in 2016-17), according to the Ministry of Planning. The national economy has consistently posted growth at around 7% in the past 3 years, and 2017-18 GDP growth is projected to be around 7.65% by the Government (BBS 2018, Daily Star 2018 b). The second largest contributor to GDP is the industrial sector at 33.71% (which grew 11.99% in 2017-18, against 10.22% in 2016-17), wherein RMG is the largest contributor. The RMG industry exported goods worth USD 28.14 billion in 2016-17, which was 81.23% of Bangladesh's total exports. Bangladesh is also the world's second largest apparel exporter, after China.

Main products: The two main categories of exported products are woven garments and knitwear. In 2016-17, Bangladesh exported USD 14 billion in woven items, while the knitwear category exported USD 13 billion. Except for a period in the late 1990s, woven and knitwear export growth rates have been rising steadily. According to the CPD (2018), share of woven exports fell 2.35% in the last fiscal to USD 14 billion; however, it posted a growth of 4% in the current fiscal to USD 7.17 billion. Knitwear exports have risen 11.4% to USD 7.6 billion.

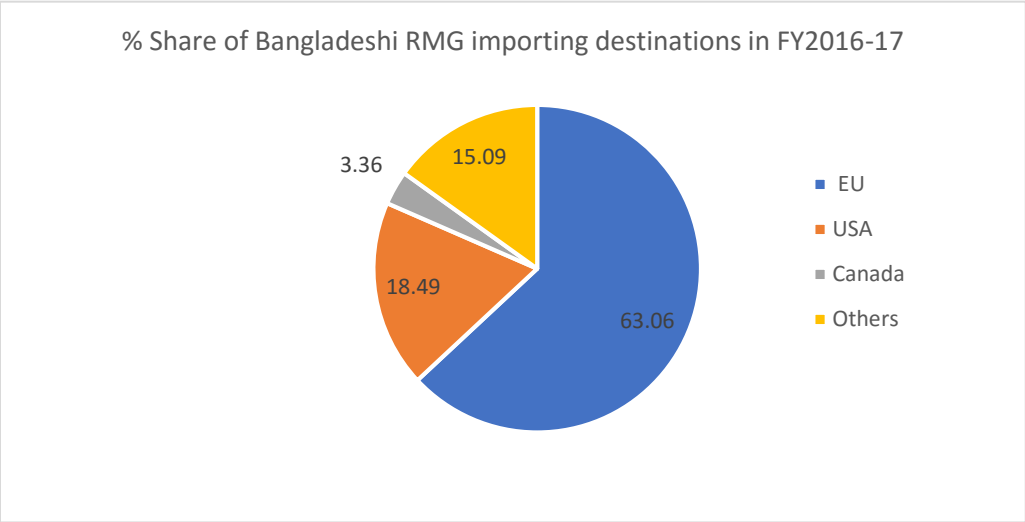
Figure 3Total RMG exports (Woven and Knitwear)



Source: BGMEA 2018

Export markets: Currently, Bangladesh mainly exports to the European Union, USA and Canada. Bangladesh been pushing aggressively to expand their export base to new markets such as South America and Africa. The sector is seeing new market opportunities in Japan, Russia and India.

Figure 4Bangladeshi RMG export destinations



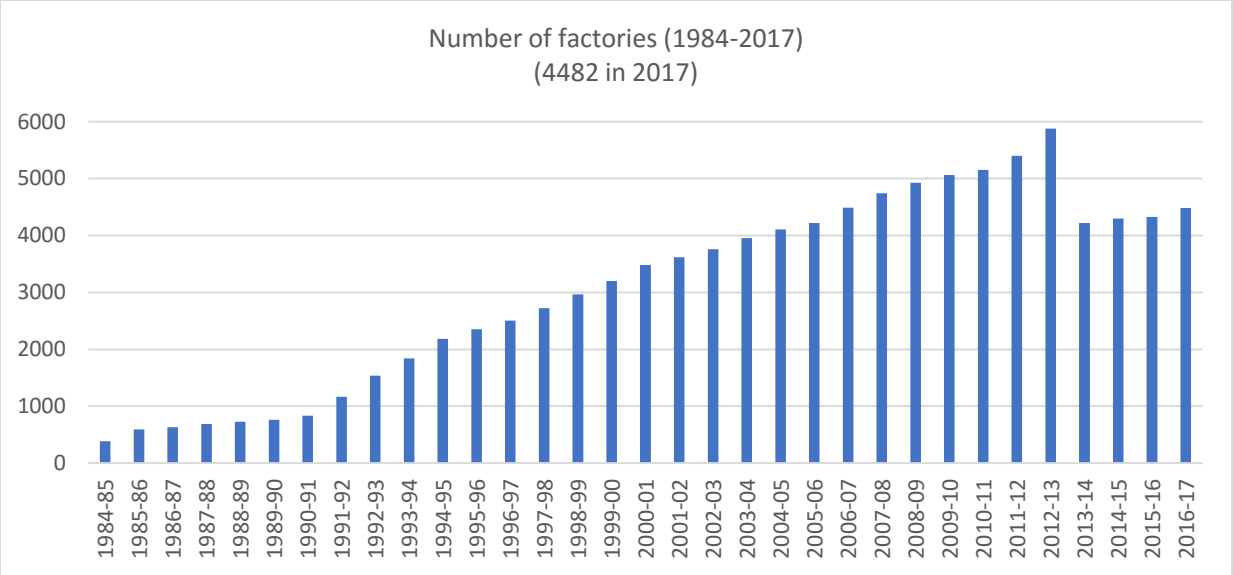
Source: BGMEA 2018

Table 1Woven and Knitwear exports to world markets (FY15 to FY17) (in USD bn)

Market	Woven			Knit			Total		
	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17
EU	6.51	7.73	7.86	8.85	9.42	9.89	15.37	17.15	17.75
USA	3.97	4.22	3.90	1.32	1.39	1.30	5.29	5.62	5.20
Canada	0.54	0.57	0.54	0.38	0.42	0.40	0.93	0.99	0.95
Others	2.02	2.20	2.09	1.88	2.11	2.16	3.91	4.32	4.25
GRAND TOTAL	**13.06**	**14.74**	**14.39**	**12.43**	**13.35**	**13.76**	**25.49**	**28.09**	**28.15**

The garment sector value chain includes yarn making, knitting, weaving, fabric dyeing, washing, finishing, apparel cutting and making and finally, apparel exporting. Bangladeshi textiles can be divided into two depending on its place in the value chain: backward linkage industries (supporting basic textiles, such as spinning, weaving, knitting, dyeing and finishing) and forward linkage industries (garment manufacturing factories – sewing and knit – printing and packaging). There are several large composite mills who span both ends of the segment.Most companies are Bangladeshi owned. The industry has spawned a fast growing backward and forward linkage industry, and BGMEA estimates that about 50 million Bangladeshis directly and indirectly depend on the industry for their livelihoods.

Figure 5Number of RMG Factories



3.2 Vision 2021 and Challenges Ahead:

The global apparel industry has grown at 5.5% annually, and according to the McKinsey Global Fashion Index 2018, industry sales growth is projected to nearly triple between 2016 and 2018, from 1.5% to between 3.5 – 4.5%. Emerging markets remain a crucial source of this growth. The global market for clothing products came down to USD444 billion in 2016 from USD450 billion in 2015. Although China comfortably retains its position as the top exporter of apparel products with USD161 billion in 2017, its market share slid to 36.4% from 39.3% last year. China shifting is a great opportunity for Bangladesh, backed by its past growth records. Indeed, McKinsey (2011) forecasted continued growth for the sector – at about 7 - 9% annually - with the growth in the higher value-added mid-market sector outstripping the currently dominant value sector. The Bangladeshi RMG sector grew at 12.37% on average annually since 2015-16, despite international market recessions, international trade quota changes, internal infrastructural problems, labour unrests and devastating industrial building accidents.

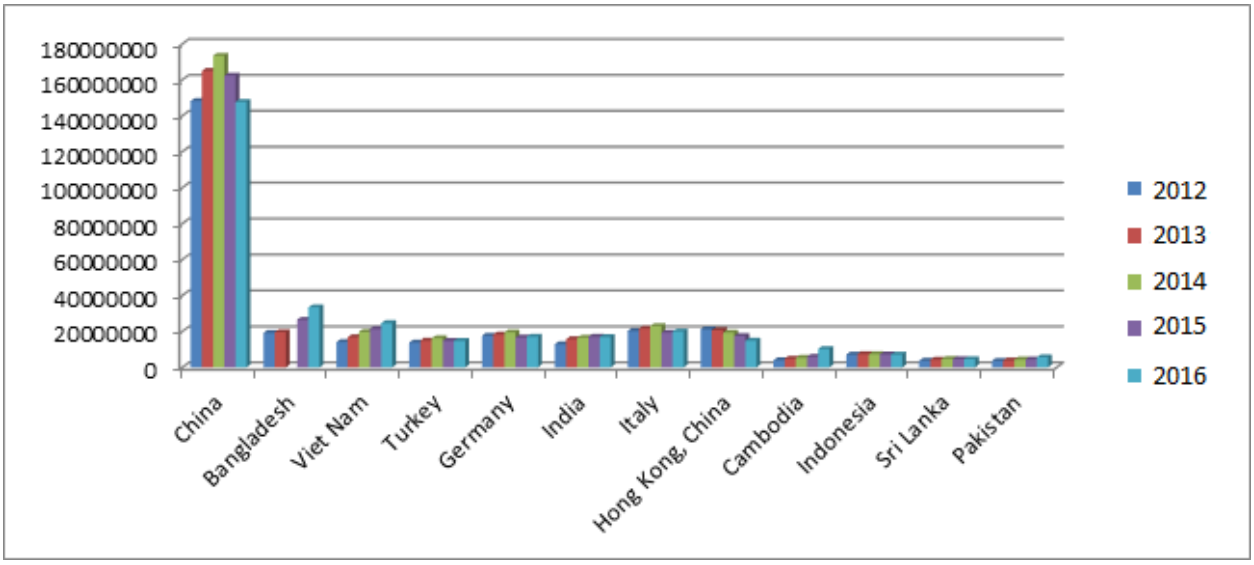
Table 2RMG exports and growth in the last decade

FY	US$ millionsin exports	% Growth
2006-07	9,211.23	16.59
2007-08	10,699.8	16.16
2008-09	12,347.77	15.40
2009-10	12,496.72	1.21
2010-11	17,914.46	43.35
2011-12	19,089.73	6.56
2012-13	21,515.73	12.71
2013-14	24,491.88	13.83
2014-15	25,491.4	4.08
2015-16	28,094.16	10.21
2016-17	28,149.84	0.20

Source: BGMEA 2018

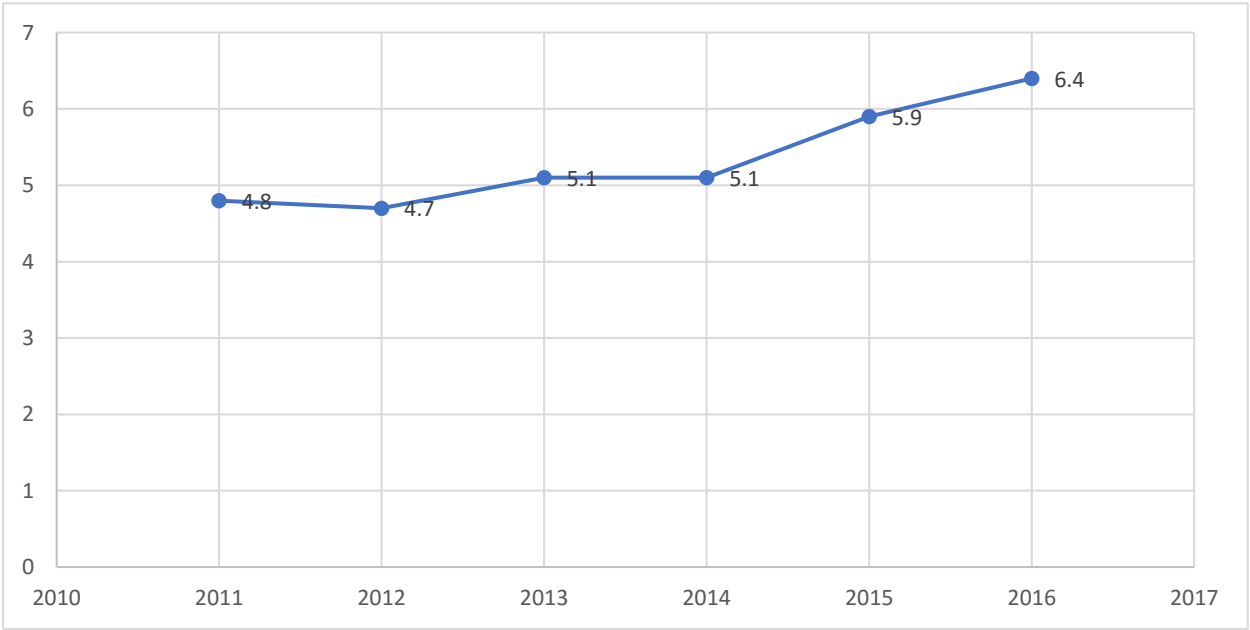
According to the World Trade Organization's (WTO) World Trade Statistical Review 2017, Bangladesh's global market share in clothing rose to 6.4% in 2016, an increase of 0.50% over the previous year (Dhaka Tribune 2017). In the meantime, Bangladesh is gaining in export volume to the EU and the US markets, despite a fall in prices in a very challenging global market in 2016-17.

Figure 6Export trend (USD 000) of major apparel exporters in the world 2102 -16.



Source: ITC WTO as cited in Textile Today (2017)

Figure 7Bangladesh's Global Apparel Market Share



In South Asia, some RMG exporters have fared better than others — while export growth has grown in Bangladesh (the top performer), and in Pakistan, it has slowed in India and Sri Lanka. The Bangladesh RMG

sector is facing tough challenges ahead as it braces to capture more of the market as China's share declines, and competitors like Viet Nam put in a stronger performance. Key challenges are the following:

1. Experts agree that the issue of shortening lead time (due to high dependence on imported raw materials) is key in edging out competitor countries. The knitwear segment performs better than woven because of shorter lead time in yarns; however, the woven sector depends on imported fabrics, which is very sensitive to global price fluctuations. 'Lead time' is important because on average, goods from Bangladesh take 35 days to reach US markets, whereas Chinese products take 20 days. This means that Bangladeshi manufacturers cannot accept last minute high-value orders. As a result, Bangladesh's woven exports get lower prices from buyers.
2. In the quest for value addition, upgrading existing technology in RMG factories is also a major challenge. According to the BGMEA, factory owners are investing in it in the hopes of boosting buyer confidence and assurance of continued participation in the apparel supply chain. RMG is an energy-intensive sector, and gas shortage in Bangladesh is a major concern. Getting a gas connection is problematic, and this is adding to the woes of the factory owners who have had to relocate their factories after the Rana Plaza accident, to new fully compliant buildings. In some cases, factories that relocated are not in production due the lack of gas connectivity. Weak gas pressure means that factories are wasting precious off-peak hours (when gas availability is supposed to be higher as it is night time) of production time, adding to the supplier's lead time worries (Nasir 2017). There is considerable uncertainty about the energy supply situation, and even though the Government is implementing the import of LNG, the initial estimate suggest that LNG will be more costly than natural gas.
3. Bangladesh can only meet 30% to 35% of local demands of woven fabrics (CPD 2018). The raw materials gap is a challenge for the future growth of the woven segment. Not only is there not enough investors willing to invest in backward linking units to supply raw materials to the woven industries, but also the land requirements of a fully compliant woven factory is much higher than that of a knitwear factory.
4. Infrastructure deficit is one of the most critical challenges facing RMG entrepreneurs. Port facilities, delays at the airport, and poor condition of roads from Dhaka to Chittagong are often cited as reducing valuable lead time (Nasir 2017).
5. Compliance challenges are also getting tougher for the entrepreneurs in remaining competitive. According to the World Bank (2016) Bangladesh's biggest strength in comparison its competitors is that it is cost competitive, however, compliance continues to dog the sector and hold it back.[2] Wages and working conditions have long been a source of concern in the apparel sector, as evidenced by the frequent strikes and labor unrest following the collapse of the Rana Plaza factory in April 2013 (which killed more than 1,000 people) and other incidents such as the fire at Tazreen Fashions in November 2012 (which killed 112 workers). In response, the industry—in collaboration with the government, foreign buyers, and development partners— has agreed on several policy measures to improve

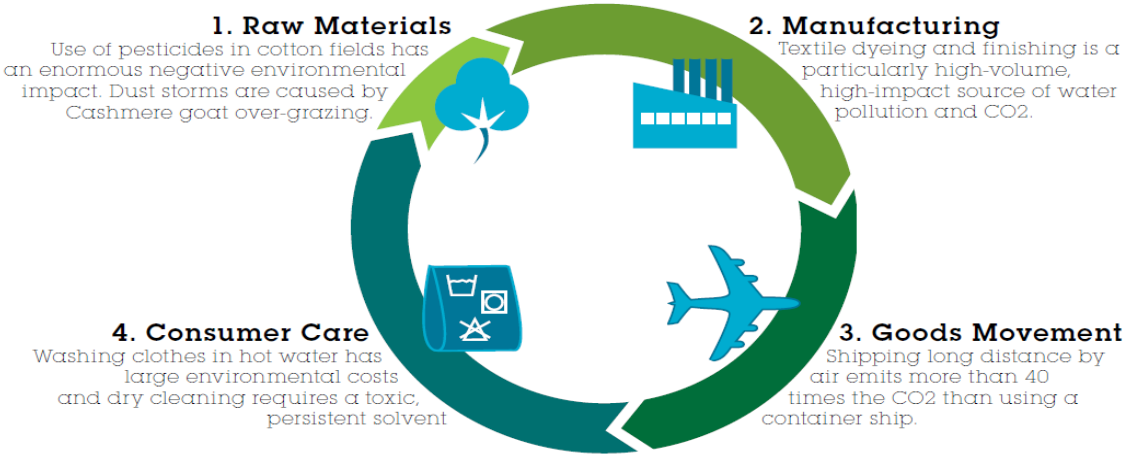
[2] According to the World Bank (2016) worker conditions are problematic in neighboring India as well. Overtime and child labour are recurring problems. Negotiating and collective bargaining is also difficult. Worker safety is also an issue in Pakistan (factory fire in 2012 in Karachi). The granting of Generalized System of Preferences (GSP) Plus status by the European Union in 2013 hoped to have a strong push for compliance in Pakistan. Worker condition are perhaps the least problematic in Sri Lanka, where political stability and compliance (driven by strong mutually reinforcing partnerships with buyers) are strong competitive factors. Also, the literacy and skill-levels of the Sri Lankan RMG workforce is higher.

factory safety and social compliance. However, negotiating collective bargaining agreements is still very difficult. Female workers lack voice and representation in the country's weak industrial relations system (Kabeer and Mahmud, 2004).

3.3 The Environmental Footprint of the RMG Supply Chain

Textile and apparel manufacturing is a resource hungry and pollution intensive sector, in each stage of the life cycle (see Figure below). The Natural Resources Defense Council (NRDC) estimated that on average, a single ton of finished fabric can pollute up to 300 tons of water (NRDC 2012).

Figure 8The four heaviest impact areas of the fashion and apparel industry



Source: NRDC 2012

The largest portion of Bangladesh's RMG pollution stems from its Washing, Dyeing and Finishing (WDF) units. Washing involves cleaning textiles or apparel with water and chemicals; dying involves coloring or printing substrates; finishing involves the superficial treatment of textiles or apparel at the wet or dry stage. WDF is more popularly known in Bangladesh as dyeing, printing and finishing. These are the final-stage processes in the textile industry. Here textile materials undergo both mechanical and chemical treatment. Perfection in WDF operation determines the appearance and use of the fabric, and thus its marketability.

WDF units can be of the following types: garment washing and dyeing (post-garmenting knit RMG and woven RMG processing WDF units); woven dyeing/printing-finishing (pre-garmenting textile operation for woven fabric processing); knit dyeing/printing-finishing (pre-garmenting textile operation for knit fabric processing); and yarn dyeing/washing (pre-garmenting textile operation for yarn processing) (World Bank 2012). Such operations are often conducted in the premises of relevant textile or RMG manufacturing units. Sweaters are made from both dyed yarn and grey yarn. If produced solely with grey yarn, they need to be dyed. Otherwise they are washed in the same factory or in garment washing and dying units. Terry towels go through a similar process, as they are produced with colored/bleached yarns that may need

simply washing sometimes, or with grey yarns that must be processed (dyed or bleached). The WDF units are again sub-divided depending on their integration with other types of operation such as: standalone or integrated with either woven or knit "parent" unit. More than 95% of WDF units are in Greater Dhaka (Naraynagonj, Savar, Gazipur, and Dhaka City) and in Chittagong. There are also WDF units in the export processing zones (EPZs) around the country (NRDC 2012 and ADSL 2009).

3.4 Water Pollution

The washing, dyeing, and finishing of textiles requires large amounts of clean freshwater, and while typically estimates are difficult, it can range from under 100 – over 300 cubic meters/ton of textiles, but this depends on the nature of the production process and efficiency levels of the manufacturing unit (World Bank 2014). Assuming an annual textile production of 5 million tons, it is estimated that an average factory in Bangladesh consumes 300 liters per day (ADSL 2009). The NRDC in 2009 put the estimate at 200 tons of water per ton of fabric.[3] Across the sector, water usage is estimated to be 1,500 million cubic meters (World Bank 2014). Most of this water is sourced from groundwater wells.

It is estimated that annual groundwater consumption by WDF units in Dhaka is around 880 million cubic meters a year, based on the following assumptions: total annual fabric production of 5 million tons, average water efficiency of 250 cubic meters per ton (conservative estimate), and around 70 percent of WDF units located in Greater Dhaka area (ADSL 2009). In comparison, the Dhaka Water Supply and Sewerage Authority obtains around 16,500 million liters per day from groundwater, or 610 million cubic meters a year (Akther, Ahmed, and Rasheed 2009).

Table 3WDF sector's contribution to water pollution

Process	Wastewater
Singeing	Little or no wastewater is generated
Desizing (removal of starch materials from fiber)	Organic waste (BOD)
Scouring (removal of fatty/oily and waxy substances) Bleaching (whitening)	Hydrogen peroxide, sodium silicate or organic stablizer; high pH Hydrogen peroxide, sodium silicate or organic stablizer; high pH
Dyeing and washing printing	Cationic materials; color; BOD; sulfide; acid Suspended solids; urea; solvents; color; metals; heat; BOD; foam
Finishing Mercerizing (enhancing luster by treating with NaOH)	BOD; COD; suspended solids; spent solvents High pH; NaOH
Heat setting	Little or no wastewater
Dry finishing	Little or no wastewater
BOD= biological oxygen demand; COD= chemical oxygen demand; NaOH= sodium hydroxide	

Source: Ramesh Babu et al 2007.

3

The WDF processes result in a range of chemicals being added to the water or steam used in these wet processes, and large volumes of starch being washed out. The leftover combined organic materials, chemicals, and water are then discharged from mills as wastewater. A pollution assessment carried out by IWM (2007) found that industrial sources, notably the textile industry, tanneries, and the pharmaceutical industry, were the largest contributors to pollution in the Dhaka watershed. Garment factories were found dumping untreated effluents containing toxins such as fabric dyes, formaldehyde, chlorine, heavy metals like lead and mercury, defoamers, bleaches, detergents, optical brighteners, and equalizers, into open waterbodies connected to the main rivers surrounding Dhaka, leading to the Buriganga river being declared as ecologically dead in 2011.

Despite existing regulatory requirements (please see Annex 1 for a summary of applicable regulations), many factories have not installed legally mandatory Effluent Treatment Plants (ETPs). Reasons for this include a lack of regulatory capacity for oversight, lack of free space for situating ETPs, and a lack of finance and know-how on constructing and running ETPs. The IWM test results of surface water samples collected from factory outlets in the nine major industrial clusters in Dhaka suggest extremely high organic pollution as demonstrated by very high biological oxygen demand (BOD)[4] and chemical oxygen demand (COD)[5] values in almost all the industrial clusters. Inorganic pollution is also indicated by the high concentrations of total dissolved solids, chloride, sulfate and the heavy metal chromium in the outlets of some of the industrial clusters. High pH values and suspended solids (TSS) have also been recorded for a number of outlets. High concentrations of sulfides are often detected in wastewater, which are produced due to conversion of sulfate to sulfide in the effluent (particularly from dyeing industries) under anoxic conditions. Very strong color is often the most visible sign of pollution, especially in the effluents from the prevalent dying industries. According to the IWM study, over 1.3 million cubic meters of heavily polluted industrial wastewater entered the drainage and river system without treatment on a daily basis in Dhaka alone. Most surface water is unfit for human use and is likely to be dangerous for livestock.

3.5 Air Pollution

The textile sector is energy intensive, and Bangladesh in particular faces an acute shortage of gas supplies to the factories, which is considered a serious threat to the future export targets (Naser 2018). The WDF segment requires extensive generation of hot water and steam, thereby contributing to greenhouse gas emissions. Factory boilers for heating water typically release nitrous oxides and sulphur dioxides. Carbon monoxide is released from factory sizing operations. Bleaching operations release chlorine dioxide, and fabric printing releases hydrocarbons and ammonia. Fabric-finishing operations can release formaldehyde into the air. Permanganate bleach used to make jeans look “worn” causes lung irritation and can damage the central nervous system. Denim “sand blasting” causes silicosis which can be fatal. Caustic soda – a common “scouring agent” – used to treat fabrics before dyeing can cause the lungs to stop working. Although there are no available estimates on the amount of air pollution generated by the garments sector (and the brick and construction industry and traffic are more visible sources of urban air pollution),

[4]BOD is the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period. It is used as a robust indicator of organic pollution levels in water.
[5]COD is the amount of organic compounds (pollutants) in water.

there is no doubt that garments manufacturing is contributing to poor air quality. The ETPs attached to factories can result in direct emissions. Greenhouse gases GHG) such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), can result directly from the biological processes, and can be reduced by changing the operational conditions, treatment of gaseous streams and changing the processes to remove organic matter and pollutants (J. L. Campose et al 2016).

Table 4WDF sector's contribution to air pollution

Process	**Air emissions**
De-sizing (removal of starch materials from fiber)	Volatile organic compounds (VOCs) from glycol ethers
Scouring (removal of fatty/oily and waxy substances	VOCs from glycol ethers and scouring solvents
Bleaching	Chlorine dioxide
Dyeing & washing	VOCs; metals; salt; surfactants; toxics
Printing	Solvents, acetic acid from dyeing and curing oven emissions; combustion gases; particulate matter
Finishing	VOCs; contaminants in purchased chemicals; formaldehyde vapor; combustion gases; particulate matter
Heat setting	Volatilization of spin finish agents

Source: ADSL 2009.

3.6 Addressing Environmental Pollution and the Costs of Compliance

The Department of Environment (DOE), under the Ministry of Environment and Forests and Climate change (MOEF) is the main environmental regulation and enforcement agency for industrial licensing and pollution monitoring. It is responsible for awarding factories with environmental clearance certificates, undertaking factory inspections, and monitoring compliance and enforcement of environmental standards (through fines and factory closures). The most relevant national laws pertaining to the industrial sector are as follows:

National Environmental Policy 1992
National Energy Policy 1995
Environment Conservation Act 1995
National Environment Management Action Plan (1995-2005)
Environment Conservation Rules 1997 (Amended Feb and Aug 2002)
National Industrial Policy 2005
Environment Court Act 2000
Environment Conservation Act (Amended 2000 and 2002)
Environment Conservation Rules 1997 (Amended 2005)
Environmental Conservation Rules 1997
Renewable Energy Policy 2008
BEZA Act 2010
Bangladesh Climate Change Trust Act 2010
Balumahal & Soil Management Act 2010

Speedy Increase of Electricity & Fuel (Special Provision) 2010
National 3R Strategy 2010
Environment Court Act 2010
Environment Conservation Rules 1997 (Amended Feb 2010)
Environment Conservation Act (Amended 2010)
Bangladesh Electricity & Energy Research Council Act 2015
Bangladesh Standards and Guidelines for Sludge Management 2015
National Industrial Policy 2016
Energy Audit Rules 2016
Petroleum Act 2016
Bangladesh Biodiversity Act 2017
Environment Conservation Rules 1997 (Amended Feb 2017)
SREDA Act 2012
Action Plan for Energy Conservation 2013
Energy Efficiency & Conservation Master Plan 2014
National Environment Policy 2013
Brick Manufacturing and Brick Kiln Establishment (Control) Act 2013
Bangladesh Water Act 2013
National River Conservation Act 2013

Many of the laws are cross sectoral and are only partially related to environmental issues. Depending on the extent of impact on the environment, the DOE classifies all the projects in four categories: green, orange A, orange B and red. According to the ECR Schedule 1, apparel and textiles falls into Orange B category, while the textile dyeing and chemical processing is a Red category. In both categories, factories are required to obtain an Environmental clearance from the DOE (details of the process can be found in Annex 1). Among the many pre requisites for getting this clearance (such as Initial Environmental Examination (IEE), Environmental Management Plan (EMP) for orange B; and an additional Environmental Impact Assessment (EIA) for red category projects), is the installation of an Effluent Treatment Plant (ETP) within the factory premises. Environmental Clearance renewal is conditional upon keeping the ETPs operational and performing to the standards set by the DOE in Schedules of the ECR, which sets about standards for air (schedule 2), water (schedule 3), Waste from Industrial Units or Projects waste (schedule 10), Gaseous Emission from Industries or Projects (schedule 11) and Sector-wise Industrial Effluent or Emission (schedule 12). Details of these standards are given in Annex 1.

In addition to the DOE, the Dhaka City Corporation, local pourashavas (municipalities), the Dhaka Water Supply and Sewerage Authority, and Dhaka's Capital Development Authority have regulatory oversight on the RMG sector's water demand and pollution. Despite an impressive regulatory framework for controlling pollution (although heavily reliant on traditional command and control models and load based effluent standards rather than XXX based standards), regulating pollution from RMG or ensuring their compliance with national requirements has been an uphill task. The Bangladesh RMG sector grew in an unplanned manner, without longer term planning or land zoning (a problem that is exacerbated by multiple overlapping government agencies who are responsible for different aspects of industrial planning in a strategic way). The factories grew despite lack of appropriate infrastructure or services like water supply or energy connections. In the first few decades the factories operated without environmental clearances, or monitoring and enforcement by the regulatory bodies. Environmental compliance to national regulations has improved greatly since the early days of the industry, as has the number of ETPs

as the industry has grown up the value added chain. The DOE's enforcement has improved as well, but institutional weakness remain. Many firms that have installed the mandatory ETP often do not run them due to their significant operating costs—combined with a relatively low probability of getting caught and fined. Other establishments remain unable to install ETPs due to lack of space, finance, and know-how, and the lack of alternatives to in situ treatment.

Some of the larger firms have volunteered to enroll in cleaner production programs and have made cost savings, while some have struggled. RMG sector's environmental compliance performance cannot be understood without understanding cost implications and greening incentives. The opportunity cost of investing into greening is high for smaller firms, as it competes with higher priority investments that go towards increasing productivity and efficiency of a factory. However, the higher the value added segment that a firm belongs to, the more likely it is to have been WRAP, ISO, or LEED certified, suggesting that the trade-off is less risky because of assured participation in the supply chain ("buyer loyalty"). But what makes Bangladesh so competitive for the buyers, and how does environmental compliance (as distinct from wage or social compliance) fit in?

The apparel value chain is buyer led, meaning that they set the terms of trade as well as the prices at the time of placing the order. The supplier accepts the price and does its best to meet the shipment on time, and to the buyer's full satisfaction, while ensuring profitability. This means that it takes time and repeated transactions with the buyer for greening related cost increases from the suppliers' side to be reflected in the price offered by the buyer. The biggest price point that buyers value while sourcing from Bangladesh is low wages. As Ali (2016) shows in the table below, productivity and supply chain efficiency are the two main variables impacting Bangladesh's cost competitive edge.

Table 5Bangladesh's cost competitiveness in South Asia

Factors	Bangladesh	India	Sri Lanka	Vietnam	Pakistan	Cambodia	Source
Min. Wage	$69	$71	$73	$78	$79	$80	ILO
Productivity	77%	92%		90%	88%	68%	Mc Kinsey
GNI per capita (atlas)	$840	$1,530	$2,920	$1,400	$1,260	$880	WB
Bank Interest Rate	16%-18%	10.60%	13.30%	13.50%	13.50%	12.98%	WB & CIA

Source: BGMEA 2016

Though Bangladesh provides the lowest minimum wage, it is still only 2 dollars cheaper than India. However, India has a productivity level of 92%, whereas Bangladesh is at 77%. This large efficiency gap is the highest priority for RMG factories to not only survive in the current price regime, but to grow its exports. Roughly, 80% of production costs incurred by an RMG owner goes towards raw materials, with the remaining going towards production (including investments into machinery, skills, compliance, wages, etc.). Of the production costs, wages account for 80%. Over the last few years, wages in Bangladeshi RMG factories have gone up by 219%. The Exporters Association of Bangladesh (EAB) president Abdus Salam Murshedy is quoted as saying that the days of cheap labor being Bangladesh's main selling point it over (ProthomAlo 2018). Other production factors (electricity, gas, oil or chemicals that are a necessity for production, transport etc.) have also become more expensive. Interest rates in Bangladesh are the highest in South Asia (giving an advantage to competitors in India, for instance) and frequent USD exchange rate fluctuations also increase the costs for the producers. According to Ali (2016), Table 8 below shows how

these factors are contributing to the "price crunch" felt by the suppliers as profit levels drop despite increasing volume of exports.

Table 6Loss of profitability in T shirt manufacturing

Component	January 2012	December 2013	Change
FOB	5.8	5.8	
Wages	0.81	0.89	10%
Gas & Electricity	0.04	0.05	35%
Bank interest/charges	0.05	0.07	40%
Transportation	0.02	0.02	12%
Source Tax	0.03	0.05	34%
Others	0.04	0.04	0%
Production cost	1	1.13	12.60%
Profitability (US $)	0.16	0.03	-79.02%
Taka per US $ Rate	84.44	77.75	-8.60%
Profitability (Taka)	13.47	2.33	-82.74%

Source: BGMEA 2016

However, buyers are not about to raise prices. Across the board, apparel prices have been on the decline. According to consumer price index (CPI)[6] data released by the US Department of Labor in March 2018, US market for apparel is slowing down as prices continue to fall. Apparel prices given to suppliers have not kept up with costs. According to the UNESCAP's Asia-Pacific Trade and Investment Report (2016), the price growth of export goods of Bangladesh will continue to decline but the volume will increase significantly. The downward pressure on price, from the demand side, has been two-fold: consumers are now buying more high-end products and cash strapped consumers are buying less clothes (Moody 2017). The implication of this on greening incentives is simple – suppliers must do it to continue participation in the supply chain, with no earmarked return from the buyers.

Despite the decline in prices, buyers remain concerned about compliance risks in Bangladesh. In fact, the US Fashion Industry Benchmarking Study (USFI 2017) lists Bangladesh as having the highest compliance failure risk in among the top suppliers to the US market (see Table below).

Table 7Supplier risks to US buyers

Sourcing base	Speed to market	Sourcing cost	Risk of compliance
USA	*****	**	****
Mexico	****	***	***
CAFTA-DR	****	***	***
China	***	****	***

[6]The Consumer Price Index (CPI) measures the change in prices paid by consumers for goods and services. The CPI reflects spending patterns for each of two population groups: all urban consumers and urban wage earners and clerical workers. The all urban consumer group represents about 93 percent of the total U.S. population.

Vietnam	***	****	***
Cambodia	**	****	**
Indonesia	**	****	***
Sri Lanka	**	****	***
India	**	****	**
AGOA	**	****	***
Bangladesh	**	*****	*
Note: The results were based on respondent's average rating for each sourcing base. ***** means much higher performance than the average and * means much lower performance than the average			

Source: USFI 2017

However, the Benchmark study reveals that increasing supplier costs (part of which is compliance) is no longer their biggest worry. While most respondents remain confident about the five-year outlook for the U.S. fashion industry, their top concerns are to do with: "protectionist trade policy agenda in the United States" (up to #1 from #10 a year ago) and "market competition in the United States from e-commerce". The US decision to leave the Trans-Pacific Partnership (TPP) and renegotiate others, like NAFTA, and even Brexit, which will have an uncertain impact on the US apparel market.

Table 8Top business challenges for the US Fashion Industry in 2017

Top business challenges for the US Fashion Industry in 2017	**Rank in 2016**	**Rank in 2017 vs in 2016**
#1 Protectionist trade policy agenda in the United States	10	Much more important
#2 Market competition in the United States of E-commerce	1	No major change
#3 Market competition in the United States from brick and mortar stores	1	No major change
#4 Investing in updating technology	3	No major change
#5 Managing supply chain risk	6	No major change
#6 Meeting consumer demand	5	No major change
#7 Increasing production or source costing	2	Much less important
#8 Economic outlook in developed countries	13	Much more important
#9 Compliance with trade regulations (such as rules of origin, requirement for restricted substance)	4	Less important
#10 HR issues, including talent recruitment for restricted substance	9	No major change
#11 Currency value and impact of exchange rates on completeness or profitability	7	Less important

#12 Economic outlook in emerging markets	14	No major change
#13 Market competition in markets other than United States	11	No major change
#14 Finding a new sourcing base other than China	8	Much less important
#15Protectionist trade policy agenda in countries other than the United States	15	No major change
#16 Political tensions in developing countries	12	Less important
Note: total score for each business issue is calculated based on weighted average as follows: 1st importance = 5 points, 2nd importance = 4 points, 3rd importance = 3 points, 4th importance = 2 points and 5th importance = 1 point.		

Source: USFI 2017

Increasing supplier costs is still a concern but it has dropped to #7 from #2 last year. Nearly 60% US buyers polled said they expect a modest or slight increase in sourcing costs; 31.3% expect no sourcing cost changes, while 6.3% expect their sourcing cost to decline. Labor cost remains the top factor driving up sourcing cost in 2017. Raw materials and shipping fees are the #2 and #3 drivers; and costs associated with factory compliance (social and environmental standards) was #4 (36% buyers are expecting supplier costs to rise because of that). What this might mean is that supplier costs may rise, but US buyers are banking on a strong dollar and low oil prices to buffer that.

However, compliance costs for the buyers has increased (as in, the amount they spend managing compliance risks in their supply chain) along with a growth in social responsibility as a buying decision factor (in fact, some US buyers have stopped placing orders in factories with shared premises in Bangladesh). 90% suppliers map their supply chains. Self-identified brands are making a greater effort to monitor Tier 1 suppliers, whereas a higher proportion of self-identified retailers map Tier 2 suppliers than the average (70% vs. 61%). However, a more diversified sourcing base makes it more difficult to monitor supply chains closely; but 100 percent of respondents currently audit their suppliers (third-party certification programs and their own compliance teams conduct both announced and unannounced audits). Regarding the content of audit, respondents say they usually focus on three primary areas related to social responsibility: treatment of workers (100%), supplier's fire safety (91%), and supplier's building safety (83 %). While the above is only for US buyers, it is still revealing that environmental compliance – especially water pollution – is still low on the checklist for buyers, which further dilutes the incentives for Bangladeshi suppliers supplying to the US market. While there is no similar study of EU buyers, and the EU typically has stringent regulations for chemicals used in the apparel they import, their prices have been falling as well.

Chapter 4: Achievements and Lessons in Greening Bangladeshi RMG

4.1 The High Achievers in Green Apparel Manufacturing

This chapter will take a closer look at some of the highest achievers in green textiles and apparel production. We include all segments of the RMG industry, including knitwear, woven, denim, washing and dyeing, etc. The chapter will explore two kinds of – sometimes overlapping – green initiatives.[7] Firstly, the Leadership in Energy and Environmental Design (LEED), which is an American standard for green buildings with elements of resource efficiency and pollution reduction built into it. LEED primarily focuses on the factory building and surrounding compound. This chapter will also look into the cleaner production side that has the production process at its core. We will also look at the IFCs' Partnership for Cleaner Textiles (PACT) project results. We have interviewed key stakeholders from LEED listed and PACT partner factories and their consultants. Lastly, we present our findings on internal and external factors that facilitate or hinder adoption of greening practices by factories at large, going beyond the top performers.

4.2 Leadership in Energy and Environmental Design (LEED)

Leadership in Energy and Environmental Design (LEED) is the world's most widely recognized and used green building certification system. It is a framework for identifying and implementing measurable and practical and green building design, construction, operations and maintenance solutions. Developed by the U.S. Green Building Council (USGBC) in 2000, the LEED certification provides independent, third-party verification that a building was designed and built using certain eco efficiency standards. Beginning in the early 2010's, LEED certification became popular in Bangladeshi RMG factories as a method of demonstrating their voluntary commitment to metrics such as energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and resource stewardship.

LEED provides RMG owners of new and existing buildings and their engineering contractors a framework for identifying green building elements and implementing those elements through green building design, construction, operations and maintenance. It is a design guide and a verification system. The challenge of LEED is for the different departments in an RMG set up to engage across their various disciplines to deliver on the LEED process. Coordination and cooperation across a shared understanding is a key factor driving LEED success. According to the USGBC 2018[8] , promotes action in 6 key areas, known as credit categories:

- Location and Transport
- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation and Design Process

[7] There are other greening initiatives in the RMG industry, led by various proactive buyers and sometimes development partners. However, this paper has selected the LEED certified companies and the PACT partner companies due to their high market visibility for the buyers, and robustness of data.

[8] https://www.usgbc.org/sites/default/files/LEED%20v4%20Impact%20Category%20and%20Point%20Allocation%20Process_Overview_0.pdf

- Regional Priority Credits

Each credit category has mandatory and optional strategies. Mandatory ones are “prerequisites” for entering the LEED process, while the optional strategies are called “credits”. Each “credit” has an intent behind it, and a set of requirements. Mechanical, electrical and plumbing engineering design teams, contractors and factory management have to work together to identify what the most effective and cost efficient strategies they should adopt in order to achieve credits, resulting in a higher performing and ranked building. Higher scores are rewarded with higher levels of certification:

- 40 points - LEED Certified
- 50 points - LEED Silver
- 60 points - LEED Gold
- 80 points - LEED Platinum

LEED v4 was introduced in November, 2013. Until October 31, 2016, new projects could choose between LEED v3 2009 and LEED v4. New projects registering after October 31, 2016 have been required to use LEED v4. [9] Most Bangladeshi LEED platinum factories are LEED v4 certified.

The world’s highest rated green denim, knitwear, washing and textiles mills are all in Bangladesh. In the global top 11 platinum certified LEED apparel factories, 8 are in Bangladesh. According to data from the BGMEA, so far 67 RMG factories have achieved LEED certification from the USGBS. 16 are platinum, 34 are gold and the remaining are silver and certified. Around 280 factories are currently enrolled with LEED and are getting certified.

Table 9Bangladesh’s Place Among the Highest LEED Achievers in Apparel

Points	Factory Name	Country Name	Date certified	Category
97	Remi Holdings Ltd	Bangladesh	July 2016	Platinum
93	Tarasima Apparels Ltd.	Bangladesh	July 2016	Platinum
92	Plummy Fashions Ltd.	Bangladesh	September 2015	Platinum
90	CONFIDENTIAL	Ireland	September 2014	Platinum
90	AR Jeans	Bangladesh	March 2018	Platinum
90	Vintage Denim Studio Ltd.	Bangladesh	May, 2012	Platinum
88	Green textile Limited Unit #3	Bangladesh	April, 2018	Platinum
87	Columbia Washing	Bangladesh	November 2016	Platinum
86	Echotex Ltd.	Bangladesh	March 2017	Platinum
86	BottegaVeneta Atelier	Italy	March 2014	Platinum
86	Method Products PBC	United States	March 2015	Platinum

[9]http://www.usgbc.org/articles/usgbc-announces-extension-leed-2009#comment-4384

Source: BGMEA (updated as of May 2018).

Bangladeshi LEED Platinum certified companies have invested in a range of features corresponding to the LEED point system. Details of the LEED's global pioneers (who happen to be Bangladeshi) and some of the highest ranked Bangladeshi LEED Platinum factories are given in annexes 4 and 5.

4.5 Understanding the LEED Price Premium

How expensive is it to achieve LEED certification? Are LEED buildings much more expensive than non-certified buildings? Broadly, this depends on the site characteristics (location, factory building size, compound size etc.), the level of LEED certification desired, and how the process is conceptualized and managed by senior management. Secondly, it also depends on what you compare it to, because expensive is a relative term. Lastly, it also depends on the time frame being considered, because some of the most expensive investments towards LEED features (or for that matter, towards cleaner production) are expensive at the initial stage but have short payback periods.

USGBC cites several American studies that argue that LEED building costs are only minimally more expensive in the initial days, but resource savings over time makes them more cost competitive in the long run. A 2003 study, called Managing the Cost of Green Buildings,[10] by energy consulting company KEMA, is referred to by the USGBC as somewhat indicative of the "LEED premium" paid by the building owners. The study only looks at new buildings for schools, laboratories, housing and libraries in California; however, despite these limitations of generalizability, the KEMA costing is commonly cited by the industry. The study identified the following price increases to the overall budget of a new building:

- LEED Certified – 0-2.5 percent
- LEED Silver – 0-3.3 percent
- LEED Gold – 0.3-5.0 percent
- LEED Platinum – 4.5-8.5 percent

A more comprehensive American study in 2007, titled The Cost of Green Revisited,[11] looked at 221 buildings and their results showed that many projects are achieving LEED within their budgets, and in the same cost range as non-LEED projects; and that while construction costs have risen dramatically, but projects are still achieving LEED standards. Based on conversations with LEED and RMG stakeholders, a rough breakdown of the "LEED premium" is shown in the figure below.

[10]https://www.usgbc.org/Docs/Archive/General/Docs5049.pdf

[11]http://global.ctbuh.org/resources/papers/download/1242-cost-of-green-revisited-reexamining-the-feasability-and-cost-impact-of-sustainable-design-in-the-light-of-increased-market-adoption.pdf

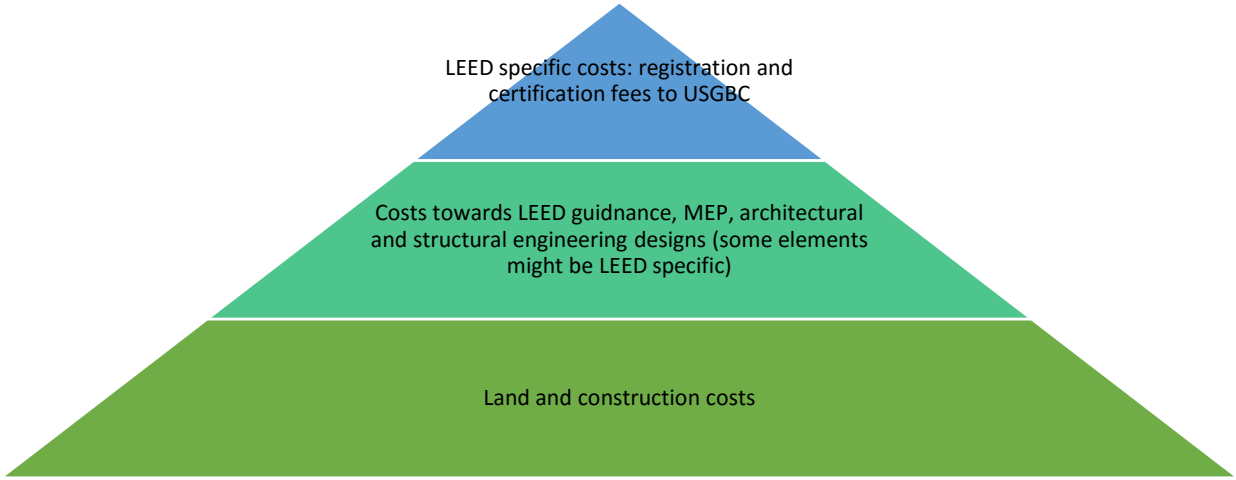


Figure 9Making of a green RMG factory and LEED costs in Bangladesh

While LEED cost estimates vary widely, some have spent around USD 200,000 for their certification, design and consultancy costs. As a rule of thumb, the least to most expensive categories of expenses for LEED certification in Bangladesh are as follows:

- **Registration and certification fees to USGBC**: Detailed information can be found in the USGBC website, and their current fees as of July 4, 2018 are presented in Annex 3.[12] Depending on factory floor size, the fees can vary: for a factory up to 50,000 square feet, USGBC charges USD 1,500 for registration and USD 2,000 for certification. Above that, for every square feet, they charge USD 0.05.
- **Design and Consultancy costs:** fees given to an outside consultant or the time of a current staff member if the company has the human capital for design, commissioning, modeling or extra research. This varies if it is a new building or an existing building. For MEP design, Bangladeshi consultants can charge around BDT 25-30 per square feet. Structural engineering and architectural costs are additional. RMG companies usually employ a consulting company that guide the MEP, architectural and structural designs to ensure LEED certification. This consultancy can cost around USD 35,000 – 45,000 for a factory up to 400,000 square feet. Larger factories can be charged up to USD 65,000.
- **Construction costs:** materials and contractor costs for measures such as solar panels, rain water harvesting, energy efficiency measures, heat island offsets, etc. This is the largest share of the costs, but here is also the most scope for innovation through collaboration.

4.6 Cost Sensitive Aspects of LEED Certification in Bangladeshi RMG

While costing for greening initiatives in a LEED certified building are not considerably different from a (non LEED) sophisticated green RMG factory, below we discuss some of the most cost sensitive construction elements that can drive up the bills under the LEED criteria:

[12]https://new.usgbc.org/cert-guide/fees

Location and transport: This category impacts decisions about building location, with credits that encourage non fossil fuel consuming modes of transport used by staff to get to the factory site, close proximity to important amenities (mosques, banks, schools, markets), etc. Plummy fashions Limited provides secure bicycle parking facilities and encourages the use of non-fossil fuel transport. Carbon emission free commuting practice has been implemented at Envoy Textiles through providing dormitory close to the factory building. Bicycle parking shed are minimal costing, but dormitories can increase costs considerably, unless the company was already considering it (13 RMG firms had taken soft loans in 2016 for constructing worker dormitories to alleviate poor living conditions of workers).[13]

Sustainable sites: This category involves the area around the building, rewarding points for protecting the natural habitat, keeping open spaces, managing rainwater, reducing heat island and light pollution. Project teams must do a site assessment of the project location (covering topography, hydrology, climate, vegetation, soils, etc.) to get a baseline. The factory must preserve at least 40% of the land as open green space, and it is quite common to find LEED RMG factories with ponds or livestock farms. Vegetated roofs are also encouraged, like at Tarasima. The factory must have a rainwater harvesting system where higher points are given if the amount of rainwater harvested is a higher percentage of total rainfall. The less the runoffs, the higher the score. Heat islands are also another measure that is rewarded in this category. Heat islands happen where hardscape areas hold heat and reflect it back, raising temperatures. Factories usually get heat island credits by installing solar reflectors, shading, and changing the type of paint on hard surfaces. Night pollution reduction is also another measure in this criterion. Light pollution management needs a photometric plan to be drawn up by the factory to control light levels outside the building at night time as per certain standards. The design team must take measurements to confirm that the built condition meets the requirements for this credit. Most platinum factories undertake most of these measures in Bangladesh.

AR Jeans, ranked 5 in the world's top 10 list of LEED platinum factories, has an underground rain water harvesting tank of 570 m3 and some percolation pits constructed across the project site to conserve rain water. Genesis Washing Limited has similar tank and percolation pits. Tarasima has converted it old ETP site into rainwater harvesting tank, and like the others, uses the rain water for gardening irrigation and in toilets. LEED certified factories owned and managed by the SQ Group (one of the largest RMG groups) all have 100% recycling of rainwater. Depending on how much space a company has, rainwater harvesting can have moderate cost impacts. Heat island protection is a popular measure. Highly reflective Albedo can be costly, especially if the roof is large, and if VOC paint emissions are taken into consideration. Night time light pollution controls are of minimal cost impact.

Water efficiency: Credits under this category have to do with limiting water use, both inside buildings and outside in landscaping. Factories have to reduce water used for irrigation of the outdoor green spaces; and indoors they have to install special taps and fittings to reduce indoor water use by 20% over a baseline case. All plumbing fixtures need to be compliant. The use of water saving fixtures, such as dual-flush toilets, low-flow urinals, and sensor fitted faucets, are common. An important investment must be into water metering to measure monthly water use. The following must be metered: irrigation, indoor plumbing fixtures and fittings, domestic hot water, boilers, reclaimed water, and other process water. Bangladeshi RMG factories with LEED v3 certification managed with taps and flushing systems that could be modified non-water saving models. With LEED V4, those designs are no longer effective and factories

[13]https://www.dhakatribune.com/business/2016/08/17/rmg-factories-get-funds-workers-dorms

have to invest in slightly more expensive newer models. Water efficiency gains by Bangladeshi RMG firms are given below.

Table 10 Global ranking and water efficiency of RMG factories in Bangladesh

Global Rank	RMG Company Name	Water efficiency[14]
1	Remi Holdings Ltd.	100% reduction in potable landscape water use 40% reduction in baseline indoor water use 50% reduction in wastewater generation
2	Tarasima Ltd.	30% reduction in indoor potable water use 100% reduction in potable landscape water use
3	Plummy Fashions Ltd.	100% reduction in potable landscape water use 40% reduction in baseline indoor water use 50% reduction in wastewater generation
5	AR Jeans	100% reduction in potable landscape water use 40% reduction in baseline indoor water use 50% reduction in wastewater generation
6	Vintage Denim Studio Ltd.	100% reduction in potable landscape water use 40% reduction in baseline indoor water use 50% reduction in wastewater generation
7	Green Textile Limited Unit 3	50% reduction in potable landscape water use 35% reduction in baseline indoor water use 50% reduction in wastewater generation
8	Columbia Washing	100% reduction in potable landscape water use 40% reduction in baseline indoor water use 50% reduction in wastewater generation
9	EchoTex Ltd	No information available

Energy and Atmosphere: This category addresses energy use reduction, energy-efficient design strategies, and renewable energy sources. Improving energy efficiency is one of the easiest ways to save money and is among the most popular LEED interventions for Bangladeshi RMG. Systems that need to be commissioned include: HVAC, electrical, plumbing, and renewable energy. Commissioning and verification of these measures is a complicated, time consuming and potentially expensive task. Solar panels can be considerably expensive. LEED platinum certified SQ Group has energy efficient vapor absorption chillers, spilt AC's, ventilation fans with evaporative coolers, air compressor with VFD, energy efficient automatic

[14] Data source:
Remi: http://www.gbig.org/activities/leed-1000042111
Tarasima: http://www.gbig.org/activities/leed-1000067829
Plummy: http://www.gbig.org/activities/leed-1000037288
AR Jeans: http://www.gbig.org/activities/leed-1000074866
Vintage Denim: http://www.gbig.org/activities/leed-1000006026
Green Textile: http://www.gbig.org/buildings/1374174
Colombia: http://www.gbig.org/activities/leed-1000035141
Echotex: http://www.gbig.org/buildings/1085556
All websites accessed on July 4, 2018

knitting machines, and energy efficient lighting system to reduce energy consumption of the building. Tarasima uses Steam Traps in irons and thermic fluid driven dryers to reduce thermal energy utilization. They also have solar panels. Typically these factories also have some form of energy management system in place to help keep track of performance. Energy and Atmosphere efficiency gains by Bangladeshi RMG firms are given below.

Table 11Energy and atmosphere efficiency gains by Bangladeshi RMG firms

Global Rank	RMG Company Name	Energy and atmosphere
1	Remi Holdings Ltd.	40% improvement on baseline building performance rating 9% onsite renewable energy 35% green power purchase
2	Tarasima Ltd.	79 Energy Star Performance Rating 12% or 100% onsite renewable energy or offsite renewable energy 80% of total energy consumption is system-level metered
3	Plummy Fashions Ltd.	42% improvement on baseline building performance rating 13% onsite renewable energy 35% green power purchase
5	AR Jeans	44% improvement on baseline building performance rating 5% onsite renewable energy 35% green power purchase
6	Vintage Denim Studio Ltd.	44% improvement on baseline building performance rating 9% onsite renewable energy
7	Green Textile Limited Unit 3	36% improvement on baseline building performance rating 13% onsite renewable energy 35% green power purchase
8	Columbia Washing	36% improvement on baseline building performance rating 3% onsite renewable energy 35% green power purchase
9	EchoTex Ltd.	No information available

Source: ibid.

Materials and Resources: Factories must have a recycling system with space provided for storage and collection (this must include paper, cardboard, glass, plastic, metals, etc). During construction of the building, they must develop a waste management plan and points are given for recycling. Bangladeshi RMG firms usually score high marks in this category, at minimal costs. Materials efficiency gains by Bangladeshi RMG firms are given below.

Table 12Materials efficiency gains by Bangladeshi RMG firms

Global Rank	RMG Company Name	Materials and resources
1	Remi Holdings Ltd.	20% recycled content building materials 20% regionally extracted, harvested, recovered, or manufactured materials 50% FSC-certified wood products 75% diversion of construction and demolition debris 10% salvaged, refurbished, or reused building materials 2.5% rapidly renewable materials
2	Tarasima Ltd.	60% sustainable purchasing of ongoing consumables

		40% sustainable purchasing of electric equipment 50% reuse, recycle or compost of ongoing consumables 75% reuse or recycle of durable goods 50% sustainable purchasing of facility alterations and additions 90% sustainable purchasing of reduced mercury lamps 70% diversion of waste from facility alteration and additions 25% sustainable food and beverage purchasing
3	Plummy Fashions Ltd.	20% recycled content building materials 20% regionally extracted, harvested, recovered, or manufactured materials 50% FSC-certified wood products 75% diversion of construction and demolition debris
5	AR Jeans	20% recycled content building materials 20% regionally extracted, harvested, recovered, or manufactured materials 50% FSC-certified wood products 75% diversion of construction and demolition debris
6	Vintage Denim Studio Ltd.	20% recycled content building materials 20% regionally extracted, harvested, recovered, or manufactured materials 75% diversion of construction and demolition debris
7	Green Textile Limited Unit 3	20% recycled content building materials 20% regionally extracted, harvested, recovered, or manufactured materials 50% FSC-certified wood products 75% diversion of construction and demolition debris
8	Columbia Washing	20% recycled content building materials 20% regionally extracted, harvested, recovered, or manufactured materials 50% FSC-certified wood products 75% diversion of construction and demolition debris
9	EchoTex Ltd	No information available

Source: ibid.

Indoor Environmental Quality: factories must make provisions for indoor air quality ventilation as per international standards. They must monitor outdoor air intake and install special ventilation grates and windows. Temperature control is very important, and a factory must have an HVAC system that meets international standards. Thermal controls must be in place for at least 50% of occupant spaces. Day light use must be maximized and 75% of regularly occupied spaces must have a view of the outdoors. Bangladeshi LEED certified factories typically install evaporative coolers, fresh air fans and ceiling fans. Sky lights can be of moderate cost if the company wants to import high quality skylights and exhaust fans to regulate intake of air as per international standards. Indoor environmental efficiency gains by Bangladeshi RMG firms are given below.

Table 13Indoor environmental efficiency gains by Bangladeshi RMG firms

Global Rank	**RMG Company Name**	**Indoor environmental quality**
1	Remi Holdings Ltd.	75% of occupied space has daylighting 90% of occupied space has quality views
2	Tarasima Ltd.	50% of occupied space has daylighting and quality views
3	Plummy Fashions Ltd.	75% of occupied space has daylighting 90% of occupied space has quality views

5	AR Jeans	75% of occupied space has daylighting 90% of occupied space has quality views
6	Vintage Denim Studio LTD	75% of occupied space has daylighting 90% of occupied space has quality views
7	Green Textile Limited Unit 3	75% of occupied space has daylighting 90% of occupied space has quality views
8	Columbia Washing	75% of occupied space has daylighting 90% of occupied space has quality views
9	EchoTex Ltd	No information available

Source: ibid.

Additional Cost Factors: according to LEED engineering consultants, factories tend to underestimate metering costs and efforts. However, increasingly the high end platinum factories are opting for Building Management Systems which includes hardware and software (and an organizational system) to track all the resources being used by the facility at any given time. The panel for the system has to be imported. For a facility of 2,00,000 square feet, a panel costs up to USD 90,000. Cables are additional. Another cost factor is the way the LEED certification is managed. Sometimes, management will decide to forego employing the supervising contractor/consultant and ask the contractor to do some additional market research and choose the best technical option. This suffers the risk of tender capturing by the machinery suppliers, or the purchase of a machine that has excess capacity compared to the factory's needs. Third cost factor is approach taken to LEED certification, if it is thought of by the entrepreneur as an additional burden, and if it is decided at a late stage (whether an existing building is being refurbished or a new construction), then making modifications for LEED will be require more investment.

4.7 Cleaner Production: Partnership for Cleaner Textiles (PACT)

Bangladesh is the home to the world's largest initiative in resource efficient apparel making. In 2013, the International Finance Corporation (IFC) in partnership with the NGO Solidaridad, the Embassy of the Kingdom of the Netherlands, 13 leading buyers and two technology suppliers, textile factories, and the Bangladesh Garment Manufacturers and Exporters Association (BGMEA), launched the water efficiency Partnership for Cleaner Textiles (PACT project).[15] PACT provided selected RMG companies with advisory services to help them switch to more sustainable production methods. Cleaner production (CP) methods were introduced by first creating awareness about CP, then companies were given in depth CP assessments carried out by PACT technical experts. This resulted in demonstrable ways to minimize use of resources like water, energy. chemicals etc. and support to factories implement the measures. For larger, more capital intensive investments, in depth CP assessments were done for large savings in water, chemicals, energy in wet processing units, ETPs, etc. PACT partner factories received technical and business information on CP measures, B2B linkages with vendors.[16]The objective was to demonstrate to

[15] More details about the PACT project can be found at the following websites:
http://www.textilepact.net/about-us/what-is-pact.html
https://www.thedailystar.net/business/bgmea-signs-pact-green-production-1470316
https://www.thedailystar.net/business/global-business/ifc-launch-2nd-phase-advisory-service-green-textile-production-1468696
http://www.textilepact.net/focus-areas/brand-guide/decision-support.html

[16] More details at: https://www.textilepact.net/pdf/pact-brochure.pdf

the companies that it is possible to reduce the amount of energy, dye and chemicals that they use and to reduce the amount of water and electricity that they consume by millions of liters per year. At the end of Phase I, the cost savings made sense to the participating factories – environmentally as well as financially. They were shown that it is possible to do more with less – and in shorter time. An increase in overall efficiency led to a more profitable factory. Phase II of PACT has been launched recently.

PACT Phase 1 Results (involving 215 partner factories, and USD 11 million in development assistance)

- Saved 21.6 billion liters of groundwater per year; which is equivalent to average annual water use for 840,000 people in Bangladesh.
- Saved 2.5 million MWh/year of energy which is equivalent to 5.4% of total national grid output of Bangladesh in 2015– 2016
- Avoided 460,428 tons CO2 eq/ year of GHG emissions
- Avoided 18.8 billion liter/ year of waste water
- Paid back in 10 months the US $ 39 million in investments from RMG owners
- Generated US $ 16.3 million/ year cost savings per year
- Developed environmentally safe sourcing guidelines for global brands;

PACT Phase 2 Goals (involving 250 partner factories, and USD 7 million in development assistance)

- Saving 32 million cubic liters of water/year
- Saving 3.8 million megawatt hours of electricity
- Saving greenhouse gas emissions by 701,588 tons
- Saving wastewater discharge by 28.8 million cubic liters
- Reducing chemical use by 10,000 tons

4.8 Cleaner Production Lessons: Water Savings and Effluent Management

Textiles production requires water at almost every stage, and consumption varies among processes within a textile mill as well as by machine type and setup. Recycling and reuse of process water can positively impact the groundwater levels, as well as yield cost savings for the RMG factory. Basic CP assessment for water usage usually consider the following: whether water is left running when not in use; whether fresh water is used at every stage of production; whether some of that water could be from a recycled source; how much cost savings could be made by more efficient water use, etc. Since the water recovered is often hot, these improvements can reduce energy bills as well. Steam condensate and non-contact cooling water is a second valuable source of water to recover because it is high in both quality and temperature. Finally, water is used for general washing and cleaning throughout the factory, and good housekeeping practices can substantially reduce wasteful use of water in cleaning. In Bangladesh especially, reductions in water use also lead to savings in energy and chemicals because factories typically extract water from their own tube wells and treat it before use.

The most common water efficiency measures found in apparel factories include: reusing recycled water from "cleaner" stages of production in "dirtier" production stages (for example, use final rinse water in first stage rinsing of the next batch); reducing water use by “dry cleanup” of the factory floors (doing the initial cleaning without water (sweeping, wiping down) before washing, so that solid and semi solid dirt

and wastes from floors and machine surfaces are cleaned without water); regulating water flow (installing high pressure water nozzles and hoses); limit water use between production stages (turn off taps when transferring materials from one bath to another, installing trigger nozzles, making sure baths are not over filled by installing automatic water switch off mechanisms, etc.).

The textiles and wet processing factories use different types of dyes and chemicals in the operation of weaving, dyeing, printing, finishing and garment washing. This wastewater is legally required to be treated in effluent treatment plants (ETP) to reduce organic contamination (to acceptable DOE standards) before emission. The most common ETP processes used to remove organic pollutants from textile waste water include: physical methods (adsorption, filtration methods, coagulation and flocculation processes), chemical methods (oxidation, advanced oxidation, Fenton's reagent) and biological treatment (anaerobic, aerobic). The most cost-effective way to reduce ETP operations cost is to reduce water use during the production process. The table below shows the top three water saving recommendations made to Bangladeshi RMG in a 2014 World Bank study.

Table 14Water Saving Best Practices (World Bank Assessment 2014)

Practice	Percentage Resources Saved (water)	Financial Savings per ton of fabric produced (Tk/ton)	Water Savings per ton fabric produced (ton water /ton fabric)
Eliminate water leaks and reduce hose pipe use	0.3-0.7 percent[17]	7-31	1.0-1.5
Reuse cooling water from dyeing machines	8-15percent	392-714	19.8-35.3
Reuse process water from rinsing operation	9-12 percent	91-426	21.6-23.5

It is worth noting that total cost savings from water and effluent management is a combination of savings from avoided pumping costs (saving energy) and avoided chemical treatment costs (saving chemicals) because most Bangladeshi RMG factories use groundwater through privately installed deep tube wells, and hence do not pay for water. The factories inside BEPZA are the exception in that they have to purchase water from BEPZA.

4.9 Cleaner Production Lessons: Energy Efficiency

Global cleaner production experience identifies steam generation as one of the most energy consuming activities in textiles factories. Usually steam is produced in boilers and is fairly common in Bangladeshi factories. The 2014 cleaner production assessment of the sector yielded the following top three cleaner production practices to increase the efficiency of steam generation and use through insulation and maintenance of the steam delivery system.

Table 15Energy Saving Best Practices (World Bank Assessment 2014)

Practice	Percentage Resources Saved (energy or energy proxy)	Savings per ton of fabric produced (Tk/ton)*

[17] Not rounded to nearest whole number because value is below 1. All other ranges reflect rounding to nearest whole number.

Steam Management	1-5% of total steam used	Variable (81, 123, 270, 349)
Recover heat from drying operations	20% of drying costs	Variable (527, 770, 1769)
Insulate Pipes, Valves & Flanges	0.4% of total natural gas used	23

* The Tk/ton figures represent the savings for the number of factories where the measure was applicable in the 2014 study.

The PACT program looked at energy efficiency from a heat and steam loss perspective. The textile industry is very power hungry, and the largest part of their electricity bill comes from the dyeing and finishing processes which use hot water and steam. Factory assessments by PACT show that 20-50% of the energy used gets wasted through gas boiler exhaust fumes, boilers and driers, etc. CP tech suggests that such wasted heat can be recovered and reused through operationalizing a Waste Heat Recovery (WHR) system. Potential sources for waste heat recovery include: exhaust gas from generators (high grade heat); boiler blowdown flash steam (high grade heat); hot condensate flash steam (high grade heat); wastewater (low grade heat), etc. The recovered heat can be used to heat combustion air or generate more steam. PACT estimates that by installing these low cost solutions, it is possible for an average textile factory to reduce their electricity bill by 5-25%. Their mitigating solutions include: heat recovery, increasing combustion efficiency, improve boiler efficiency, reduce excessive boiler blow down, condensate recovery, hot process water recovery, etc.

Bangladeshi RMG factories use a combination of the national grid and on site gas powered generators to feed their operations. A few hours of load shedding causes significant production slow down, which has driven the popularity of gas generators and in some cases, solar panels. Most factories rely on gas generators for a few hours. Increases in electricity tariffs has meant that factories are eager to invest in energy efficiency measures. Energy audit recommendations by the PACT project typically have the following recommendations: install gas flowmeters at individual generators to measure efficiency; upgrade T8 tube lights to more energy efficient T5 tube lights with electronic ballast or LED lights; find and repair compressed air and vacuum leaks; carry out proactive electrical maintenance; install power factor improvement panels; mount energy meters in different areas; Install VFD invariable loading areas; install energy-efficient versions of motors are used in the garment factory.

4.10 Cleaner Production Lessons: Chemicals Management

Chemical dyes and solvents are a significant contributor to the textiles sector's environmental pollution footprint. It also forms a large part of their production costs. In some cases, chemicals are over used or used incorrectly, or perhaps they are not stored as per standard. Typical CP measures for better handling of chemicals include: improved chemical application techniques; use of correct measurements to reduce waste or spoilage; considering using less chemicals; switching to less carcinogenic and harmful options; use lower foaming detergents; investigate which chemicals can be recycled; improve chemical storage, etc.

4.11 Analysis of Greening Barriers and Enablers

Green performance by the RMG industry depends on the internal and external motivating factors that each company faces. These are in turn influenced by market signals (price factors outside of compliance

issues), and pressures from regulators and buyers. Comparing the literature on greening in supply chains, regulatory policies, stakeholder interviews, case studies and trade reports, we can classify the most important barriers and motivating factors to greening in Bangladeshi RMG. This study has identified the following key factors:

Table 16Internal and external motivating factors

Internal Factors	External Factors
- Top management commitment - Corporate vision (down to floor level) - Current organizational structure/functions - Current fiscal health of company - Proper measurement system in place - Green compliance training plan in place - Regular allocation of budget for operations and maintenance of green initiatives - Proper communication regarding green practices - Employee involvement - Alignment of company's strategies with greening - Existing compliance management strategy for other standards (product quality, building safety, etc.) - Position of the RMG firm in graduating to a higher tier of suppliers (e.g. graduating from a silver band to a gold or platinum rated supplier for an important buyer)	- Government policies and incentives - -Buyer demands - Market demand for low cost clothing - Pressure from competitors - Collaboration with suppliers - Technology availability/constraints - Pressure from investors (which is missing in Bangladesh, as overwhelmingly, most companies are family owned)

Internal and External Factors:

Environmental regulations: As discussed earlier in the paper, the RMG industry (except for "dry" factories that are cut and sew only) falls under the red category due to its environmental footprint. All red category establishments (RMG factories and textile dyeing plants that supply to them) are required to use Effluent Treatment Plants (ETP) to treat wastewater before discharge. Prior to that, they must get an Environmental Clearance Certificate (ECC) from the DOE by conducting an Environmental Impact Assessment (EIA) and having it approved before going into production. The certification has to be renewed. According to industrial waste water regulation studies on the Dhaka watershed, there is no effective EIA system and the DoE only published non-statutory guidelines for industrial projects. The status of greening in these factories (who make up the majority of the industry) is many stages behind the factories we covered earlier in the chapter. According to a 2017 survey of RMG factories by Transparency International Bangladesh, environment management plans that are a pre-requisite to getting DOE

clearance, are not followed in the day to day operations of a textile factory. There is only a low chance that a factory will in fact be penalized for failing to meet environmental standards. The report finds that more than 70% of respondents say that environmental laws are not implemented properly, thereby creating an "oasis of green in the middle of filth" – as described by an RMG entrepreneur. Despite the DOE's 2010 initiative to introduce mobile pollution control drives, pollution from textiles continue, as evidenced by the water quality of Dhaka's rivers. Earlier reports (World Bank 2014, 2011) note how ETPs are not always kept running, as DOE monitoring is weak. In 2015, the Swedish apparel retailer H&M and the World Wild Life Fund commissioned a study looking at the waste water management practices by Bangladeshi RMG firms. Legal weakness put the entire enforcement system at risk of inefficiency and corruption. As long as weaknesses and loopholes exist, polluters will bypass wastewater treatment to gain higher profits. According to H&M (2015),

> *"There are substantial challenges around monitoring on the ground and major opportunities for improved monitoring of groundwater extraction and ETP functionality through decentralised monitoring approaches and, if possible, increased staff resources. Penalties for non-compliance are too low to be effective, and the mechanisms for pursuing penalties have opportunity for improvement. There is significant potential in the delegation of monitoring powers to local public representatives to improve implementation."*

While an in depth analysis of the needed regulatory reform and enforcement structure is needed (with a new focus on using some of the learnings from the high achievers), the following could be considered: review of DOE's discharge standards to encourage cleaner production rather than pollution dilution; review of monitoring mechanisms including upwards revision of penalties; pilot testing third party monitoring; matching functions with organizations best suited for the tasks; and identification of capacity needs at the DOE.

Buyer demands: Environmental sustainability concerns remain front and center for buyers sourcing from Bangladesh. They are moving forwards from demanding water, energy, and chemical sustainability to "closing the loop" through recycled fibers. Front of the line buyers are engaging in innovative partnerships on sustainably sourced cotton, chemical management etc. American and European buyers are also spending more every year mapping their supply chains, and monitoring sustainability compliance (among other issues such as product quality, fair wages, building safety, etc.). Requirements for recycling, water efficiency, renewable energy use, waste water quality (as per Business for Social Responsibility standards, for example) are going to increase the pressure on RMG companies. Close collaborations and better business is set to continue. However, as most RMG buyers working in Bangladesh state, price per piece of garments will not be increased to help pay for greening initiatives. The RMG factories must invest in compliance to achieve sustainability as their end goal. Based on sustainability target achievements, companies can move on to better buyers, and higher supplier categories. The end reward of that upward transition is longer term contracts of work orders consisting of higher value items, depending on the production capacity of the RMG supplier. The LEED top achievers and PACT partners have achieved that "win-win" through a suite of management practices. That management approach stems from wanting to be more competitive than their competitors. As the sustainability manager from a LEED platinum factory, Fakir Fashions Limited, said: "What the other companies can learn from us is that if you do sustainability initiatives, and invest in a green building, it is not a waste of time or effort. What they will learn is that we have a good turnover because we invest in things like sustainability, because it is a better way of doing things."

Efficiency as a core principle: An environmentally aware corporate culture in RMG factories starting from the company's chairperson and managing director and permeating through their corporate policy of sustainable and profitable apparel production is emphatically stated by the top performing RMG factories. Environmental awareness or proactivity at these levels are not found in Bangladesh's other industrial sectors, and it may be assumed that this is a result of greater regulatory and buyer pressure on the RMG industry.

Sustainable organizational set up: Compliance implementation and monitoring in factories (regardless of size) correlates to the kind of reporting they have to do to the buyers and government regulators. Factories tend to have separate teams for social compliance and environmental compliance (the latter is sometimes called "sustainability compliance"). Social compliance teams tend to be larger, and involve worker representatives. Sustainability compliance teams in larger companies with washing, dying or finishing facilities, tend to involve designated compliance managers, middle management staff, staff from the in house chemical laboratory, engineering staff, etc. The larger the floor space, the larger the sustainability team tends to be. The greater the involvement of a factory with higher end buyers, frequent audits or resource saving projects (e.g. IFC's PACT, or the Swedish Textile Water Initiative, STWI, implemented by SIDA), the larger the size of the compliance teams, and their activity levels. Most practical approaches to sustainability compliance seek to integrate the greening mission within the company's structure and culture. Most companies have a designated sustainability managers and involve staff and workers from all key departments. The locus of the sustainability team leader/manager is can vary (from health and safety, HR, operations, administration to engineering), but what distinguishes the success of the program is how integrated it is across the factory's operational units. This research found that multi-level, cross functional and matrixed compliance functions is common in these factories. For example, before any decision is made to upgrade a machine, the engineering team is aware enough to look at the energy and or water efficiency savings together as part of the sustainability team.

Measuring right: an important indicator of the health of a company's green initiatives is whether the company has SMART (Sustainable, Measurable, Accountable, Replicable, and Time Sensitive) resource efficiency goals. To begin with, factories must decide which parameters to measure. Most garment factories measure indicators based on DOE and buyer requirements. Tier one apparel manufacturers (e.g. gold or platinum ranked companies by H&M) tend to measure various indicators and report to each buyer as per the individual buyers' own tracking system. Then resource use is calculated in a standardized format, such as kilo watt hours per kilo gram of fabric processed, or per square foot of floor area, etc. Then a baseline is calculated which becomes the basis for standard setting, measurement of gains and in the case of certification systems such as LEED, the basis for point earning. An authentic baseline is the foundation of a meaningful greening program (anecdotal evidence of regulatory capture suggests the importance of triangulation of baseline data by third party auditors). The way a company monitors and manages resource efficiency depends on its existing management style. Sometimes companies take the help of the higher tier buyers to come up with a resource management plan. Some companies depend on specialized software and hardware for tracking (e.g. in the LEED factories we saw building management systems installed at the construction phase). Monitoring and measuring must happen all throughout the factory space, and this is recognized in the high performing RMG companies. Floor level workers and line supervisors must be trained and given checklists with these indicators built in, and feedback loops have to be incorporated so that urgent laggings can be immediately flagged to the right management level. Close working relationship and trust building among the apparel company's sustainability team, and the

buyers' compliance teams is a key factor. RMG companies say that a decade ago, compliance was thought of separately, but now they think of data collection for compliance in a holistic manner. In smaller companies, this progression might be at earlier stages. However, a broader shift in the culture of continuous monitoring and improvement and reporting is happening in Bangladesh, that is part of a shift in becoming comfortable with using stringent and complicated reporting systems that encourages early trouble shooting, innovation for cost savings, and the search for resource savings in every department.

Cost and purchasing: According to green technology suppliers and consultants, a factor inhibiting the most effective green tech purchase is the "principal agent" conflict, which occurs when the unit making equipment-purchasing decisions differs from the sustainability team. The overall motive of each department is to maximize profitability, and procurement decisions are linked to this. Most greening incentives are fairly small compared to larger investments the company management has to consider. Companies that can break through such grid lock by building a sustainability program that motivates the purchasing team as much as the compliance team, although oftentimes the final decision rests at the managing director level.

Green skills: training for workers and staff on compliance is a large part of duties of the compliance managers. Across the board, RMG officials, green technology suppliers and consultants have mentioned how important it is to train workers and staff on compliance on a regular basis, especially in a post Rana Plaza market. Thanks to efforts of Accord and Alliance on building safety, compliance training is getting highlighted in all of the factories that wish to remain part of the apparel exporting value chain. Green compliance has been a beneficiary of this attention boom, without needing an environmental disaster to provoke action.

Green skill building is often facilitated by the network relationships that a company is part of. Some of the large LEED certified firms and PACT partner firms mentioned that sometimes when their buyers identify a requirement, based on their working relationship, companies are comfortable to ask the buyer to arrange for site visits to similar facilities to see solutions first hand. Such a demonstration is a core facilitator is green uptake. However, such relationships are hard won, and could perhaps benefit from a programmatic scale up by trade associations and or development partners, to demonstrate greening in practice to smaller factories.

Typically large RMG companies who are part of a large brand buyer's preferred list will be given the opportunity for staff training on that buyer's compliance requirements. However, managers also complain about the complexity of navigating through different compliance systems favored by different buyers. Buyers usually provide information and training well ahead of introducing a new parameter or system that the apparel maker will be audited on. Third party auditors also provide skills building training. A lot of senior compliance managers get training for their own career development. The need for compliance training is different in lower tier factories, and a tailored training program with the aim of graduation into first tier level of compliance would be beneficial to the sector.

Compliance managers often remark that despite having a vision at the top management level, recruitment of middle managers and supervisors who instinctively understand the company's sustainability vision is challenging. One of the largest denim manufacturers in Bangladesh that is building a new facility is already making green compliance training plans for their floor workers and supervisors. Upon building a certain level of awareness and skill, selected middle management will be brought into the compliance team. The high staff turnover (especially at the supervisor and lower management levels) is very high, and building

a green vision and skills is a continuous process. Compliance managers are also sometimes eager to switch to higher paying jobs within the organization, such as merchandising.

Knowledge and awareness: Despite having sustainability as a core principle, the following common problems impede the uptake of green compliance which are all related to awareness: a lack of focus on greening; lack of awareness of actual cost savings and hence reluctance to invest upfront costs; lack of technical ability to identify resource savings and develop these into profitable actions; perception of risk of implementing a technology that may be outside the industry norm; lack of a proper costing with payback periods, because many green investments require relatively modest sums, etc. According to green technology consultants, the core of the difficulty of green diffusion among smaller companies, lies with the false perception of a high risk (driving up the discount rate for the investment when compared to other investments that the owner might be needing to make), high and complex transactions costs, and difficulties in understanding how to pace greening initiatives where the results are complementary. Smaller firms have problems with a workable compliance management system that would work at their scale (not just a watered-down version of what the top performers do). They tend to be aware of, and interested in energy savings (low hanging fruit), but higher hanging fruit rarely rank as equals to investment into machinery that is needed to expand production, for example, especially if the financial health of the company is dictating a scale back on spending. Financial, regulatory and technical assistance for this segment of the RMG needs to be addressed on a priority basis.

Green rewards: Compliance managers and green tech consultants highlight an important enabling factor: the ability of the team (and their contractors) to notice greening opportunities or wastefulness that can be corrected. Assessing and assembling the saving potentials across different production departments to come up with a greening plan with identified investments and savings (with a payback period) can make these choices visible to top management in a powerful way. Without this kind of detailed assessment and valuating, a lot of green initiatives do not become actionable. Sometimes the presence of a visible "green champion" among staff or senior management can enable greening changes in a meaningful way. A few of the PACT partner and LEED certified companies that we studied for this report mentioned that they have employee reward schemes for workers in the shop floor, engineering, finance and management when the facility meets a certain audit goal. One compliance manager said, "These are small things, but our workers and staff become very happy when we recognize that they worked for something. We give appreciation gifts and certificates to the people in charge of maintaining and reporting on the ETP and in the chemical laboratory." Strengthening of such low-cost initiatives could help spread and sustain greening.

Communication of green gains: A clear communication of the gains/savings from greening initiatives to the top management, the workers, and the community on their environmental performance could be a strong enabler. However, factories tend to communicate only within the concerned stakeholders. They undertake self-audits every 2 or 3 months, and additionally are audited by buyers by accredited third party auditors or buyers' own audit teams. In well-functioning sustainability teams, problems and solutions are identified following a self or external audit (with costing and payback periods courtesy of engineering contractors) and presented to the managing director. If the costs are minimal to moderate, then the sustainability team implements it straight away, and then reports to top management. However, for more substantial repairs, they need management clearance, where the greening imperative must compete with other factors. Communication of green gains to the buyers happens regularly via buyer audits. However,

sharing of green lessons nationally and internationally can help being about the kind of transformational greening changes that the industry hopes to achieve.

This chapter shed light on the research questions posed in the first chapter. The paper reveals that high performing RMG manufacturing companies fully recognize the positive effects of greening on their company's profitability, and have used that as the chief motivating factor in embedding sustainability in their management systems (including staffing). These aspects have not been without their challenges. However, there is a positive correlation between higher end buyers' relationships with their higher end RMG suppliers and the green performance by the latter, which could be explored for scaling up for smaller factories. There is also a positive correlation between having access to financial resources, and the motivation to design a through and sophisticated green factory. The chapter also shows that sustainability initiatives in smaller companies suffer from a lack of awareness, tailor made technical knowledge and easier access to green finance. The next chapter will look at green finance at more depth.

Chapter 5: Sustainable Financing for RMG Borrowers

5.1 Green Financing and the Bangladesh Bank

Bangladesh's central bank, Bangladesh Bank, has been at the forefront in encouraging green economic growth through a combination of policy and institutional initiatives, which directly and indirectly encourage green investments by high polluting industrial sectors, such as leather and textiles. Bangladesh Bank has issued policy guidelines (Green Banking Policy Guidelines 2011) which required the commercial banks to move towards a more comprehensive approach to encourage disbursements towards environmentally benign technologies. This was to be done in 3 phases. In phase one, commercial banks had to develop their own environmental policies and practices (such as: internal operations and lending strategies, the establishment of in house green banking units, allocate budgets for green finance, climate risk funds, etc.); in phase two, commercial banks were required to draft sector specific green financing policies for high polluting sectors, develop screening tools for environmental risk assessments of loans. In phase three, banks were required to start innovating in designing green financing products and to use standardized formats for green reporting of their disbursements. Green lending policy guidelines for non-bank financial institutions were issued in 2013 (Khan et al. 2017, Khan 2018). While these policy guidelines and institutional requirements has set up an encouraging environment for green growth, our paper finds that very few of the green high achieving RMG factories have successfully accessed green finance from commercial banks. This chapter looks at the two main funds that the RMG may access for investing in green compliance, which are: Refinance Scheme for Renewable Energy and Environmentally Friendly Financeable Sectors, and Green Transformation Fund for Export Oriented Textile and Leather Sectors.

5.2 Refinance Scheme for Renewable Energy and Environmentally Friendly Financeable Sectors

In 2009, Bangladesh Bank established a revolving refinance scheme of BDT 200 crores from its own fund for lending to borrowers (through commercial banks and non-banking FIs) who are interested to invest in solar energy technology, bio-gas plants and ETPs. The product line has grown since then and now covers 52 items in 8 categories (please see Annex 4) (SFD Master Circular No. 03/2017, Bangladesh Bank, 2017). This mechanism allows commercial banks to access capital at lower rates thus increasing profitability of green lending. There are two channels available for lending money from the re-financing scheme: the direct model allows direct credit lending through financial institutions (e.g. banks) while the indirect model involves wholesale lending through an NGOs or MFIs. For direct credit lending a commercial bank enters into a participatory agreement with Bangladesh Bank. It provides loans to SMEs or direct investors and then applies to the Bangladesh Bank for refinancing. The commercial bank can lend directly to a borrower or go through a credit linkage facility by credit wholesaling; the difference will be in the interest rate. Direct model receives a concessional loan of 5% and can lend to the borrower at the rate of 9%, giving it a profit margin of 4 per cent (Rai, et al., 2015). Up until 2015, private commercial banks was able to allocate BDT 167,976 million and utilize BDT 79,329.37 million during July to September (Azad & Abedin, 2016). As of 2016, the total amount disbursed through this re-financing scheme was BDT 503 million, involving 46 banks and non-banking FIs (Hoshen, et al., 2017).

Table 17Disbursement trend of Bangladesh Bank refinancing scheme for green products during 2015-2016 (in million BDT)

Green Product Category	**FY12**	**FY13**	**FY14**	**FY15**	**FY16**
Bio gas	133.20	113.60	212.80	83.30	84.80
Solar Home System	10.50	40.20	32.20	87.50	114.70
Solar Irrigation Pump	8.40	0.00	17.90	26.50	0.60
Solar Mini Grid	248.80	122.70	49.60	148.10	16.30
Effluent Treatment Plant	0.00	0.00	0.00	0.00	10.00
Solar Assembly Plat	22.20	57.40	10.00	0.00	58.00
HHK Technology in brick kiln	55.00	172.20	59.00	47.00	177.80
Vermi compost	0.00	0.00	0.00	1.10	1.60
Green industries	0.00	0.00	0.00	0.00	400.00
Safe working environment for textile and garment industries	0.00	0.00	0.00	0.00	35.70
Organic manure from slurry	0.00	0.00	0.00	0.00	0.20
Paper waste re-cycling	0.00	0.00	0.00	0.00	20.00
Total	478.10	506.10	381.50	393.50	919.70

Source: Bangladesh Bank Annual Report-2015-16

Out of the 52 products that are allowed, the following are relevant to the RMG industry:

- Green Industry
- Conversion from Chemical ETP to Biochemical ETP
- Installation of new Biochemical ETP
- Installation of new Biological ETP
- Ensuring work environment and safety for RMG sector
- Waste Heat Recovery System
- Energy efficient measures based on energy audit report
- Rooftop Solar micro/ mini grid

In case of single ticket size, Green Industry is the most popular product among RMG companies (BDT 200 million can be borrowed for setting up a green factory as per Bangladesh Bank criteria). Other items popularly accessed by RMG companies are ETPs. Our research shows that while RMG companies are much more involved in green borrowing than other sectors, the amount of loans taken from this fund is a lot lower than what the industry requires in terms of low interest borrowing. Banks with green lending experience mention some proactive RMG clients who are aware of the Bangladesh Bank windows that

pursue these loans, but other banking stakeholders mention low awareness of the funding window (and associated mechanisms) among the majority of smaller and medium sized RMG companies.

At the time of introducing the green financing, it was a fairly new concept for the commercial banks to adopt. Due to the nature of green financing products and the technologies involved in the implementation as well as the gap of knowhow while forecasting the risk involve with green financing, the bankers struggled to grip green financing as one of the most lucrative banking instruments of all. With the increased capacity among banks to understand the green financing and implement this, commercial banks are now coming forward and trying to make a difference in this segment. As of 2016, more than 50 commercial banks have disbursed only 0.5% of their total credit as green financing or sustainable banking in 2016 (Dhaka Tribune, 2017). The following banks have signed agreements with Bangladesh Bank for participating in the Green Refinancing scheme. Out of all the FIs, private commercial banks disburse the highest amount of funds under green financing.

Table 18List of Commercial banks that have pledged to finance ETPs.

1. Sonali Bank Ltd 2. Bangladesh Krishi Bank 3. AB Bank Ltd. 4. Bank Asia Ltd. 5. BRAC Bank Ltd. 6. Commercial bank of Ceylon Ltd 7. Dhaka Bank Ltd. 8. Dutch Bangla Bank Ltd. 11. IFIC Bank Ltd	9. Eastern Bank Ltd. 10. First Security Islamic Bank Ltd. 12. Jamuna Bank Ltd. 13. Mercantile Bank Ltd. 14. Mutual Trust Bank Ltd. 15. National Bank Ltd. 16. NCCBL	17. One Bank Ltd. 18. Prime Bank Ltd 19. The City Bank Ltd 20. The Premier Bank Ltd 21. Trust Bank Ltd.

Table 19Popular green financing initiatives taken by commercial banks involving RMG companies

Commercial banks	Disbursement details
Prime bank	During 2013, the bank has extended finance of BDT 25.4 million for setting up an ETP in one project. Additionally, the bank financed 373.52 million taka in 3 projects that had ETPs. During 2014, the bank has extended finance of BDT 6757.46 million in 24 projects having ETPs.
Bank Asia	In the first nine months of 2012 the bank has provided Tk. 6,040.45 million for 37 projects ETPs. Earlier Bank Asia's client Echotex Ltd. achieved the "National Environment Award 2010". In 2017, Echotex Ltd was recognized as one of the highest achiever in apparel business by LEED and received a certification under Platinum category, as mentioned in chapter 4 of this report.
EXIM bank	They have inserted a mandatory clause for installing ETP for any Composite Textile, Dyeing units for availing of investment from EXIM Bank. The bank has allocated BDT 2500.00 crore for installation of ETPs.
DBBL	DBBL has financed in selected industries which have taken steps to establish an effluent treatment plant. In addition, Bank has financed in solar power plant, automatic brick manufacturing industry as the product name of tunnel kiln, zigzag and handing waste in a safe manner in a hospital, hot water heat recovery system in textile and ready-made garments and eco-friendly power generation projects. They approved the credit proposal of Tk 34433.40 million in 2013 for the industries which have effluent treatment plant.

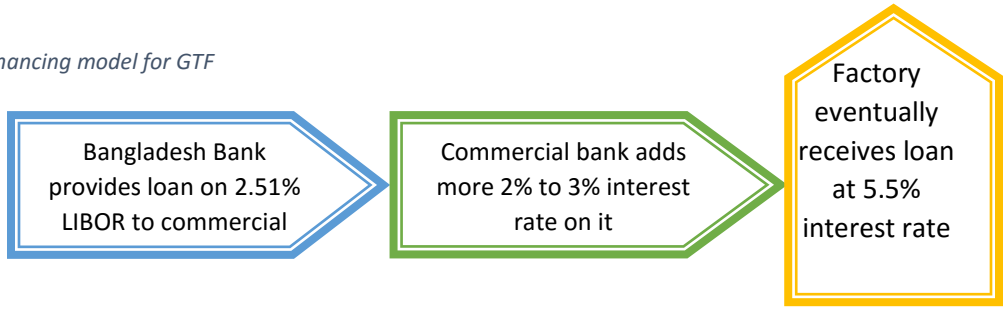
NCBL	NCBL has introduced green finance for installation of effluent treatment plants (ETP) back in 2011. During that year, the Bank has disbursed BDT 37.58 million in ETP.
Pubali Bank	Pubali bank has disbursed BDT 268.90 crore for installation of ETP in 2 projects under Green Banking scheme.
BRAC Bank	BRAC Bank is aligned with the 'triple bottom-line' approach. The bank emphasizes on green financing and also strives to exceed our green financing targets set by the management. In the year 2017, they disbursed around BDT 11,000 million in green financing (both direct and indirect). Amongst the whole amount 44% went to LEED certified green industries and for building ETPs.

5.3 Green Transformation Fund (GTF) for Export Oriented Textile and Leather Sectors

In January 2016, a new longer-term refinancing window named Green Transformation Fund (GTF), with USD 200 million was launched for access by export-oriented textile and leather sectors (FE Circular No. 02/2016). Within the Bangladesh Bank, the Sustainable Finance Department (SFD), is the approving authority on loans. The Forex Reserve and Treasury Management Department (FRTMD) of the Bangladesh Bank is responsible for disbursement and supervision. The Authorised Dealers (AD) or the commercial banks reviews the loan applicants' documents and files the application.

To further fortify the financing arrangement under GTF, it was decided to provision for a Participation Agreement to be signed between Bangladesh Bank and intended banks. Under this scheme, so far 17 banks have signed participation agreement with Bangladesh Bank (Bangladesh Bank, 2017). It is intended to facilitate access to financing in foreign exchange by all manufacturer-exporters in export-oriented textiles and textile products and leather manufacturing sectors to import capital machinery and accessories for implementing environment-friendly initiatives (Bangladesh Bank, 2015). The categories relevant for the RMG industry are: water use efficiency in wet processing; water conservation and management; waste management; resource efficiency and recycling; renewable energy; energy efficiency; heat and temperature management; air ventilation and circulation efficiency; work environment improvement initiatives; and other fields as identified by Bangladesh Bank from time to time. Participating banks will bear all risks associated with the financing and disbursing of funds to appropriate clients. (Khan, Khan, Uddin, Azim, & Islam, 2017).

Figure 10Financing model for GTF



As of June 2018, only two RMG companies - Goodrich Sweater Ltd. and Sky Line Apparels – have accessed US $ 130,000 for workplace improvement initiative projects from the GTF through Southeast Bank.

Additionally, around US$ 1.35 million worth of proposals for GTF are in the pipeline (submitted by Mercantile Bank, Dhaka Bank and Prime Bank). According to Bangladesh Bank, another BDT 54.80 million was waiting to be disbursed in 2018 (Financial Express 2018). So far, GTF disbursements have not kept up with expectations for several reasons, such as: the difficulty in processing a GTF loan, the restriction of machinery that can only be imported, the qualifying criteria of commercial banks, etc. These are discussed in detail in chapter 6. A revision of the GTF as an instrument, and an awareness raising campaign by the Bangladesh Bank and stakeholders on the GTF as a fund for green development remains most critical factors.

Outside of the Bangladesh Bank, green financing is also available for the private sector from the **Infrastructure Development Company Limited (IDCOL)**. Established by the Government of Bangladesh, they are licensed by the Bangladesh Bank as a non-bank financial institution (NBFI). They are internationally known as a private sector energy financer in Bangladesh. They offer financial products such as rooftop solar grids, bio gas plants, etc. that would be feasible for RMG firms looking towards energy efficiency. In July 2017, IDCOL became an accredited National Implementing Entity (NIE) for accessing the Green Climate Fund (GCF). This makes them an attractive provider of green financing. Some possible project ideas suitable for GCF are mentioned in the next chapter.

5.4 Banks' Role in Assisting Green Investments

The basic steps that a commercial bank can take to help an RMG client interested in green loans are as following:

- Identify opportunities in resource efficiency and renewable energy use through dialogue with the RMG client, especially the mechanical and chemical engineering teams
- Evaluate technological solutions
- Assess technical feasibility and economic viability
- Link up with vendors and energy service providers
- Package financing and mobilize funds for investment

A bank can have exploratory discussions with RMG companies to assess their resource needs, savings estimates and payback periods. Then the bank can assist the client by providing an appropriate financing program for a sustainable energy project. A bank can identify different types of credit facilities that fit the RMG company's needs (foreign loans, BDT loans, possible donor grant schemes). They can assist by offering the client simplified loan applications and quick management approvals, a structured or blended model of financing that has attractive interest rates for the RMG company, given its whole loan portfolio. However, discussions with the bankers and some of the RMG green high achievers for this paper shows that most RMG companies are content with "the way things are" in their core business and do not care about the interest rates offered by the Bangladesh Bank's funds enough to make different loan applications. Although payback periods (return on investment) is higher on green investments (especially energy saving investments) compared to other capital investments that a RMG company typically makes, there is still a barrier of not thinking outside the box.

Chapter 6: Conclusions and Recommendations

6.1 A Vision for Green Growth

The twin challenges of maintaining the competitiveness of Bangladeshi RMG and enhancing its environmental sustainability are well articulated in the Government's key strategy documents. The **7th Five Year Plan (FYP) 2016-2020** is the Government's chief development strategy document. The document notes the pollution footprint of the RMG and textiles industries, the state of noncompliance by most factories, and also recognizes environmental governance challenges. According to the 7th FYP 2016-2020 (2016: 425),"Policies to combat pollution are largely ineffective because of loose regulatory practices. Governance elements such as information access, transparency, accountable decision-making, management tools all need improvement. The government fully recognizes that environmental policies need to instill market-based incentives to firms to encourage good environmental performance. Access to information and knowledge about risks could greatly reduce the harmful impacts of environmental factors." The "**Bangladesh Delta Plan (BDP) 2100**" currently being prepared by the Bangladesh Planning Commission, will provide a complete strategy for the development of the Delta project until 2100. It presents vision with priorities, translated to actions that can be taken now, integrating current policies. According to the draft (2017: 263), "Sub-strategy FW 2.1: Pollution control and treatment: This sub-strategy involves both protection of environmentally valuable and sensitive areas and the prevention of pollution by enhanced treatment (Figure 6.16). The DoE authorities as well as the urban drinking water and sanitation authorities are key actors in implementing these interventions, many of which have already been elaborated in master plans and investment projects. The main aim of the BDP 2100 is to ensure synergy between these highly necessary investments and other interventions. Developing a sound knowledge base is a key component of this sub-strategy." The BDP 2100 mentions setting up groundwater protection zones, limiting groundwater use, pollution monitoring, pollution permitting, pollution control, investment in industrial (and municipal) ETPs, and the introduction of cleaner production technologies. While eco-friendly development remains a desideratum, the $28 billion question is how do we go from LEED and PACT success stories to transformational change that will ensure Bangladesh's place in a green supply chain? PACT and LEED results are critical at this point of breakthrough because they reify the eco-efficiency business case that fuels peer demonstration. Success stories in more than 400 factories present compelling case studies of what is possible through constructive dialogue, collective effort and technical advisory. The business case will act as a catalyst towards greening in many factories until being high achieving becomes the norm.

6.2 Key findings: Enablers for Greening Bangladeshi RMG

In Chapter 4 we have seen the kind of barriers and drivers that impact greening at the factory floor. However, for greening to be attractive to the medium and low performers in the industry (the segments where perhaps the buyer pressure has not been the same, or perhaps their production process does not call for heavy investments into pollution management), the following are needed:

- **Strong regulatory signals** from the government (through a combination of policy review, regulations review, revised target setting and regulatory measures suited to the medium and low performers);

- **Economic and non-economic incentives** from the government, commercial banks and financial institutions (such as simplified access to green financing, recognition of green actions through ease of business, etc.);
- **Increase in absorptive capacity** (skills building on cleaner production at RMG management and floor supervisors at the medium and low green performing companies, skills building in government stakeholder agencies, etc.); and
- **Expert knowledge sharing** and public relations management.

The high achievers' greening business case reveals an important lesson that should not be ignored while considering scaling up greening among the medium and low performers: company management will only prioritize greening investment as long as it is not in conflict with the company's overall goals of remaining profitable. It is not usually the goal of RMG companies to invest in green technologies, and their yearly turnover and profit margins remain a key factor.

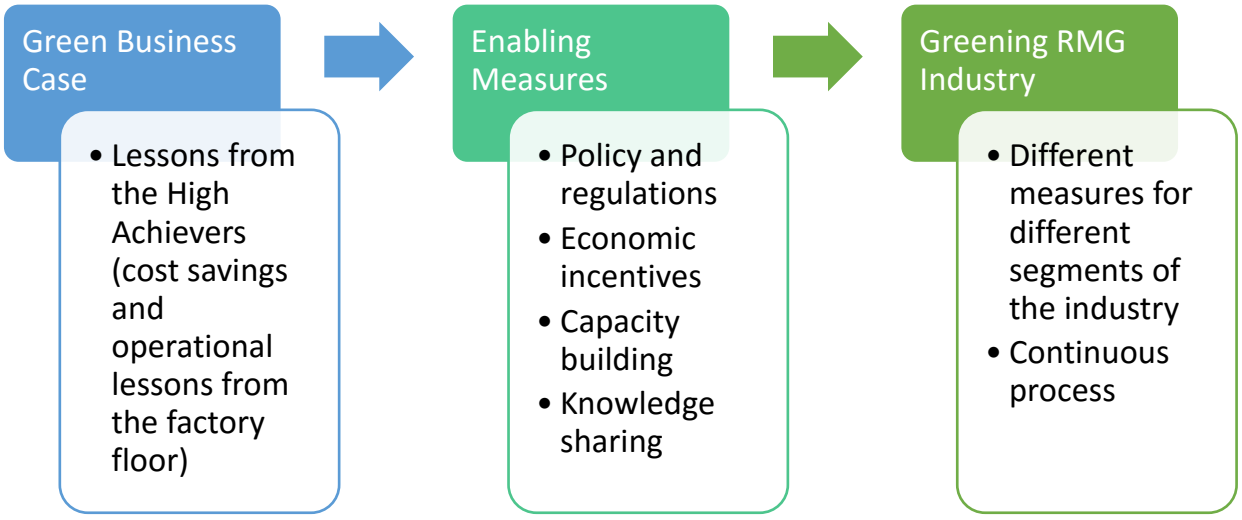


Figure 11Scaling up Greening in the Different Segments of the RMG Industry

6.3 Policy and Regulatory Signals

Actors needed: **Ministry of Environment, Forests and Climate Change, Ministry of Water Resources, Ministry of Local Government and Engineering, Ministry of Industries, BGMEA, BKMEA etc.**

Water Efficiency Signals: Although buyer pressure remains one of the key motivators for RMG industry greening, the government's role in promoting cleaner production in the RMG companies remains significant, especially in regard to RMG companies where buyer pressure for greening is comparatively less. Bangladesh has a rich and diverse mixture of policies and regulations covering water pollution management. The strengthening of regulatory provisions for groundwater monitoring, licensing, and charging as part of the rules supporting the Bangladesh Water Act by the Ministry of Water Resources (MOWR) would be a step towards promoting smarter water use by industries.

Buyer codes and LEED certification prioritizes water conservation, and rainwater harvesting could be promoted more (than is currently in the 2013 Water Act) as a source of water to be used in certain washing

dyeing or toilet facilities within the RMG factories. This is yet to be prioritized in different policies, strategies and action plans. It could be made compulsory in factories above a certain size, or a utilities bill discount could be given to companies using a certain amount of rainwater. On the punitive side, banning the drilling of uncontrolled deep tube wells by private companies, groundwater pricing, fee structure (for different types of water use), strict licensing and use fees for RMG companies could also be explored for sustainable management of the groundwater aquifers in Dhaka. A Zero Discharge policy by the DOE is under process and will go towards relieving some of the groundwater pressure. Dhaka and Chittagong water municipalities (DWASA and CWASA) could review groundwater licensing arrangements for the larger RMG companies, including a revision of water jurisdiction in the growing industrial clusters around Dhaka and Chittagong.

Regulating and pricing groundwater use is likely to be a politically sensitive issue as it will increase the production costs of factories initially before it encourages them to adopt water saving measures. A groundwater pricing scheme must be combined with technical advisory (and financial assistance in the case of smaller companies) on water efficient apparel production.

Compliance Monitoring and Enforcement: Revising volumetric tariffs to reflect environmental externalities; and developing effective environmental compliance systems are all high priority actions for the DOE.RMG factories are either classified as Red category (if they have a dyeing unit) or Orange B category (if they have a washing unit) depending on their production process and potential pollution load. The categorization determines the extent of environmental evaluation the company must undertake, and the kind of ETP and pollution management system they must design, before the DOE grants them environmental clearances. Previously, RMG factories that were “cut and sew only” were classified as Green category establishments requiring minimal environmental assessments for certification. In 2008, a strong RMG business lobby pressurized the Ministry to amend its rules so that “cut and sew” factories no longer needed any form of DOE clearance. The percentage share of these factories in the total industry is not known, however, cutting and sewing sections in typical RMG factories use high amounts of artificial lights, and generate a fair amount of heat transfer. These factories usually produce air pollution and solid waste that is disposed of without regulation. The DOE can only penalize them upon receiving written complaints from locals. Typically, these complaints are about solid wastes incorrectly disposed in local waterways, causing blockage. For greening to occur in all segments of the RMG industry, attention must be paid to the “cutting and sewing only” segment as well.

Red and Orange A category factories must submit various waste and environmental management plans as part of their certification. Every 4 months, the DOE laboratory officials visit the factories to take samples of air and ETP effluents to be tested at the DOE laboratories. The factories pay the DOE for the laboratory testing and use the results to submit reports to the DOE on their environmental management performance. During yearly certification renewal, these factory reports help the DOE track performance. According to the DOE, these sample monitoring could be more regularized. While this is an important source of revenue for DOE, it is also important to ensure transparency to prevent agency capture.

Environmental Database: It may be noted that RMG companies are now used to compliance scrutiny of an international standard. As of July 1, 2018, building safety audits have been completed in 3,780 factories under the work plan formulated by tripartite body comprising International Labour Organisation, Ministry of Labour and Manpower and factory owners (Budget Speech 2018). In addition, a Public Accessibility Database has been prepared containing information of 3,743 export-oriented RMG factories; another

database with information of another 27,000 factories is under way. The government and the industry believe this has given a strong signal to the international market. In the same spirit, a revision in the ECR (which is underway) could also consider expanding requirements for companies to publicly disclose their EIAs and their environmental management plans through an online database. A more sophisticated and transparent system would involve the public disclosure of pollution data from the companies. A pollution database such as this can be useful for the DOE to design and implement a control system for total emissions of certain pollutants and create requirements for emergency control plans. While the full database will be for use by regulators only, the public should be able to see pollution compliance status for each company. The DOE could selectively share positive results achieved by companies among their peers, buyers in Bangladesh, and on the DOE website for international audiences. A voluntary benchmarking programme could be started in collaboration with interested RMG factories – possibly from the RMG high achievers – and their buyers. This could be done with GCF funding, since this involves climate adaptation. The DOE could also start publishing details of court cases brought to the Environmental Courts, and statistics on environmental fines charged and collected.[18]

Emissions Standards: Water quality emissions standards are set out in the Environment Conservation Rules 1997, Schedule 12. The Schedule sets out the maximum amounts of a pollutant (volumetric concentrations) that may be discharged by a factory (or other source), based on available abatement technology or the impacts of the emissions on the ambient environment. While such standards are important to ensure the wastewater generated in industrial processes is adequately treated, such traditional "concentration based" environmental standards do not provide textile factories with incentives to conserve water and to reduce the amount of chemicals used in the production process. Indeed, given the practice of "free and unmetered" water use (via private deep tube wells), volumetric standards such as these, set perverse incentives for factories to dilute the effluent with clean water so that the volumetric standard is met but no effort is made to reduce cumulative effects of pollution (given the population density and economic growth in the Dhaka watershed, this situation can be alarming).

Effluent Treatment Plants: It is mandatory under the ECR 1997 for Orange B and Red category factories to have ETPs. Several reports and government documents note that many RMG owners do not run their ETPs regularly, and often run them prior to DOE visits. The government might consider clarifying the Public Interest Litigation laws to make it easier for citizens living near factory outfalls to bring cases against companies that do not run ETPs. [19] Currently the fines for violation are too small and irregularly imposed, allowing noncompliant companies to pay the fine as a cost of doing business rather than purchase and run ETPs.

Cleaner Production: The DOE's mandate as it stands is not designed to encourage greening outside of the environmental clearances. Recently they have been drafting guidelines to encourage factories to go for a Zero Discharge model for their air and water emissions. Once the guidelines are finalized, the DOE will request the factories to submit a Zero Discharge plan on a voluntary basis. According to DOE officials, the institutional challenge lies in monitoring cleaner production (beyond the national requirements), given their current staffing levels.

[18] Currently, the DOE collects fees for issuing and renewing clearances to RMG factories. They also collect fines from offending WDF facilities. Since 2010, they have collected more than BDT 250 crores in penalties.
[19] See case in China: http://www.loc.gov/law/foreign-news/article/china-environmental-protection-law-revised/

Environment Conservation Rule Revision: Bangladesh's main instrument for setting environmental standards and controlling industrial pollution control, the Environment Conservation Act (ECA) 1995 is operationalized through the Environment Conservation Rule (ECR) of 1997. The ECR 1997 is currently being reviewed and updated. The draft Environmental Protection Rules 2017 is awaiting formal approval by the ministry for official gazetting. The draft is not publicly available, however, according to the World Bank (CEA 2018), the revised ECR eases the process of obtaining environmental clearances, and includes a new requirement for public consultation for red category projects before the granting of clearances. However, under the new ECR public disclosure of final Environmental Impact Assessment (EIA) reports is not mandatory, but is up to the discretion of the Director General of the DOE. The new ECR does not make it mandatory for industries to disclose their initial environmental examination documents or final EIA findings. The new ECR misses the opportunity to push for more transparency by letting the DOE publicly disclose monitoring data (from either industries or development projects), and data on non compliance monitoring and levying of fines. The DOE currently has a nascent database for monitoring information which could be brought in line with international best practice. Given the political sensitivities around public disclosure of pollution performance, the public disclosure could be done in a phased manner. Earlier we mentioned water quality standards set in Schedule 12 which do not encourage cleaner production initiatives, but rather end of pipe pollution dilution. According to the World Bank's CEA, the new ECR has tightened some water quality standards, but a few are now more relaxed than WHO prescribed standards, which are not justified given the current levels of industrial growth. Cluster based pollution monitoring and control remains a key urgency. This aspect is highlighted in the next section under public private partnership monitoring in RMG clusters. A new partnership with the DOE and the most proactive buyers could open new opportunities for scaling up cleaner production in the RMG industry.

6.4 Economic Incentives

Actors needed: Ministry of Industries, Ministry of Commerce, Bangladesh Bank, National Board of Revenue, BEZA, Commercial Banks, Non-banking Financial Institutions, BGMEA, BKMEA, RMG representatives from medium and smaller companies, etc.

Tax Incentives for Greening: As demonstrated by the high achievers, costs of adopting best practices for cleaner production appears affordable given the reasonable payback periods. The non-complaint RMG companies with WDF facilities, and "cut and sew only" RMG factories – regardless of size – should be encouraged to adopt low cost cleaner production practices with appropriate policy measures or financial incentives. The Bangladesh Bank, and government ministries related to textiles, industries, water and environment could take the lead in determining what these incentives might be best suited for various factory sizes. The first step would be to hold stakeholder discussion at cluster level to determine how to best motivate RMG factories with economic incentives.

A revision can also be done to the National Board of Revenue's customs tariff schedules to regularize anomalies in the customs and supplementary duty rates for various green technologies suited to cleaner production. This could be regularly revised in consultation with academic experts in green technology.

In the current Budget for 2018-19, the government has increased the tax rate for RMG to 15 percent. If they are publicly listed, then then tax rate will be 12.5 percent. Any RMG factory having green building certification shall enjoy tax rate of 12 percent. However, the National Board of Revenue has also imposed

a 27 percent tax on the import of solar panels in 2018, to protect the local solar panel industry. This will impact RMG factories who have planned investments in green energy.

Review of Sustainable Financing for Medium and Small Borrowers: In Chapter 5, we have looked at the green financing mechanisms that are available to RMG entrepreneurs. The GTF, the Green Islamic Refinancing Scheme and the Green Refinancing Scheme are the main green financing options suitable for the RMG companies (the last two have identical principles, except that the Islamic fund is only for shariah compliant commercial banks, hence in this paper the green Refinancing Scheme refers to both funds). The range of incentives open to RMG companies is severely limited due to the way the GTF is structured. Firstly, GTF draws its fund from the Bangladesh Bank's reserves, and is therefore in USD. Only authorized commercial banks can access the GTF. Non-bank financial institutions – such as leasing companies very popular with RMG – are unable to access GTF funds because the latter are only authorized to handle taka as a currency.

The GTF is only applicable for green technology that is imported (issued against letters of credit issued in USD). This leaves out a considerable range of technology options that are easily available in the local market and are the basics of green manufacturing infrastructure that could possibly be attractive options for medium and smaller companies looking to invest in low hanging fruit. As we saw in Chapter 4, LEED certification awards points for using locally sourced construction materials, which will not be eligible for GTF, along with other common technology options like rain water harvesting tanks or basic plumbing materials supporting an ETP. Local engineering companies cannot access GTF and supply the RMG companies either because the fund is only for companies that export their products.

The GTF has certain criteria for commercial banks that they need to fulfill before being allowed fund access. A commercial bank must have no liquidity or capital shortfall, and its NPL share has to be less than 10%. This requirement has unfortunately meant that most government owned banks do not qualify for the fund. These banks have a considerable client base in the RMG and leather industry. Companies tend to value their long term banking relationships and do not change banks easily.

At the RMG level, there are certain procedural issues that discourage firms from accessing the GTF. For example, RMG firms tend to apply for composite loads, which means that it is a mixture of machinery, some of which will be classified as green investment. It includes costs for civil construction, sewing machines, as well as replacement parts for an ETP. This list of machines has to be sorted into green and non-green expenditures, and then green expenditures have to be sorted according to local and international procurement. This process to be undertaken by the commercial banks is cumbersome, when compared to loan applications for normal loans (or even the BDT 200 crore Green Refinancing Scheme). After the loan application is organized as per GTF requirements, they have to send the application package to Bangladesh Bank, where they aim to process everything in under a working week. However, sometimes this may take longer. For a 4% margin that the commercial bank gets for processing a GTF loan application, if a delay is longer, then the loss to the commercial bank makes it unfeasible. Related to this, is the fact that not many RMG companies are not made aware of the GTF by their commercial banks.

GTF is better suited for RMG companies who are looking to invest significant amounts for importing green technology that is not available in the local markets. This means that the GTF funding criteria could be amended to be accessed by medium and smaller RMG companies who need financial assistance in becoming green.

The medium and smaller RMG companies are better suited to the Green Refinancing Scheme fund, which is set up in BDT, so there is no issue of a limited number of commercial banks or leasing companies being able to access it. As detailed in the last chapter, this fund is structured differently from the GTF, in that this fund has 52 categories of green products that each have their own borrowing caps (for example, solar photo voltaic power plant that could be installed in an RMG facility can qualify for a loan of up to BDT 30 crores; a solar pump could qualify for a loan of up to BDT 3 crores). Under this fund, Bangladesh Bank lends to the commercial banks at a flat rate of 5%, which the bank lends onwards to the RMG at different rates, ranging from 8 % to 9% depending on its maturity period. Disbursement under this fund has been more successful, as detailed in the last chapter. The loan application process is also quicker at Bangladesh Bank when compared to the GTF processing.

Renewable Energy Champions: Renewable energy currently constitutes only 2.89 per cent of Bangladesh's energy generation, and the government aims to increase it to 10 per cent by 2020. Bangladesh has a target of increasing the renewable energy generation capacity to 2896.68 MW by 2021, more than half of which (1470 MW) is expected to come from solar power. Through their Renewable Energy and Energy Efficiency Programme project, GIZ has already worked with the Sustainable and Renewable Energy Development Authority (SREDA) to pilot the uptake of energy efficient LED lights in RMG factories. The government - SREDA, Bangladesh Bank and other bodies – might look at renewable energy targets for the RMG industry, including efficiency standards and emissions limits. Some of these are already covered under LEED certification, and lessons from those certified companies can be the basis for strategic action. An important enabler would be the development of innovative financing mechanisms to generate interest in solar power use in RMG – these might include fiscal incentives, subsidies or industry recognition for solar champions. Low cost energy efficiency measures can often be self financed, but more expensive or unfamiliar measures may need direct incentives to promote faster uptake, such as subsidies, tax rebates or soft credit. In the interests of keeping the sector secure in turbulent global market, RMG companies might require stable long-term incentives. Further exploration of the possibility of funding these incentives from carbon markets, would be useful.

Green Incentives for the Longer Term: Looking to the future, we must discuss the opportunities for ecofriendly RMG growth within the planned industrial zones under the Bangladesh Economic Zones Authority (BEZA). BEZA aims to establish 100 Economic Zones on 30000 hectares of land in the next 15 years with a target of employment generation for 10 million people. In the future, RMG growth will be dependent on the BEZA core values and incentives offered to entrepreneurs. BEZA is especially attractive to high end RMG companies who tend to be green. BEZA offers a long list of incentives, including a onetime capital subsidy up to 50% of investment costs incurred by the developers for setting up Central Effluent Treatment Plants (CETPs). However, there are no incentives for cleaner production, which the BEZA authorities could easily do by including non-financial incentives, such as quicker processing time for green businesses.

For longer term financial incentives, the RMG industry could look at the capital markets for raising funds. Unfortunately, most RMG companies are family run businesses without a corporate structure, and as yet cannot be listed in the market. If such long-term financing products are designed, then it will also encourage greening.

The PACT Program focus in the second phase shows that there is a need to reduce the risk of green investments to the RMG companies beyond the high performers. Economic incentives and financial

technical advisory can help alleviate reluctance by new comers. In the future such confidence building will be rewarding. In the longer term, a market shift will also be needed for the smallest segment of the industry. Some firms will not be able to transition to international buyer standards, and facing prospects of being phased out of the global apparel supply chain due to non-qualifications to higher green standards, those companies could start looking to expand in the domestic apparel market instead.

6.5 Increasing Absorptive Capacity

Actors needed: Private Sector (trainers, auditors), DOE, BGMEA, BKMEA, Buyers, Development Partners, Academia, International Experts, etc.

The Right Skills at the Right Level: Fostering the growth of green practices needs legal, institutional and capacity building measures. Increasing absorptive capacity of the RMG companies who are in the earlier stages of being compliant should involve investing in education and awareness building among RMG professionals. Dialogue with senior compliance managers, buyers and green technology consultants point to the serious problem of compliance skill building and skills maintenance to address changes in buyer requirements over time. RMG companies usually send their middle managers and floor supervisors for environmental compliance training, but for greening to be sustainable in an industry with high staff turnover, and for greening to be meaningful in companies with less collaborative buyer interactions on environmental compliance, green compliance training has to reach to top management.

As regulators from the DOE etc. take a more active position on enabling greening, they will also need to be trained on cleaner production for RMG companies of all sizes, and for wet or dry processing. Capacity also needs to be built through inclusion of green compliance content in the training curriculum of the various training institutes focused on RMG professionals. University level courses should also include greening topics, which they currently do not.

Training on the Right Technologies for the Right Fit: Many CP initiatives fall by the wayside due to use of technology that is inappropriate, or because the right skills were missing, or because no one was taking ownership within the company. The PACT project addressed this, and their continued emphasis underscores the need to build a relationship with technology providers/developers and users. CP tech is still somewhat new for the small and medium factories, and holistic tech assessment is needed that encompasses the host company capabilities with the tech that is being recommended. Tech assessment and requirements must be clear with tangible emissions goals that can be measured and translated into cost savings data.

High Quality Training as a Marketable Service: To attract investors, high quality trainers, capacity building programs and centers must be done as a commercial service. Many large buyers already provide compliance training, and there is a business scope for the private sector to provide CP compliance training to provide detailed training and technical support.

Green Business Development: The IFC's PACT project in its second phase is looking at new business models where third parties are brought in who will ease the process of being compliant and saving resources for the RMG companies. For example, a company could install and run an ETP, or install and operate solar panels on behalf of the RMG firm. Such innovative solutions should be incubated and encouraged.

6.6 Knowledge Sharing (Network of Experts)

Actors needed: Private Sector (trainers, auditors), DOE, BGMEA, BKMEA, Buyers, Development Partners, Academia, International Experts, International and National media outlets etc.

Regional Cleaner Production Hubs: the TTBC set up at BGMEA by PACT is a highly functional knowledge sharing platform disseminating specialized information on resource efficiency technologies, technology suppliers, specialized publications, and operational tools. This approach could be replicated to RMG clusters, but with one important addition – DOE could rely on these Hubs to interact with the RMG companies to get resource saving updates (which they could then share on their own website as good practices, to encourage other performers). These hubs could be run as public private partnerships. A network of these hubs could also be set up using GCF funds, since this hub encourages adaptation (water savings) and mitigation (energy efficiency).

Green Marketing: the BGMEA and the BKMEA could enhance their efforts in reaching a larger international audience of apparel manufacturers about Bangladesh's green achievements. This would enhance the industry's image on compliance and would complement the achievements of the recent building safety initiatives.

Associated to the point made above is the need for a media platform that will share the positive stories coming from the RMG on green compliance. The BGMEA, BKMEA, chambers of commerce and the DOE could regularly hold information dissemination events on green compliance (it is to be noted that the DOE already does press coverage of the annual green awards for the private sector, which could be scaled up). The press regularly covers pollution problems and that should also continue along with some news coverage of how changemakers are operating in this business environment. Press coverage on the buyers' perspective would also be an encouraging signal.

6.7 Key Proposed Measures

Table 20 Key Measures

Action and Actors	Barriers Addressed
Review of policies and institutional structures around environmental and water quality regulations. Ministry of Environment, Forests and Climate Change, Ministry of Water Resources, Ministry of Local Government and Engineering, Ministry of Industries, etc.	Lack of clear analysis on what resource pricing would incentivize expense conscious RMG firms to reconsider resource used
Compliance mapping along RMG clusters, regular monitoring (involving DOE and municipalities and local government), and capacity building for cleaner production monitoring. Ministry of Environment, Forests and Climate Change, Ministry of Water Resources, Ministry of Local Government and Engineering, Ministry of Industries, BGMEA, BKMEA etc.	Lack of updated and transparent pollution data for regulatory use only; lack of monitoring capacity
Review of economic incentives and duty structures.	Lack of clarity on conflicting price signals to RMG companies on greening

Ministry of Industries, Ministry of Commerce, Bangladesh Bank, National Board of Revenue, BEZA, etc.	
Review of Green Transformation Fund and the Green Refinancing Fund. Bangladesh Bank, Commercial Banks, Non-banking Financial Institutions, BGMEA, BKMEA, RMG representatives from medium and smaller companies etc.	Lack of clear understanding on what green financing products are available to medium and smaller RMG companies; lack of streamlined access to finance for locally procured green tech solutions
Regional Cleaner Production Hubs (TTBC style "one stop solution centers" but with additional participation from the DOE on monitoring and compliance assistance). Private Sector (trainers, auditors) and the DOE etc.	Lack of in depth and "just in time" information/solution options to RMG compliance teams
Knowledge Management and Network Building . DOE, BGMEA, BKMEA, Buyers, Development Partners, Academia, International Experts, etc.	Lack of sustained dialogue at the topmost level on the achievements of scaled up greening, especially at the international level

To achieve the goal of USD 50 billion in apparel exports by June 2021, Bangladesh must increase its RMG export by 16.9% (year on year), which will be very challenging given the growth rates in the recent past, and the continuing infrastructural and financial challenges that the industry faces. The industry is still beset with significant challenges impacting the ease of doing business, such as energy crisis, cumbersome export processes, transportation infrastructure weaknesses, image branding problems, and market uncertainties. Earlier, this paper argued that the greening incentive for Bangladeshi RMG firms must be re-defined as not being pegged to increased profits through higher prices.

We would also argue that greening incentive must be thought as the "entry price" into certain higher paying segments of the value chain. A strategic entrepreneur can recoup the price of admission by investing smartly into cleaner production, which can yield cost savings. While there will always be a critical role for Government regulations, compliance monitoring and enforcement by the DOE, changing market conditions and pressures call for a more collaborative engagement with the industry to enhance their greening beyond the traditional Environmental Clearance. A private-public sector engagement can help develop a more pragmatic roadmap to better support greening while keeping in mind the opportunity costs of compliance investments for different segments of the suppliers. Once these incentives are aligned – ecological welfare from the Government's side, improved access to higher end buyers for the suppliers, and reduced supply chain compliance risks for the buyers – strategic action can be taken in incremental and implementable ways.

Annexes

Annex 1: Environmental Regulations Applicable to the RMG Industry

Bangladesh Environment Conservation Act (ECA) and Environment Conservation Rules (ECR)

As per the article-12 listed in Environment Conservation Act, 1995, *"No industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate from the Director General".*
The ECA 1995 replaced the environment pollution control ordinance of 1992 and became the current main act for governing environmental protection in Bangladesh. This also provides a legal basis for Environment Conservation Rules (ECR) 1997, amended in 2002.

The main objectives of ECA'95 are: conservation of the natural environment and improvement of environmental standards, and control and mitigation of environmental pollution.
ECR'97 was initially developed consisting a set of relevant rules to put into practice the ECA'95 which specify: Categorized list (Green, Orange-A, Orange-B and Red) of the projects; Procedure to take environmental clearance; Ambient standards in relation to water pollution, air pollution and noise, as well as permitted discharge/emission levels of water and air pollutants and noise by projects Environmental Categories.

Environmental Clearance Procedure:
For the purpose of issuance of Environmental Clearance Certificate, the industrial units and projects shall, in consideration of their site and impact on the environment, be classified into the following four categories;

- Green;
- Orange-A;
- Orange- B;
- Red.

Environmental Clearance for Green category industries and projects is provided through comparatively simple procedure. In case of Orange-A, Orange-B and Red Category industries and projects, Site Clearance is mandatory at the beginning, then EIA approval and finally Environmental Clearance is issued.

General Process Steps for Environmental Clearance:

Step 1:Submit application with supporting documents.

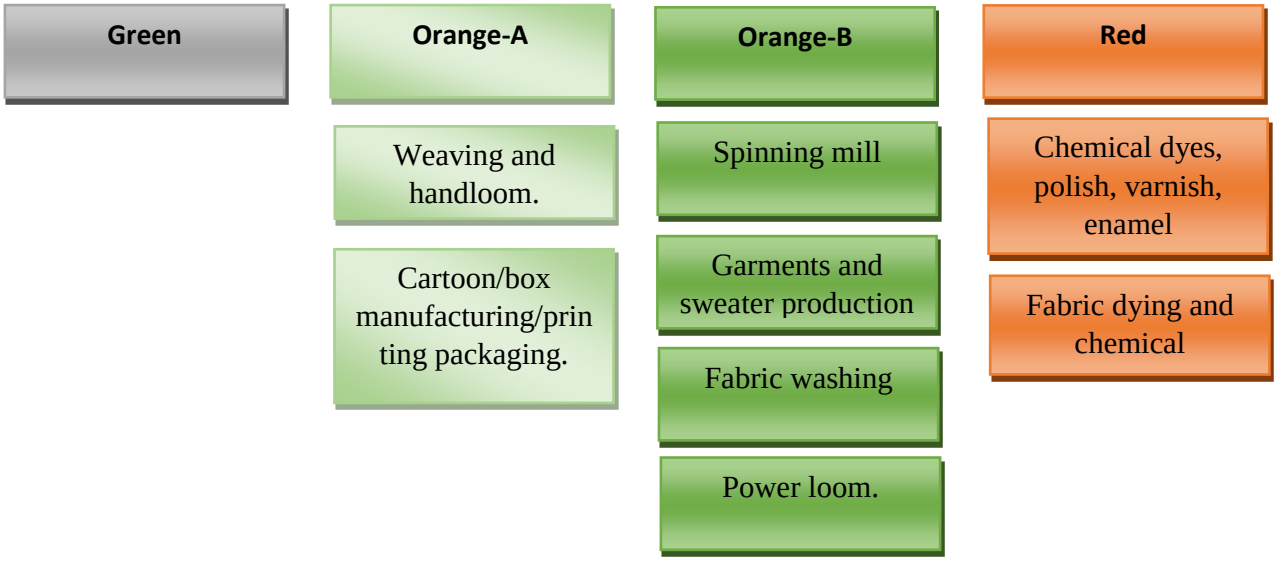
Step 2: Verification of application and supporting documents by DOE

Step 3:Inspection by the authorized officer after verification of all report and documents. [Then make decision about the clearance (Only Green and Orange-A)]

Step 4: Meeting of Environmental Clearance Committee (for Orange-B and Red

Step 5: Decision

Industrial Categories under ECR' 97



Renewal Process under ECR'97:

The period of validity of an Environmental Clearance Certificate shall be, in case of Green Category, 3 years from the date of its issuance and in all other cases 1 year. Each Environmental Clearance Certificate has to be applied for renewal at least thirty (30) days before expiry.

SCHEDULE – 13, ECR'97

Fees for Environmental Clearance Certificate or Renewal

Investment (in Taka)	Fees for Environmental Clearance Certificate (in Taka)	Certificate Renewal Fee
(1)	(2)	(3)
(a) Between Tk. 100,000 and 5,00,000	Tk. 1,500	One-fourth of the Fees in Column (2).
(b) Between Tk. 5,00,000 and 10,00,000	Tk. 3,000	-Do-
(c) Between Tk. 10,00,000 and 50,00,000	Tk. 5,000	-Do-
(d) Between Tk. 50,00,000 and 10,000,000	Tk. 10,000	-Do- 1
(e) Between Tk. 10,000,000 and 2,00,000,000	Tk. 25,000	One-fourth of the Fees in Column (2).
(f) Between Tk. 2,00,000,000 and 5,00,000,000	Tk. 50,000	-Do-
(g) Above Tk. 5,00,000,000	Tk. 1,00,000	-Do-

SCHEDULE – 2

Standards for Air					
Density in microgram per cusec meter					
Sl. No	Catagories of Area	Suspended Particulate Matters (SPM)	Sulphur dioxide	Carbon Monoxde	Oxides Nitrogen
a.	Industrial and mixed	500	120	5000	100
b.	Commercial and mixes	400	100	5000	100
c.	Residential and rural	200	80	2000	80
d.	Sensitive	100	30	1000	30

SCHEDULE – 3					
Standards for water					
(A) Standards for inland surface water					
Best Practice based classification		Parameter			
		pH	BOD mg/L	DO mg/L	Total Coliform number/100
a.	Source of drinking water for supply only after disinfecting:	6.5-8.5	2 or less	6 or above	50 or above
b.	Water usable for recreational activity:	6.5-8.5	3 or less	5 or more	200 or less
c.	Source of drinking water for supply after conventional treatment:	6.5-8.5	6 or less	6 or more	5000 or less
d.	Water usable by fisheries:	6.5 – 8.5	6 of less	5 or more	
e.	Water usable by various process and cooling industries:	6.5 – 8.5	10 or less	5 or more	5000 or less
f.	Water usable for irrigation:	6.5 – 8.5	10 or less	5 or more	1000 or less

(B) Standards for drinking water					
Sl. No	Parameter	Unit	Standard		
1	Aluminium	ml/g	0.2		
2	Ammonia (NH3)	"	0.5		
3	Arsenic	"	0.05		
4	Balium	"	0.01		
5	Benzene	"	0.01		
6	BOD5 20*C	"	0.2		
7	Boron	"	1		
8	Cadmium	"	0.005		
9	Calcium	"	75		
10	Chloride	"	150-600		
11	Chlorinated alkanes carbontetrachloride	"	0.01		

	1.1 dichloroethylene	"	0.001		
	1.2 dichloroethylene	"	0.03		
	tetrachloroethylene	"	0.03		
	trichloroethylene	"	0.09		
12	Chlorinated phenols				
	pentachlorophenol	mg/l	0.03		
	2.4.6 trichlorophenol	mg/l	0.03		
13	Chlorine (residual)	"	0.2		
14	Chloroform	"	0.09		
15	Chromium (hexavalent)	"	0.05		
16	Chromium (total)	"	0.05		
17	COD	"	4		
18	Coliform (fecal)	n/100 ml	0		
19	Coliform (total)	n/100 ml	0		
20	Color	Hazen unit	15		
21	Copper	mg/l	1		
22	Cyanide	"	0.1		
23	Detergents	"	0.2		
24	DO	"	6		
25	Fluoride	"	1		
26	Hardness (as CaCO3)	"	200-500		
27	Iron		0.3 – 1.0		
28	Kjeldhl Nitrogen (total)		1		
29	Lead		0.05		
30	Magnesium		30 – 35		
31	Manganese		0.1		
32	Mercury		0.001		
33	Nickel		0.1		
34	Nitrate		10		
35	Nitrite		<1		
36	Odor		Odorless		
37	Oil and grease		0.01		
38	pH		6.5 – 8.5		
39	Phenolic compounds		0.002		
40	Phosphate		6		
41	Phosphorus		0		
42	Potassium		12		
43	Radioactive materials (gross alpha activity	Bq/l	0.01		
44	Radioactive materials (gross beta activity)	Bq/l	0.1		
45	Selenium	mg/l	0.01		
46	Silver		0.02		

47	Sodium		200		
48	Suspended particulate matters		10		
49	Sufide		0		
50	Sulfate		400		
51	Total dissolved solids		1000		
52	Temperature	°C	20-30		
53	Tin	mg/l	2		
54	Turbidity	JTU	10		
55	Zinc	mg/l	5		

SCHEDULE – 4			
Standards for Sound [See Rule 12]			
Sl. No	Category of areas	Standards determined at dBa unit	
		Day	Night
a.	Silent zone	45	35
b.	Residential area	50	40
c.	Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes)	60	50
d.	Commercial area	70	60
e.	Industrial area	75	70

SCHEDULE – 5			
Standards for Sound originating from Motor Vehicles or Mechanized Vessels [See Rule 12]			
Category of Vehicles	Unit	Standards	Remarks
*Motor Vehicles (all types)	dBa	85	As measured at a distance of 7.5 meters from exhaust pipe.
		100	As measured at a distance of 0.5 meter from exhaust pipe.

Mechanized Vessels	dBa	85	As measured at a distance of 7.5 meters from the vessel which is not in motion, not loaded and is at two thirds of its maximum rotating speed.
		100	As measured at a distance of 0.5 meter from the vessel which is in the same condition as above.

*At the time of taking measurement, the motor vehicle shall not be in motion and its engine conditions shall be as follows:-
(a) Diesel engine – maximum rotating speed.
(b) Gasoline engine –at two thirds of its maximum rotating speed and without any load.
(c) Motorcycle – If maximum rotating speed is above 5000 rpm; twothirds of the speed, and if maximum rotating speed is less than 5000 rpm, three-fourth of the speed.

SCHEDULE – 8

Standards for Odor
[See Rule 12]

Parameter	Unit	Standard Limit
Acetaldehyde	ppm	0.5 – 5
Ammonia	ppm	1 – 5
Hydrogen Sulfide	ppm	0.02 – 0.2
Methyl Disulfide	ppm	0.009 – 0.1
Methyl Sulfide	ppm	0.01 – 0.2
Styrene	ppm	0.4 – 2.0
Trim ethylamine	ppm	0.005 – 0.07

Notes :

(1) Following regulatory limit shall be generally applicable to emission/exhaust outlet pipe of above 5 meter height:

Q = 0.108 x He2Cm (Where Q = Gas Emission rate Nm3/hour) He = Height of exhaust outlet pipe (m) Cm = Above mentioned limit (ppm)

(2) In cases where a special parameter has been mentioned, the lower limit shall be applicable for warning purposes, and the higher limit shall be applicable for prosecution purpose or punitive measure.

SCHEDULE – 9

Standards for Sewage Discharge [See Rule 12]		
Parameter	Unit	Standard Limit
BOD	miligram/l	40
Nitrate		250
Phosphate		35
Suspended Solids (SS)		100
Temperature	Degree Centigrade	30
Coliform	number per 100 ml	1000
Notes : (1) This limit shall be applicable to discharges into surface and inland waters bodies. (2) Sewage shall be chlorinated before final discharge.		

SCHEDULE – 10					
Standards for Waste From Industrial Units or Projects Waste [See Rule 13]					
Sl. No	Parameter	Unit	Places for determination of standards		
1	Ammonical Nitrogen (as elementary N)	mg/l	50	75	75
2	Ammonia (as free ammonia	"	5	5	15
3	Arsenic (as)	"	0.2	0.05	0.2
4	BOD5 at 20oC	"	50	250	100
5	Boron	"	2	2	2
6	Cadmium (as CD)	,,	0.5	0.05	0.05
7	Chloride		600	600	600
8	Chromium (as total Cr)	,,	0.5	1	1
9	COD	,,	200	400	400
10	Chromium (as hexavalent Cr)		0.1	1	1
11	Copper (as Cu)	,,	0.5	3	3
12	Dissolved Oxygen (DO)	,,	4.5 – 8	4.5 – 8	4.5 – 8
13	Electro-conductivity (EC)	micro mho/ cm	1200	1200	1200
14	Total Dissolved Solids	,,	2,100	2,100	2,100
15	Fluoride (as F)	,,	2	15	10
16	Sulfide (as S)	,,	1	2	2
17	Iran (as Fe)	,,	2	2	2

18	Total Kjeldahl Nitrogen (as N)	,,	100	100	1000
19	Lead (as Pb)	,,	0.1	1	0.1
20	Manganese (as Mn)	,,	5	5	5
21	Mercury (as Hg)	,,	0.01	0.01	0.01
22	Nickel (as Ni)	,,	1	2	1
23	Nitrate (as elementary N) mg/l		10	Not yet Fixed	10
24	Oil and Grease	,,	10	20	10
25	Phenolic Compounds (as C6H5OH)		1.1	5	1
26	Dissolved Phosphorus (as P)	,,	8	8	15
27	Radioactive substance	To be specified by Bangladesh Atomic Energy Commission			
28	pH		6 – 9	6 – 9	6 – 9
29	Selenium (as Se)	mg/l	0.05	0.05	0.05
30	Zinc (as Zn)	Degree	5	10	10
31	Total Dissolved Solids	,,	2,100	2,100	2,100
	Temperature	Centigrade	40	40	40-Summer
32			45	45	45-Winter
33	Suspended Solids (SS)	mg/l	150	500	200
34	Cyanide (as Cn)	,,	0.1	2	0.2

Notes:
(1) These standards shall be applicable to all industries or projects other than those specified under the heading "Standards for sectorwise industrial effluent or emission."
(2) Compliance with these standards shall be ensured from the moment an industrial unit starts trial production, and in other cases, from the moment a project starts operation.
(3) These standards shall be inviolable even in case of any sample collected instantly at any point of time. These standards may be enforced in a more stringent manner if considered necessary in view of the environmental conditions of a particular situation.
(4) Inland Surface Water means drains/ponds/tanks/water bodies/ ditches, canals, rivers, springs and estuaries.
(5) Public sewerage system means treatment facilities of the first and second stage and also the combined and complete treatment facilities.
(6) Irrigable land means such land area which is sufficiently irrigated by waste water taking into consideration the quantity and quality of such water for cultivation of selected crops on that land.
(7) Inland Surface Water Standards shall apply to any discharge to a public sewerage system or to land if the discharge does not meet the requirements of the definitions in notes 5 and 6 above.

SCHEDULE – 11

Standards for Gaseous Emission from Industries or Projects
[See Rule 13]

Sl. No	Parameters	Standard present in a unit of mg/Nm3
1	Particulate	
	(a) Power plant with capacity of 200 Megawatt or above.	150
	(b) Power plant with capacity less than 200 Megawatt.	350
2	Chlorine	150
3	Hydrochloric acid vapor and mist	350
4	Total Fluoride F	25
5	Sulfuric acid mist	50
6	Lead particulate	10
7	Mercury particulate	0.2
	Sulfur dioxide	kg/ton acid
8	(a) Sulfuric acid production (DCDA* process)	4
	(b) Sulfuric acid production (SCSA* process)	10
	(* DCDA: Double Conversion, Double Absorption; SCSA: Single Conversion, Single Absorption.)	
Lowest height of stack for dispersion of sulfuric acid (in meter).		
	Coal based power plant	
	(1) 500 Megawatt or above	275
	(2) 200 to 500 Megawatt	220
(a)	(3) Less than 200 Megawatt	14(Q)0.3
(b)	Boiler	
	(1) Steam per hour up to 15 tons	11
	(2) Steam per hour more that 15 tons	14(Q)0.3
	[Q = Emission of Sulfur dioxide (kg/hour)].	
9	Oxides of Nitrogen	
(a) Nitric acid production		3 kg/ton acid
(b) Gas Fuel based Power Plant		50 ppm
(1) 500 Megawatt or above		50 ppm
(2) 200 to 500 Megawatt		40 ppm
(3) Below 200 Megawatt		30 ppm
©	Metallurgical oven	200 ppm
10	Kiln soot and dust	mg/Nm3
(a)	Blast Furnace	500
(b)	Brick Kiln	1000
©	Coke oven	500
(d)	Lime Kiln	250

SCHEDULE – 12	
Standards for Sector-wise Industrial Effluent or Emission [See Rule 13]	
(A) Fertilizer Plant	
Nitrogenous fertilizer plant	
Effluent (liquid waste)	
Parameters	Standard presence in a unit of mg/l
As Nitrogen	50 (New) 100 (Old)
Total Kjieldahl Nitrogen	100 (Old) 250 (New)
pH	6.5 – 8
Chromium at discharge point of the chromate removal plant (as total Cr)	0.5
Hexavalent Chromium	0.1
Suspended Solids	100
Oil and Grease	10
Wastewater flow	10m3/t Urea

Gaseous Emission		
Source	**Parameters**	**Standard of presence in a unit of mg/Nm3**
Urea Prilling Tower	Particulate	150 dry de dusting 50 wet de dusting and new plant

Phosphatic	
Effluent (liquid waste)	
Parameters	Standard of presence in a unit of mg/l
Fluoride at the exhaust of Fluoride removal plant (as F)	10
Phosphate (as P)	5
Suspended Solids Chromium at the discharge point of	100
Chromate removal plant (as Cr)	
Total	0.5
Hexavalent Cr	0.1
Oil and Grease	10

Gaseous Emission		
Source	Parameters	Standard of presence in a unit of mg/Nm3
Granulation, Mixing and Grinding section	Particulate	150
Phosphoric acid preparation	Total Fluoride (as F)	25
Sulfuric acid plant	Sulfur dioxide	
	DCDA	
	SCSA	
	Sulfuric acid mist	50

(B) Composite textile plant and large processing unit (in which capital investment is more than thirty million Taka)
Effluent (liquid waste)

Parameters	Standard and presence in a unit of mg/l
pH	6.5 – 9
Suspended solids	100
BOD5 20oC	150
Oil and Grease	10
Total dissolved solids	2100
Wastewater flow	100 per kg of fabric processed

Note: BOD limit of 150 mg/l implies only with physico chemical processing.
Special parameters based on classification of dyes used

Total Chromium, as Cr 2
Sulfide, as S 2
Phenolic compounds, as C6H5OH 5

(C) Pulp and Paper Industry

Gaseous Effluent

Parameter	Standard and presence in a unit of mg/l, except pH	
	Large plant with production capacity of above 50 tons per day.	Small plant with production capacity of less than 50 tons per day.
pH	6 – 9	6 – 9
Suspended Solids	100	100
BOD5 20oC	30	50
COD	300	400

Wastewater flow	200 cubic meter per ton of paper	200 cubic meter per ton of paper produced of agricultural raw materials.
		75 cubic meter per ton of paper produced of wastepaper.

(D) Cement Industry		
Gaseous Emission **1. Basic units for manufacturing cement**		
Source	Parameters	Standards for presence in a unit of mg/Nm3
All sections	Particulate	250
2. Clinker Grinding units		
Source	Parameters	Standards for presence in a unit of mg/Nm3
All sections	Particulate	
	Daily production capacity above 1000 ton	200
	Daily production capacity 200-1000 ton	300
	Daily production capacity up to 200 ton	400

(E) Boiler of Industrial unit	
Gaseous Emission	
Parameters	Standards for presence in a unit of mg/Nm3
1. Soot and particulate (fuel based)	
(a) Coal	500
(b) Gas	100
(c) Oil	300
2. Oxides of Nitrogen (fuel based)	
(a) Coal	600
(b) Gas	150
(c) Oil	300

(F) Nitric Acid Plant	
Gaseous Emission	
Parameters	Standards for presence in a unit of mg/Nm3
Oxide of Nitrogen	3 kg/ton of weak nitric acid produced

(G) Distillery		
Effluent (liquid waste)		
Parameters		Standards for presence in a unit of mg/l
	pH	6 – 9
	Suspended solids	150
	BOD5 20oC	5000 (standard for 2 years transitional period) 500 (standard for 74 years transitional period)
	Oil and Grease	10

(H) Sugar Industry	
Effluent (liquid waste)	
Parameters	Standard for presence in a unit of mg/l
pH	6 – 9
Suspended solids	150
BOD5 20oC	50
Oil and Grease	10
Wastewater per ton of sugarcane crushing (in Cubic meter)	0.5

Gaseous Emission	
Boiler using baggasse Particulate, mg/Nm3	Stepgrade 250 Pulsating/ 500 (horse, shoe, Spreader, Stocker) 800

(I) Tannery Industry	
Effluent (liquid waste)	
Parameters	Standard for presence in a unit of mg/l
pH	6 – 9
Suspended solids	150
BOD5 20oC	100
Sulfide (as S)	1
Total Chromium (as Cr)	2
Oil and Grease	10
Total dissolved solids	2100

Wastewater per ton of hide processing (in cubic meter)	30
Note: Soak liquor shall be separated from wastewater.	

(J) Food Processing, Fish Canning, Dairy, Starch and Jute Industries	
Effluent (liquid waste)	
Parameters	Maximum Limit of Values in mg/l
Suspended solids	6 – 9
BOD5 20oC	150
Wastewater flow	100
Starch	8 Cubic Meter per Ton of raw materials
Jute processing	1.5 Cubic Meter per Ton product
Dairy products	3 Cubic Meter per Ton of Milk

(K) Crude Oil Refinery			
Gaseous Emission			
Parameter	Source	Standards for maximum presence	Unit
Sulfur dioxide	Distillation	0.25	kg/ton
	Catalytic Cracker	2.5	kg/ton

Effluent (liquid waste)		
Parameters	Standards for maximum presence	Unit
Suspended solids (SS)	100	mg/l
Oil and Grease	10	"
BOD5 20oC	30	"
Phenol	1	"
Sulfide (as S)	1	"
Wastewater flow	700	Cubic Meter/1000 Ton of treated crude oil

Notes:
(1) All new industrial units from the beginning of their operation shall abide by these standards while discharging/emitting wastes. All existing industrial units shall install necessary treatment facilities within 2 years (if not otherwise directed) from the date of the notification of these rules. In special cases, the Department may extend the deadline on valid reasons. (2) These standards shall apply irrespective of the discharge/emission points. (3) These standards shall never be violated at the time of sample collection. These standards may be enforced in a more stringent manner, if considered necessary in view of the surrounding conditions of a particular situation.

1 “SCHEDULE – 13		
Fees for Environmental Clearance Certificate or Renewal [See Rules 7(5), 8(2) and 14]		
1. Industrial unit or project		
Investment (in Taka)	Fees for Environmental Clearance Certificate (in Taka)	Certificate Renewal Fee
(a) Between Tk. 100,000 and 5,00,000	Tk. 1,500	One-fourth of the fees in Column (2).
(b) Between Tk. 5,00,000 and 10,00,000	Tk. 3,000	DO
(c) Between Tk. 10,00,000 and 50,00,000	Tk. 5,000	DO
(d) Between Tk. 50,00,000 and 10,000,000	Tk. 10,000	DO
(e) Between Tk. 10,000,000 and 2,00,000,000	Tk. 25,000	One-fourth of the fees in Column (2).
(f) Between Tk. 2,00,000,000 and 5,00,000,000	Tk. 50,000	DO
(g) Above Tk. 5,00,000,000	Tk. 1,00,000	DO
1 Schedule-13 was substituted by Notification S.R.O. No. 234-Law/2002 dated 24/08/2002 and came into force on 26/08/2002 being the date of publication in Bangladesh Gazette extraordinary issue.		

1 SCHEDULE – 14		
Fees to be realized by the Department of Environment for supplying various analytical information or data or test results of samples of water, effluent, air and sound. [See Rule 15]		
(A) Sample of water or effluent		
Parameter		Fee (in Taka)
1	Coliform	1000
2	Chlorine	500
3	Total hardness	500
4	Iron	800
5	Calcium	800
6	Magnesium	800
7	Colour	150
8	Electrical Conductivity (EC)	200
9	pH	200
10	Suspended Solids (SS)	600

11	Total Solids (TS)	400
12	Total Dissolved Solids (TDS)	400
13	Ammonia Nitrogen	800
14	Arsenic	1000
15	Boron	800
16	Cadmium	1000
17	COD	800
18	BOD	800
19	Chloride	500
20	Chromium, Hexavalent	1000
21	Chromium, Total	1000
22	Cyanide	800
23	Fluoride	800
24	Lead	1000
25	Mercury	1000
26	Nickel	1000
27	Organic Nitrogen	800
28	Oil and Grease	600
29	Phosphate	800
30	Phenol	800
31	Sulfate	800
32	Zinc	1000
33	Temperature	150
34	Turbidity (GTU)	200
35	Turbidity (NTU)	200
36	P-Alcanity	500
37	T-Alcanity	400
38	Acidity	400
39	Carbon dioxide	400
40	Calcium Hardness	500
41	DO	600
42	Nitrate	800
43	Nitrite	800
44	Silica	600
(B) Sample of Air		
	Parameter	Fee (in Taka)
1	S.P.M.	1000
2	Sulfur dioxide	1000
3	Nitrous dioxide	1000
4	Carbon Monoxide	600
5	Lead	1000
(C) Sample of Sound		
	Parameter	Fee (in Taka)

1	Sound	400

(D) For Supplying Analytical Information or Data

1. Annual information or data about Surface Water (except river water) and Ground Water collected by monitoring stations of Dhaka Division/Chittagong Division and Sylhet Division/Khulna Division and Barisal Division/Rajshahi Division –

(a) For Government organizations 4,500

(b) For Others 9,000

2. Annual information or data about river water collected by monitoring stations of Dhaka Division/Chittagong Division and Sylhet Division/ Khulna Division and Barisal Division/Rajshahi Division –

(a) For Government organizations 6,000

(b) For Others 9,000

3. Annual information or data about Air collected by monitoring stations of Dhaka Division/Chittagong Division and Sylhet Division/ Khulna Division and Barisal Division/Rajshahi Division –

(a) For Government organizations 3,500

(b) For Others 6,000"

Annex 2: Environmental Compliance Content within a Sample of Buyer Codes of Conduct

Examples of Buyer Codes of Conduct

H&M	
Supplier code of conduct	**1. ENVIRONMENT** The environment is of increasing concern globally and H&M expects its suppliers and other business partners to act responsibly in this respect. Our suppliers must comply with all applicable environmental laws and regulations in the country of operation. In particular, we are concerned about how the production of our garments and other products contributes to climate change and water stress. **1.1 Environmental Permits** The company must have the relevant environmental permits and licenses for its operations. **1.2 Handling of Chemicals** Chemicals used must be in compliance with H&M's Chemical Restrictions for the relevant product type. Chemical containers must be properly labelled and safely stored. A material safety data sheet (MSDS) must be available (in the local language) in the workshop. The instructions in the MSDS must be followed. (Refer to ILO Convention 170) **1.3 Water Management and Wastewater Treatment** Water is a scarce resource in many parts of the world and should be used as efficiently as possible. All outgoing wastewater from wet processes must be treated before it is discharged. The treated wastewater quality must meet the requirements in local legislation or the BSR guidelines1, whichever is stricter.
Sustainability commitment	**Impact on climate and air quality** <u>Fundamental:</u> The enterprise conducts all operations in full compliance with all applicable laws and regulations on air quality, air emissions and energy efficiency, including maintaining valid permits. <u>Aspirational:</u> The enterprise actively mitigates its impacts on climate change and air quality by: · Continuous improvement in energy management and efficiency. · Reduction or elimination of Greenhouse Gases (GHG) and other air emissions that pose a hazard to the environment, calculating emissions and setting targets according to the GHG Protocol1. · Selecting energy sources responsibly and taking a progressive approach towards adopting lower-carbon-intensity and renewable energy sources. **Impact on water resources** <u>Fundamental:</u> The enterprise conducts all operations in full compliance with all applicable laws and regulations on water conservation and water

	quality, including maintaining valid permits. Facilities with internal wet processing shall measure water withdrawals and wastewater discharge by flow meters and facilities with full internal treatment2 of wastewater must adhere to legal requirements or the BSR Wastewater Standard3, whichever is stricter. Aspirational: The enterprise takes active measures to reduce water use by showing continuous reduction of the facility's water withdrawals. For facilities using water only for domestic purposes (taps, toilets, cooling) it is sufficient to ensure implementation of water efficient equipment. Water saving techniques such as rain water harvesting shall be applied wherever feasible. For facilities with internal wet processes; · Appropriate level of metering to measure internal water use shall be implemented. · To reduce impact on water resources, the facility's water balance4 should be assessed and appropriate reduction measures taken to show continuous improvement. · In the long term, act as a responsible water steward. This means that in addition to reducing water impacts from own operations, the business partner engages in collective action with local stakeholders to ensure available water resources are managed to meet long term social, environmental and economic needs. Water stewardship and what it means for business is defined by the AWS International Water Stewardship Standard. **Use of chemicals** Fundamental: The enterprise conducts all operations in full compliance with all applicable laws and regulations regarding chemical use and disposal, including maintaining valid permits. Business Partners manufacturing any product for H&M must meet all contractually agreed applicable requirements specified in H&M's Restricted Substances List (RSL) and Manufacturing Restricted Substances List (MRSL). Storage, handling, use and disposal of all chemicals used must comply with the Safety Data Sheet (SDS) of each chemical product. Aspirational: All chemical products used by the enterprise are free of hazardous substances6. The enterprise proactively assesses its chemical use and substitutes with better available chemicals and alternative processes which reduce risks to people and the environment or which enhance resource efficiency through the adoption of "green chemistry"7. The pre-cautionary principle should be applied. **Waste, re-use and recycling** Fundamental: The enterprise conducts all operations in full compliance with all applicable laws and regulations including maintaining valid permits. Where services are available, all hazardous waste must be handled by an authorized company or licensed receiver. Aspirational:

	The enterprise proactively reduces its use of virgin raw materials and its impact on the environment by showing continuous improvement in optimization of raw material usage, increasing recycling and re-use of raw materials. The enterprise shows progress on elimination of wastes going to landfill and actively offer solutions in-line with circular economy innovation.
Bestsellers	
Supplier code of conduct	**5.1 ENVIRONMENTAL MANAGEMENT PLAN** BESTSELLER's Code of Conduct stipulates that our suppliers must follow all national and regional environmental laws. All factories must set up, and continuously develop an 'environmental management plan' (EMP) in order to minimise the effect of our business activities on the environment. An EMP works like other management systems with cycles that create continuous improvements from each cycle passed. As a minimum an EMP should address the following issues: · Domestic sewage and industrial waste water. Monitoring, handling, treatment and disposal. · Waste management (hazardous waste like chemicals and non-hazardous like textile waste). Monitoring, handling and disposal. · Air emission from e.g. boilers etc. Monitoring and treatment. · Monitoring schemes for the consumption of chemicals, water and energy. · Policy and plans for the continuous work to reduce the environmental impacts e.g. by implementing cleaner production techniques that will reduce the consumption of chemicals, water and energy and the amount of solid waste generated. In recent years our work on environmental issues throughout our business has become more focused – as our expectations for achieving a more sustainable business approach have become higher. BESTSELLER's environmental work follows the product from 'the cradle to the grave'. The following information and guidelines however, are aimed at our supply chain and the beginning of the life-cycle of our garments **5.2 CHEMICAL RESTRICTIONS** The Chemical Restrictions describe the limitations and prohibitions of substances in products manufactured for BESTSELLER. The Chemical Restrictions have been developed based on a concern for the health of our customers, the working conditions inside the factories producing our goods and for the preservation of the environment. They are revised on an annual basis to make sure that the restrictions always meet all new standards and consumer concerns. **5.3 WATER & WASTE WATER MANAGEMENT** Suppliers should use water responsibly and work to minimise their water footprint. This includes reducing water use and implementing water recycling as much as possible. Suppliers must treat and dispose waste water according to the law and be able to prove that this has been done. BESTSELLER

	EFFLUENT REQUIREMENTS Effluent chemical composition (waste water quality) must, as a minimum, meet local legal requirements. For a fully compliant site the water quality must meet the standard set by the Sustainable Water Group. **5.4. ENERGY EFFICENCY, AIR EMISSIONS AND CLIMATE CHANGE (GHG EMISSIONS)** Suppliers should work to reduce energy consumption and greenhouse gas footprint. All emissions that are produced during production must be monitored and controlled and treated as required by law
Sustainability commitment	DID NOT FIND ANY
G-Star	
Supplier code of conduct	**1. Commitment and responsibility** 1.1. Supplier must have a written declaration stating the importance of care for the environment, signed by the director. 1.2. Supplier must have formally assigned the responsibility for environmental performance to a member of the management team and/or board member. 1.3. Supplier should have a form stating the functions, responsibilities and names with regard to environmental issues. **2. Environmental management** 2.1. Supplier should have a written environmental policy, signed by the director. 2.2. Supplier must have an overview and copies of applicable local and national environmental laws and regulations and other (clients) requirements covering environment. 2.3. Supplier must have all environmental permits required by local laws and regulations available on site. 2.4. Supplier must be aware of its most important environmental aspects. Supplier should keep an up to date overview of the environmental aspects at its site (both for regular work as well as any additional aspects that apply during maintenance and/or incidents). 2.5. Supplier should have prioritized its environmental aspects and set targets for reduction of its top priority environmental aspects. 2.6. Supplier must have any local inspection documents and/or communications from authorities and/or complaints as well as documentation of the supplier's response to these available for review. 2.7. Supplier should strive towards implementing best available technology

	3. Energy Usage 3.1. Supplier must record energy usage (including electricity, gas, fuel use, and if applicable steam and compressed air) and monitor trends in energy usage against the output (for example number of products and/or the kgs of material processed). 3.2. Supplier should set targets to reduce energy usage per unit of output. 3.3. Supplier should investigate opportunities to use renewable energy (such as solar, wind turbines, geothermals, hydroelectric energy, or energy from biomass). 3.4. Investigate opportunities to implement of best practice technologies for energy use and reuse. **4. Water Usage** 4.1. Supplier must have an overview of sources from which water is used (purified drinking water, municipal mains, wells, surface water, collected rainwater, recycled grey water). 4.2. Supplier must keep records of the water usage per source and monitor trends in water usage against the output for example number of products and/or the kgs of material processed). 4.3. Supplier should set targets to reduce water usage per unit of output. 4.4. Supplier should investigate any opportunities for using 'fit for quality' water instead of 'highest quality' water, such as opportunities for recycling water and re-using grey water for other processes, or use collected rain water or surface water instead of purified drinking water when possible.
	5. Use of raw materials 5.1. Supplier should keep records of the mainstream amount of raw materials used (covering approximately 80% of their total purchasing). 5.2. Supplier should monitor the usage of raw materials per unit of output. 5.3. Investigate the possibilities of reducing the amounts of raw materials used. 5.4. Investigate the possibilities of using recycled materials as raw material. **6. Use of hazardous substances** 6.1. Supplier must comply with the G-Star restricted substances list. 6.2. Supplier must keep a register of all hazardous substances on site. 6.3. Supplier must keep records of the amounts of hazardous substances used. 6.4. Hazardous substances must be stored and handled in accordance with local and national laws and regulations. 6.5. Supplier must be aware of the hazards the substances on site can pose and have the Material Safety Data Sheets of all substances available on-site. 6.6. Hazardous substances must be stored on second containment and where possible handle only above an impermeable floor. 6.7. Supplier must have spill kits readily available in case of a spill.

	Employees must be trained in how to use the spill kits. 6.8. Supplier must have a list of all above ground and underground storage tanks. Tanks should be inspected and maintained on a regular basis to avoid leakage. 6.9. Supplier should investigate the possibilities to replace hazardous substances by more environmentally friendly alternatives. 6.10 Employees must have appropriate training in handling chemicals in case of normal activities and in case of calamities, including use of personal protection equipment. 6.11 Supplier must enforce proper handling of hazardous substances and use of personal protection equipment at all times.
	7. Waste water discharge 7.1. Supplier must keep records of quality and quantity of wastewater discharged. 7.2. Supplier must ensure the quality of the discharged water meets the parameters as stipulated in local and national regulations and/or in the water discharge permit. To achieve this the quality of the discharged water must be monitored through periodic testing. The frequency of testing must at a minimum meet the legal requirements. 7.3. Supplier should set targets to improve the quality and reduce the quantities of discharged water. 7.4. Supplier must have procedure in place for how to handle in case the discharged water does not meet the quality requirements. The relevant employees must be trained in this procedure. 7.5. Supplier should investigate and implement best practice technologies for wastewater treatment. **8. Waste** 8.1. Supplier must keep records of the volumes and types of wastes produced on site and handed over to contractors Where possible supplier will record and monitor the methods of disposal. 8.2. Supplier should set targets to reduce the amount of wastes produced and/or set targets to recycle waste internally. 8.3. Supplier must segregate different waste streams (textile, paper, glass, plastic, metals, wood/pallets, and hazardous waste) at a minimum in accordance with local and national regulations. If the local infrastructure allows a further segregation then required by regulations, supplier will endeavor to improve its waste segregation to make use of the additional possibilities. 8.4. For waste collection, transport, treatment and disposal, supplier must use contractors with the required licenses as stipulated by law. 8.5. Supplier should stimulate the contractor to find recycling

	opportunities for the waste streams. 8.6. Supplier will ensure that empty packaging which contained hazardous substances are properly disposed of and are not being re-used as containers for other substances (especially not for foodstuffs or drinks). **9. Nuisance** 9.1. Supplier must identify any sources of nuisance (noise from machines and/or transport, odor, light, heat, vibrations (from machines)). 9.2. Supplier must keep records of any complaints and of the corrective actions. 9.3. Supplier should implement best practice technologies to avoid and reduce nuisance.
	10. Emissions to air 10.1. Supplier should keep and update an overview of (greenhouse) gases purchased and occurring in processes and other air emissions. 10.2. Supplier must have the necessary permits for air emissions and/or report its air emissions to the relevant authorities as required by law. 10.3. Supplier should keep records of the volumes and types of air emissions. 10.4. Supplier should have an action plan to control and reduce air emissions. 10.5. Supplier should implement best practice technologies to avoid and reduce the air emissions.
Sustainability commitment	DID NOT FIND ANY
GAP	
Suppliers code of conduct	**ENVIRONMENTAL MANAGEMENT SYSTEM** The facility shall have an Environmental Management System (EMS). **ENVIRONMENTAL EMERGENCY PLAN** The facility shall have an Environmental Emergency Plan (EEP) that includes procedures for notifying local community authorities in case of accidental discharge or any other environmental emergency. **WASTEWATER TREATMENT POLICY AND PROCEDURE** The facility shall maintain an up-to-date Wastewater Treatment Policy and Procedure. All industrial and domestic wastewater shall be treated to meet the discharge requirements of local laws. In addition, the facility shall comply with all applicable monitoring and reporting requirements. As such, the treatment facility must be appropriately sized to process effluent of all production processes and shall not be left idle during production times. **WATER QUALITY PROGRAM** The denim laundry facilities shall comply with the requirements of the Gap Inc. Water Quality Program (WQP). **CHEMICALS INVENTORY** The facility shall maintain a current Chemical Inventory that lists all chemicals used in the facility and the supplier's name. **RESTRICTED SUBSTANCES LIST** The facility shall adhere to chemical restrictions, as described in the Gap

	Inc. Restricted Substances List (RSL), and shall prohibit the use of banned chemicals in manufacturing processes, as described in the Zero Discharge of Hazardous Chemicals - Manufacturing Restricted Substances List (ZDHC MRSL). **CHEMICALS STORAGE** The facility shall ensure that the chemicals and hazardous substance storage areas are maintained in an organized and safe manner, with clear and proper labelling of chemical containers. **CHEMICAL HANDLING PROCEDURES** The facility shall have defined safe chemical handling procedures and shall train workers on these procedures and the hazards of chemical exposure. **CHEMICAL DISPOSAL** The facility shall segregate hazardous from non-hazardous materials and shall dispose of both types of materials in a safe and legal manner. **SAC HIGG INDEX FACILITY ENVIRONMENT MODULE** The facility shall complete and submit the Higg Index Facility Environment Module as per Gap Inc.'s required timeline
Sustainability commitment	**Water Stewardship (Covering Women + Water, Improving Manufacturing in Mills & Laundries and Chemicals)** Water is essential for our business as well as the people and communities where we operate. At each stage of our products' creation, we look for ways to reduce water impacts. Through our programs, we reduce water use, eliminate discharge of hazardous chemicals and work directly with women to improve their access to clean, safe water. <u>Women + Water</u> Our water strategy is focused on the intersection between our industry's significant use of water and the basic right people have to clean, safe water. In many parts of the world, women are largely responsible for household duties such as cooking and cleaning; they shoulder a disproportionate burden when it comes to water stress. If women had better access to water, they could spend that time caring for their families, getting an education or earning additional income. Women and children also face serious health risks due to inadequate access to safe water and sanitation, which is sometimes worsened by a limited understanding of healthy hygiene practices. Our Women + Water strategy is aimed at reducing impacts in three primary ways: • Building awareness and educating the women who make our clothes about safe water-handling practices, and by increasing their access to safe water • Partnering with fabric mills and laundries to reduce manufacturing impacts • Adopting more water-efficient product design and sourcing practices

	Improving Manufacturing in Mills and Laundries The processes behind making a piece of clothing affect both the environment and people in the surrounding communities. Traditional fabric mills use a great deal of water and chemicals during the dyeing and finishing process, and wastewater must be treated to ensure that both ecosystems and nearby communities are protected. Laundries, especially for denim, also require a great deal of water and pose pollution risks. Gap Inc. is working with fabric mills and laundries to improve practices, and we are pursuing partnerships across our supply chain to reduce water and chemicals use. We aim to save 1 billion liters of water in our manufacturing processes by the end of 2017. We encourage and support our suppliers in conducting environmental footprint assessments, including water use, using the Sustainable Apparel Coalition's (SAC) Higg Index. Though our sustainability programs have traditionally focused on our tier 1 cut-and-sew facilities, we recognize the need to measure and address the impact of the apparel supply chain more broadly. For this reason, we have expanded our program beyond direct suppliers to reach deeper in our supply chain. Through our Mill Sustainability Program, we have used the Higg Index to engage strategic mills in China, India, Pakistan, Vietnam, Korea and Taiwan to conduct environmental assessments, including water consumption and wastewater treatment and disposal.
	Chemicals Chemicals are used throughout the production cycle of most garments, from fabric dyeing to creating unique finishes. According to some estimates, the global apparel industry accounts for 25% of manufacturing chemical usage. The discharge of these chemicals threatens local water sources; contamination could affect people living in surrounding communities. Because we know certain chemicals can be harmful to consumers, in 2008, we developed a Restricted Substance List (RSL) that dictates which chemicals must not be used to produce our clothing. We base this list on both existing and developing legislation as well as toxicity risk assessments. As part of our ongoing monitoring process, we have an independent, accredited, third-party lab test for restricted chemicals in our finished products. If products do not meet applicable legal chemical requirements and regulations, they will not be sold or must be remade to meet our compliance standards. **'Three denim laundries that we source from in Bangladesh are participating in the Partnership for Cleaner Textile program, alongside other mills, which has identified nearly 114 million liters of water savings.'**

	Product Sustainability (covering The Product, Life Cycle Sustainably Sourcing Raw Materials , Addressing Water Use with Design Choices, Integrating Sustainability into Our Brand Decisions) Our integrated commitment to sustainability begins with our design teams and the development of products that look good, have lower impact on the environment and bring confidence to our customers. Since the materials in our clothes greatly contribute to each garment's environmental impact, our design and production decisions have significant power to make our products more sustainable. We are committed to integrating environmental sustainability more deeply into every aspect of our business, from the materials we source, to the suppliers we work with and, ultimately, the clothes we sell. We are committed to pursuing technology and product innovation, allowing us to continually deliver great products that look good, delight our customers wear after wear and reduce our impact on people and the planet. Given the size and complexity of the apparel supply chain, we work hard to identify and measure our greatest environmental impacts so that we can invest resources in areas that will have the greatest impact. We have identified several critical ways to improve product sustainability: • We partner with our most progressive and strategic suppliers to identify and scale best practices across our supply chain. • We've identified ways to more sustainably source key raw materials. • Through our life cycle analyses, we are examining ways to reduce impacts in other stages of our products' life, including manufacturing, packaging and distribution and in our retail operations. • Our brands work to develop solutions that are meaningful to their customers and that can be scaled up across our business.

	Mapping The Product Life Cycle To understand environmental impacts for the entire process—from design, to sourcing, to manufacturing, all the way to a customer's closet—we perform life cycle assessments (LCA). We use these to evaluate indicators such as product carbon emissions, chemicals and water usage from cradle to grave. Our LCAs helped us understand where we can engage our supply chain, internal teams and customers to help reduce the environmental impacts of our products at all stages. Key Stages in the Apparel Life Cycle Resource Extraction and Refining: This stage includes the sourcing of raw materials, including cotton, polyester and man-made cellulosic fibers such as viscose/rayon and modal. Impacts can be reduced in this phase through strategic sourcing of more sustainable materials. Manufacturing: Manufacturing covers all processes involved in creating our products, such as yarn spinning, knitting/weaving, dyeing, embroidering, cut-and-sew processes, laundering and finishing. In manufacturing, it's possible to reduce the use of water, energy and chemicals, especially with closed-loop or zero-discharge manufacturing that reuses chemicals or water without releasing them to the environment. Packaging and Distribution: This includes all steps involved with labeling, packaging for transport and storage, and freight to our distribution centers and eventually to customers or stores. Consumer Use: Consumer use of products—mostly from garment care including washing, drying and dry-cleaning—contributes to a product's water and carbon footprint when in the customer's possession. Use may also include multiple "lives" if the garment is resold as a second-hand product, which reduces the product's life cycle impacts compared to a new item. End of Life: Finally, we consider the environmental impacts of when an item is eventually discarded, usually into a landfill. This phase offers opportunities for recycling, upcycling or helping create a circular product life cycle. Sustainably Sourcing Raw Materials We use many types of fibers in Gap Inc. products: natural fibers include plant-based items such as cotton and linen, and animal-based materials such as wool, leather and cashmere; synthetic fibers include polyester and spandex; and man-made cellulosics include pulp-based materials such as rayon and modal. Each type of fiber has a social and environmental impact, and we are empowering our designers with the knowledge needed to make informed choices within the design process. Addressing Water Use with Design Choices Since up to 80% of a product's environmental impact is tied to decisions made in design and development, we know that reducing water impacts begins with innovative product design. Our designers have embraced the opportunity to save water while creating the style and quality our customers love. We are working with our designers to evaluate a variety

	of factors that can reduce water impacts throughout a product's life cycle. These factors include: the type of raw materials and how much are used, how our products are manufactured and how long our clothes are designed to last. Integrating Sustainability into Our Brand Decisions One of the most effective ways we've found to design and create more sustainable products is to build awareness and education around sustainability, so as to improve the impacts of our products on people and the planet. We continue to educate our brand designers, merchants, product development and sourcing teams about how to design using more sustainable fibers, fabrics and manufacturing techniques that save water—and how to procure more responsible materials.
	Operational Eco-Efficiency A dedication to reducing the impacts of our owned and operated stores, distribution centers and offices means reducing our operational greenhouse gas (GHG) emissions and waste production, and working with our logistics and procurement partners to identify practices that are more efficient and have lower environmental impact. A healthy environment is critical to healthy populations and our success as a business. Alongside our supply chain work, we recognize we have the greatest power to reduce our impact within our own operations. Our transportation team also works to achieve emission reductions while streamlining our logistics. We view climate change as both an environmental and a human rights issue. These efforts reduce environmental impact and are cost-effective. Climate and Energy We focus primarily on energy and waste when it comes to the environmental impacts of our own operations. Taking action in one area, like waste, can also reduce GHG emissions. We believe it is vitally important that we address the urgent challenge of climate change—and that integrating climate change into our business strategy contributes to a competitive advantage in several ways, as it: • reduces our operating costs by increasing energy efficiency and reducing consumption • positions us well to adapt to a fast-changing regulatory environment affecting energy use, product marketing and labeling, and store construction • helps us improve our reputation and build support from a range of stakeholders, including customers, employees, investors and

	environmental organizations. <u>Waste</u> Our biggest waste streams from our owned-and-operated facilities are polyethylene bags and plastic hangers. As many of our facilities are within larger mall complexes,we are looking for solutions that address the diverse needs of our stores and distribution centers.
C&A	
Suppliers code of conduct	**Legal Compliance:** - Suppliers must comply with all relevant local and national environmental protection laws and regulations, and aim to meet international environmental protection standards. - Suppliers must obtain all necessary environmental permits, and keep them up-to-date. **Environmental Performance Management** -Suppliers must have an environmental management system10 in place, and assign responsibility for environmental performance to a senior management representative. -Suppliers must measure energy & water use, emissions & discharges into the environment, and disposal of wastes, and disclose this information to C&A, upon request. -Suppliers must integrate environmental impact into business decisions, take a progressive approach towards improving environmental performance, and require the same from their suppliers and subcontractors. **Resource Use & Climate Change** - Suppliers must take measures to continuously improve energy efficiency in buildings, transport & production, and make reasonable efforts to use renewable or less carbon intensive energy sources. - Suppliers with wet processes must take measures to continuously improve water efficiency. - Suppliers must make reasonable efforts to ensure that their purchasing decisions do not contribute to deforestation, cruel treatment of animals, or adverse impacts on vulnerable ecosystems or endangered species. **Waste & Emissions** - Suppliers must take measures to reduce waste through design and operational efficiency, and facilitate reuse & recycling where possible. - Suppliers must treat wastewater properly prior to discharge, test the wastewater as required to meet all national and local water discharge compliance standards, and share wastewater quality data with stakeholders, upon request from C&A.

	- Suppliers must take measures to minimise noise pollution and emissions to air, soil, and groundwater. **Hazardous Chemicals** -Suppliers must work with C&A and their own suppliers towards the elimination of hazardous substances from the supply chain.
Sustainability commitment	DID NOT FIND SUFFICEINT INFO
WALMART	
Suppliers code of conduct	**Environment** Suppliers should ensure that every manufacturing facility complies with environmental laws, including all laws related to waste disposal, air emissions, discharges, toxic substances and hazardous waste disposal. Suppliers must validate that all input materials and components were obtained from permissible harvests consistent with international treaties and protocols in addition to local laws and regulations. <u>A. General Waste Management</u> 1. All containers must be maintained in good condition and have legible and informative labels. 2. Suppliers must handle, store, and transport materials in a safe and appropriate manner to control risks of accident. <u>B. Waste Storage</u> 1. Suppliers must obtain and maintain appropriate permits for onsite waste storage, if required. 2. Suppliers must segregate hazardous and non-hazardous waste. 3. Suppliers must maintain waste inventory and records, including a current inventory of stored waste, and a log of the disposal and treatment of on-site and off-site waste. 4. Workers should be provided appropriate waste management training. a. Worker training must include safe and environmentally-responsible handling procedures, proper disposal methods, proper storage methods, and the hazards of mixing waste products at the facility. <u>C. Waste Transport and Disposal</u> 1. Suppliers must obtain and maintain appropriate permits for onsite waste disposal. 2. Suppliers shall not conduct open burns of waste onsite.

	3. Suppliers shall not dispose of waste by burial onsite. 4. Suppliers must deliver hazardous waste for offsite treatment and disposal only to contractors licensed or otherwise permitted by the appropriate authority. Suppliers should regularly verify the disposal contractor's license or permit. <u>D. Wastewater and Effluents Management</u> 1. All suppliers must identify possible contaminants discharged onsite at each facility, including the flow direction of the discharge and the potential environmental impact of its contents. 2. All facilities must have a drainage system in place to convey wastewater and effluents to a legally-permitted treatment plant or final discharge point. a. A detailed scale drawing of the drainage system should be available for review. 3. Suppliers must obtain and maintain the appropriate legal permits for wastewater and any effluents discharge. 4. Suppliers must conduct regular wastewater monitoring, including sampling and testing, as required by law. 5. Suppliers must strictly comply with all legal limits on volume and discharge rate for wastewater and effluents. a. Suppliers must take immediate corrective action if volume or discharge limits are exceeded. 6. If applicable, the Supplier must maintain a wastewater treatment plant in safe operating condition to avoid risks to the environment and human health.
	<u>E. Air Emissions Management</u> 1. Suppliers shall obtain and maintain appropriate permits for air emissions as required by law. 2. Suppliers shall conduct regular air emissions monitoring, including sampling and testing, as required by law. a. Maintenance on air emission control equipment should be conducted on a regular basis. b. Suppliers must consider the potential for fugitive emissions, and monitor equipment and storage for possible leaks and unintended releases. 3. Suppliers must strictly comply with any applicable legal limits on air emissions. a. Suppliers must take immediate corrective action in the event emission limits are exceeded. 4. Suppliers must establish an inventory of point sources of air emission. 5. Suppliers must maintain an inventory of onsite ozone-depleting substances (ODS). 6. Suppliers should regularly inspect and properly maintain ODS containment equipment to prevent accidental release. 7. Suppliers must seek to expand the number, quality, and types of ODS containment equipment used in their facilities. <u>F. Water Management</u>

	1. Suppliers must obtain and maintain the appropriate legal permits for water use. 2. If water is extracted onsite, Suppliers must obtain and maintain the required extraction permits. 3. Suppliers must maintain water consumption records, including water bills and meter readings from water suppliers. <u>G. Energy Consumption and Greenhouse Gas Management</u> 1. All Supplier facilities must meet the applicable legal requirements for energy use and greenhouse gas emissions. 2. Suppliers must obtain and maintain the appropriate legal energy use and greenhouse gas discharge permits. 3. Suppliers must conduct regular monitoring of their energy use and greenhouse gas emissions. 4. Suppliers shall maintain energy use records, including energy and electricity bills, and meter readings. 5. Suppliers shall maintain records of direct and indirect greenhouse gas emissions as required by law
	<u>H. Land Use and Biodiversity</u> 1. Suppliers must obtain and maintain the appropriate permits for land use and facility construction as required by law. 2. Suppliers must meet any applicable legal standards regarding protected areas. a. A protected area is defined as clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. 3. All facilities must be subject to an environmental impact assessment. The results should be submitted for review and approval as required by law. <u>I. Environmental Management System</u> 1. Suppliers should encourage factories to: a. Adopt an environmental policy. b. Create and maintain an environmental legal register that documents compliance with applicable environmental laws and regulations. c. Monitor environmental law and regulation changes to maintain continuous improvement. d. Appoint a member of the facility management team to be tasked with the coordination of environmental management activities. This person should be properly trained in environmental management. e. Develop an Emergency Response Plan to deal with possible environmental incidents. The Emergency Response Plan should include trained emergency response teams and regular drills. 1. The Emergency Response Plan should be communicated to the local authorities, emergency services, and local communities as required by

	law. f. Provide regular environmental safety training to workers. <u>J. Hazardous Substances Management and Pollution Prevention</u> 1. Suppliers must obtain and maintain the appropriate permits for all hazardous substances. 2. Banned substances must not be used. 3. Suppliers must report all pollution and incidents involving a hazardous substance to the authorities as required by law. 4. Appropriate measures must be taken to prevent and control the risk of environmental pollution from the release of a hazardous substance, including the contamination of soil or groundwater. 5. Suppliers must identify environmentally sensitive receptors (rivers, underground water, etc.) close to facilities and implement special measures to achieve prevention of contamination. 6. An inventory of all hazardous substances used and stored in the facility must be kept, including an up-to-date Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for each substance. 7. Workers must be appropriately trained in pollution prevention and response measures. 8. Workers must be appropriately trained to handle hazardous substances in their workplace in accordance with the substance MSDS/SDS.
	<u>K. Noise Pollution</u> 1. Suppliers must obtain and maintain the appropriate permit for noise pollution as required by law. 2. Facilities must comply with legal noise pollution limits. 3. Noise pollution assessments must be completed as required by law. 4. Suppliers must conduct regular noise pollution monitoring as required by law. 5. Suppliers must take immediate corrective action if noise pollution limits are exceeded. <u>L. Nuisance</u> 1. Suppliers should have an understanding and awareness of nuisance issues and their associated local impacts. Nuisances can include but are not limited to odor, noise, visual issues, and the general cleanliness of the facility.
Sustainability commitment	DID NOT FIND SUFFICEINT INFO

Annex 3: Leadership in Energy and Environmental Design (LEED) Fees

Leadership in Energy and Environmental Design (LEED) Fees as of July 4, 2018

Building Design and Construction Fees

Building Design and Construction Fees per Building	**Silver, Gold and Platinum Level Members**		**Organizational or Non-members**	
Registration	$1,200		$1,500	
Precertification				
Flat fee (per building)	$4,000		$5,000	
Expedited review (reduce from 20-25 business days to 10-12, available based on GBCI review capacity)	$5,000			
Combined Certification Review: Design and Construction	**Rate**	**Minimum**	**Rate**	**Minimum**
Project gross floor area (excluding parking): less than 250,000 sqft	$0.057 /sf	$2,850	$0.068 /sf	$3,420
Project gross floor area (excluding parking): 250,000 - 499,999 sqft	$0.055 /sf	$14,250	$0.066 /sf	$17,100
Project gross floor area excluding parking): 500,000 - 749,999 sqft	$0.050 /sf	$27,500	$0.060 /sf	$33,000
Project gross floor area (excluding parking): 750,000 sqft or greater	Contact GBCI		Contact GBCI	
Expedited review (reduce from 20-25 business days to 10-12, available based on GBCI review capacity)	$10,000			
Split Review: Design				
Project gross floor area (excluding parking): less than 250,000 sqft	$0.047 /sf	$2,325	$0.055 /sf	$2,740
Project gross floor area (excluding parking): 250,000 - 499,999 sqft	$0.045 /sf	$11,625	$0.053 /sf	$13,760
Project gross floor area (excluding parking): 500,000 - 749,999 sqft	$0.041 /sf	$22,500	$0.049 /sf	$26,625

Project gross floor area (excluding parking): 750,000 sqft or greater	Contact GBCI		Contact GBCI	
Expedited review (reduce from 20-25 business days to 10-12, available based on GBCI review capacity)	$10,000			
Split Review: Construction				
Project gross floor area (excluding parking): less than 250,000 sqft	$0.016 /sf	$775	$0.018 /sf	$910
Project gross floor area (excluding parking): 250,000 - 499,999 sqft	$0.015 /sf	$3,875	$0.018 /sf	$4,585
Project gross floor area (excluding parking): 500,000 - 749,999 sqft	$0.014 /sf	$7,500	$0.016 /sf	$8,875
Project gross floor area (excluding parking): 750,000 sqft or greater	Contact GBCI		Contact GBCI	
Expedited review (reduce from 20-25 business days to 10-12, available based on GBCI review capacity)	$10,000			
Appeals				
Complex credits	$800 per credit			
Credits	$500 per credit			
Expedited review	$500 per credit			
Formal Inquiries				
Project CIRs	$220 per credit			

Interior Design and Construction Fees

Interior Design and Construction Fees per Space	**Silver, Gold and Platinum Level Members**	**Organizational or Non-members**
Registration	$1,200	$1,500

Combined Certification Review: Design and Construction	**Rate**	**Minimum**	**Rate**	**Minimum**
Project gross floor area (excluding parking): less than 250,000 sqft	$0.038 /sf	$1,900	$0.046 /sf	$2,250
Project gross floor area (excluding parking): 250,000 - 499,999 sqft	$0.035 /sf	$9,500	$0.042 /sf	$11,400
Project gross floor area (excluding parking): 500,000 - 749,999 sqft	$0.030 /sf	$17,500	$0.036 /sf	$21,000
Project gross floor area (excluding parking): 750,000 sqft or greater	Contact GBCI		Contact GBCI	
Expedited review (reduce from 20-25 business days to 10-12, available based on GBCI review capacity)	$10,000			
Split Review: Design				
Project gross floor area (excluding parking): less than 250,000 sqft	$0.032 /sf	$1,615	$0.038 /sf	$1,900
Project gross floor area (excluding parking): 250,000 - 499,999 sqft	$0.030 /sf	$8,060	$0.035 /sf	$9,400
Project gross floor area (excluding parking): 500,000 - 749,999 sqft	$0.026 /sf	$15,000	$0.031 /sf	$17,625
Project gross floor area (excluding parking): 750,000 sqft or greater	Contact GBCI		Contact GBCI	
Expedited review (reduce from 20-25 business days to 10-12, available based on GBCI review capacity)	$10,000			
Split Review: Construction				

Project gross floor area (excluding parking): less than 250,000 sqft	$0.011 /sf	$540	$0.013 /sf	$635
Project gross floor area (excluding parking): 250,000 - 499,999 sqft	$0.010 /sf	$2,690	$0.012 /sf	$3,100
Project gross floor area (excluding parking): 500,000 - 749,999 sqft	$0.009 /sf	$5,000	$0.010 /sf	$5,875
Project gross floor area (excluding parking): 750,000 sqft or greater	Contact GBCI		Contact GBCI	
Expedited review (reduce from 20-25 business days to 10-12, available based on GBCI review capacity)	$10,000			

Annex 4: Features of LEED Pioneers in Bangladesh

Genesis Washing Limited and Columbia Washing Limited

World's First Platinum Rated Washing Facility

World's Top 10 Platinum Factory Ranking: 8

Genesis Washing Limited and Columbia Washing Limited are part of the M&J Group. Established in 1965, they began making apparel in 1989. Now they have 6 sister concern factories producing apparel, including denim (Columbia Apparels Limited, Columbia Washing Plant Limited, Genesis Fashions Limited, and Genesis Washing Limited). The group has 400,000 square feet of production space, and produces 8 million pieces of garments per year with over 2,500 machine facilities, for international buyers such as Replay, H & M, New Yorker, C & A, Esprit, GAP, Old Navy and Macys in the Europe, USA, Asian and Canadian markets.[20]**Columbia Washing Limited** became LEED v3 platinum certified in December 2016, and is the world's first washing plant to reach platinum status. It is a 154,000 square feet industrial washing plant, and has 87 out of 110 points.

Their LEED features include:

- Waste Heat recovery boiler system,
- skylights for daylighting with integrated controls,
- 100% water use reduction for flushing and gardening,
- demand control ventilation for shop floors,
- 100% rain water harvesting system.

According to the USGBC, Columbia Washing's performance rankings are as follows: 36% improvement on baseline building performance rating; 3% onsite renewable energy; 35% green power purchase; 20% recycled content building materials; 20% regionally extracted, harvested, recovered, or manufactured materials; 50% FSC-certified wood products; 75% diversion of construction and demolition debris; 75% of occupied space has daylighting; 90% of occupied space has quality views; 100% reduction in potable landscape water use; 40% reduction in baseline indoor water use; 50% reduction in wastewater generation. [21]**Genesis Washing Limited**, in Gazipur, is a sister concern of Columbia. It is 75,000 square feet washing plant servicing the M&J Group, and is Bangladesh's first and only LEED v4 certified washing plant. It is also the first factory in Bangladesh to have a Building Management System (software and hardware for tracking green compliance performance across multiple resources). In May 2018, Genesis Washing got LEED V4 certified. Key highlights of the 2018 certification are trigeneration system in the utility side, heat and condensate recovery, demand control ventilation and Building Management System. Rain water conservation is enhanced by the provision of Rain Water Harvesting tank and percolation pits in the site.

Envoy Textiles Limited

[20] Source: http://www.mj-group.com/about/about.html
[21]http://www.gbig.org/activities/leed-1000035141

World's First Platinum Rated Denim Factory

Envoy Textiles Limited[22] is part of the Envoy Group of companies which has investments in readymade garments, textiles, local and international trading, freight forwarding, information technology, washing plant, real-estate, banking automation, financial institution, energy and power sector, hospitality service and consumer products. ETL established in 2005, started the commercial production in early 2008, within the short period of time, ETL is now the largest denim fabric producing unit in Bangladesh. It has a 2,35,000 square feet factory in Mymensingh, and got its LEED EB:OM platinum rating in March 2018. It is the world's first LEED platinum denim company. [23]

Their LEED features are:

- use of harvested rainwater in the toilets and gardens;
- carbon emission free commuting practice has been implemented by providing dormitory close to factory building;
- use of compost (organic) that made from landscape waste as fertilizer for landscapes has reduced environmental impact from utilizing chemical based fertilizer;
- use of treated water from ETP and collected stormwater for flushing and landscape application;
- provision of TDS sensor with blow down controller and use of treated water from ETP as make-up water in cooling tower ensured effective utilization of potable water in CTs operation;
- use of steam derived from waste heat in steam fired chillers and integration of hot water from Gas Generator as heat source in hot water fired chiller have tremendously reduced Natural Gas demand in space cooling process;
- use of CFC & HCFC free refrigerant for process cooling operation; installation of Combo Sensors (Temp, RH & CO2) at all occupied space have been monitoring Indoor Environment Quality (IEQ) and aid them to maintain better IEQ;
- use of Green Cleaning chemicals and carbon emission free exterior cleaning are contributes more towards sustainable cleaning;
- sustainable materials purchase criteria; and
- mercury free illumination.

[22]http://www.envoytextiles.com/about-envoy.php
[23]https://www.youtube.com/watch?v=6PKdUO3VAnI&feature=youtu.be

Annex 5: Features of the LEED Platinum Global Highest Achievers:

Remi Holdings Limited and Tarasima Apparels Limited

World's Top 10 Platinum Factory Ranking: 1 and 2

Remi Holdings and Tarasima are part of the Bitopi Group.[24] Their portfolio consists of Tarasima Apparels Limited, Remi Holdings Limited, Misami Garments Limited, and Baridhi Garments Limited. They are recognized for the highest scoring LEED certified factories in Bangladesh and for Remi Holdings, the highest in the world. Remi Holdings Limited is a 246,000 square feet garments factory in Narayanganj, Bangladesh. It got LEED NC Platinum certified in July 2016.

The following are their key LEED features:

- roof garden reduce the heat island effect inside the building;
- 56% of water savings through efficient water fixtures;
- energy efficient lighting system, air compressors with VFD, VRF system with ERV, HVLS fans and super fans to reduce energy consumption of the building;
- steam traps for steam distribution in the ironing section;
- thermic fluid heater for drying purpose;
- recycling of construction materials such as concrete, bricks and wood;
- maximum daylight through windows and skylights;
- Solar Photovoltaic panels to reduce conventional energy; and
- FSC Certified Wood and other renewable woods/carpeting.

Tarasima Apparels Limited, is a 4 80, 000 square feet factory in Manikganj. It received its LEED EB:OM platinum certification in July 2016. The following are their key LEED features:

- "Covered Parking and Building Roof" with High Albedo coating to mitigate Heat Island effect;
- conversion of existing ETP into the RWH pits and use of collected water for garden irrigation and toilet flushing;
- use of Steam Traps in Irons and Thermic Fluid driven dryers for thermal energy reduction;
- use of Building Automation System acting as heart of energy and water management tools including monitoring and control;
- conversion of waste into biogas;

[24]http://www.bitopi-group.com/

- use of Combo Sensors (Temp, RH & CO2) at all occupied space to Indoor Environment Quality (IEQ) ;
- use of eco-friendly chemicals for cleaning interiors and carbon emission free chemicals for exterior cleaning, etc.

Plummy Fashions Limited

World's Top 10 Platinum Factory Ranking: 3

Plummy Fashions Limited (PFL) is a knitwear factory located in Narayanganj.[25] Situated in a 5.5 acre complex, they received their LEED BD+C: New Construction v3 platinum certification in 2015. Some of their LEED features are:

- Site design - The factory location is such that essential facilities are within a 500 meter radius (market, school, mosque, and bus stops). PFL provides secure bicycle parking facilities and encourages the use of non-fossil fuel transport. More than 50% of the total site has been kept as open space as per LEED requirements.
- Rain Water Harvesting-Rain water is collected in a harvesting tank and re-cycled for toilet flushing and irrigation purposes.
- Reduce Ozone Depletion-PFL has installed CFC free refrigerants for chillers, air conditioning and insulation.
- CO2 Monitoring System- PFL has installed carbon dioxide sensor to monitor the level of CO2 in the occupied areas.
- Heat Island Effect - PFL has installed roofing materials with a high Solar Reflection Index of 79 and installed hardscape areas with light color reflecting paving blocks.
- Co2 monitoring - PFL has installed carbon dioxide sensor to monitor the level of CO2 in the occupied areas. Depending on the CO2 level feedback from sensors triggers fans to regulate fresh air flow.
- Certified wood and paints - FSC certified wood and low VOC paints have been used to minimize impact on environment.
- Use of Local Materials for Construction - more than 20% of local materials has been used for construction to support the local economy and to reduce the environmental impact resulting from transportation. More than 20% materials used for construction of this project have been recycled.
- Energy saving machines - PFL has selected machines with very low energy servo motors to reducing power consumption by 50% over conventional factories. State of the art LED lights further reduce the energy demand by 80% over incandescent equivalent. This reduction in waste heat reduces the load on cooling systems and creates an excellent working environment.
- Maximum Day Lighting – PFL installed 44 signature series prismatic dome skylights by Sunoptics, USA for ambient lighting during the day time.

[25]http://plummyfashions.com/

- Renewable energy - A 65 KW capacity solar power plant with mono crystalline panels produces least 110 MW hours energy every year, which is 13% of PFL's total power demand.
- Water savings -PFL has installed efficient water outlet fixtures to reduce the use of water by 60%. Auto sensor urinals, dual flush water closets and faucets with a low flow rate of 1.5 litre/minute have been specified to comply with US-EPA (US Energy Policy Act) and ISO14001. Irrigation water demand has been reduced by 80%. Landscaping includes drought resistant locally adapted plant species which do not require regular irrigation. If limited irrigation is required the need is met using recycled non-potable rainwater.
- Light pollution - PLF meets Full Cutoff IESNA Classification certification by using an automated light control system that switches off lights during non business hours and does not direct exterior lighting to induce light pollution after dusk.

Annex 6: Features of PACT RMG factories in Bangladesh

IMPROVED WATER MANAGEMENT

Tarasima Apparels Limited

Before enrolling as a PACT partner,**Tarasima Apparels Limited** used to consume 1.5 million liters of water per day. Based on PACT assessment, they installed an Electro Cascade Reactor in its ETP that runs at a capacity of 70 cubic meter/hour. The reactor synthesizes nano catalysts that continuously enter the waste water and accelerates the treatment process. The catalytic oxidation process effectively removes almost all organic pollutants, remove color, and reduces chemical consumption in subsequent units. Their overall waste water quality improved with a reduction in chemical oxygen demand and total dissolved solids by 82% and 7% respectively. In total, they invested US dollar 743,400 in establishing the effluent treatment plant. The unit cost of waste water treatment now amounts to US dollar 0.3045/cubic meter.

The PACT assessment showed that thermal oil heaters were in fact a cleaner choice because they can operate at atmospheric pressure and reach temperatures up to 300°C, as a result operating costs are a lot cheaper. The company therefore replaced 20 steam dryers in the wet processing section with 12 thermal oil heaters. This has led to 72% savings in fresh water use (40,560,000 liters per year). Replacing the conventional boiler with the thermal oil heater is saving Tarasima 54% in steam and 72% reduction in water consumption.

EchotexLimited

Echotex's fabric dyeing plant utilizes international standard dyeing technology, and PACT assessment measures. With only 45,000-50,000 liters of water used per ton of fabric, their factory is more than four times efficient than the average dyeing plant in Bangladesh.

Fakir Apparels Limited: Improved Water Management

In 2012-13, **Fakir Apparels Limited**'s water consumption was 208 liters per KG of fabric produced. In 2014 before they undertook the PACT assessments, their water consumption was 174 liters. After they undertook the cleanup production assessments, their water consumption dropped from 174 to 58 liter per kilogram of fabric. In 2016, their water consumption was further reduced to 52 L. Interestingly, the industry's best target is 70 L, and the international standard is a much higher 111 liter.

IMPROVED ENERGY EFFICIENCY

Tarasima Apparels Limited

Tarasima had high energy bills due to steam generation. They used to depend on steam for washing, drying, and ironing. Based on PACT recommendations, they replaced steam dryers with more efficient and easy to maintain thermal oil heaters. This smart switch has given TAL an annual saving of USD 75,000. TAL also switched to sustainable and resource efficient lighting options – They replaced 400 W electric bulbs in there cutting, washing, and finishing units with skylight. This is a simple and low-cost change. But this has significantly reduced their annual energy consumption by 105,000 kWh, Resulting in 21% savings in total lighting energy consumption. The thermal oil heaters cut down steam consumption, leading to 72% savings in fresh water use (40,560,000 liters per year), 54% savings in steam (21,840,000 kg/year) and 52%

savings in TAL's total natural gas consumption per year. TAL also installed a 2-ton incinerator boiler, which saved natural gas. To minimize the volume and disposal cost of waste generated at different units, TAL installed a 2-ton incineration boiler that uses factory fabric waste (unused fabric scraps, thread cones, old paper cartons, etc.) as combustion fuel. The heat generated is used to produce steam, which in turn is supplied to the washing and finishing units. TAL's smart use of waste products saves the factory 450,000 cubic meters of natural gas and realizes cost savings of USD 68,000 per year. Their Electro Cascade Reactor installed at the ETP, shortened the water treatment process, and saved energy costs. They established a bio gas plant which produces 56 cubic meters of bio gas per day from food waste, which they use to cook food for their cafeteria.

Fakir Apparels Limited

FAL operates four natural gas-fired generators to supply energy to its facilities. Prior to the installation of a waste heat recovery system, they were releasing the hot exhaust gases directly to the environment. CP assessments advised them that not only were they polluting the environment, they were losing process energy and consuming more boiler fuel than needed. The company invested in a waste heat recovery (WHR) system comprising of an Exhaust Gas Boiler (EGB). The EGB extracts heat from the exhaust gas streams at approximately 470°C through heat exchange, and further utilizes it to produce steam. The steam is then supplied to various units including the garment steam ironing section, dyeing, and finishing units. The WHR system has significantly reduced FAL's energy and gas demand by 27,460 kWh/year and 2,595,840 m3 /year, respectively. The factory now makes USD 208,620 in annual savings from waste heat recovery alone. Thanks to their CP measures, their GHG emissions are down by 14%, energy consumption is also down by 14%.

Hams Garments Limited (HGL)

PACT recommended 33 low cost or low cost project to **Hams Garments Limited** of which they implemented 18 measures investing a total of about US dollars 100,000. These changes save the company US dollars 192,730 each year. Savings was 1.9 times more than the investment. The payback period was 6 months. They reduced their gas bill by an average of about US dollars 1,300 by increasing Boiler Efficiency. They raised the boiler feed water temperature from 50 degree centigrade to 80 degrees by insulating the tank and returning all condensates. They avoided use of live steam to preheat feed water. They installed a waste heat recovery boiler which provides up to 700 kg steam per hour. After taking the CP measures, their steam use is 7.29 kg per kg of finished fabric (international standard is 9); their natural gas consumption is 1.15 cubic meters per kg of finished fabric (international standard is 0.75) and their power consumption is 1.29 kWH per kg of finished fabric (international standard is 0.75).

Apex Holdings Limited (APL)

Apex HoldingsLimited produces an average of 35.5 tons of finished fabric per day. They have seven on-site gas generators as well as electrical connections from the National Grid. They worked with the CP experts to identify energy resource measures that would make their factories save money. Energy meters were installed to measure the efficiency of their individual gas generators. Before the CP measures were undertaken they estimated that their power consumption was 1.9 6KWH per kilogram of finished fabric. The PACT specialists estimated that the company could lower energy consumption per kilogram of finished fabric and save US dollars 269,000 every year. The company invested US dollars 89,000 and made savings (approximately 40% which was from energy saving light alone - around US dollars 45,681). The

payback period was only eight months. Against their investments, in the first year they made a saving of US dollar 112,156. In the second year they made an additional saving of US dollar 156,803. In total that that is a saving of US dollar 268,969 in annual savings. they also made a savings of 14,23,344 kWH in energy.

IMPROVED CHEMICALS MANAGEMENT

Zaber and Zubair Fabrics Limited (ZZFB)

Mercerization is a process applied to fabric to increase luster and strength, by treating it with caustic soda (NaOH) and other wetting agents at room temperature. At the end of the mercerizing cycle, the mercerized fabric is rinsed with water to remove the excess caustic. The rinse water, which is mainly weak caustic, is usually generated in large quantities, which if discharged without treatment can result in a substantial loss of caustic soda and lead to high consumption of acid for neutralization in the ETP; hence generating large volumes of sludge. Before its CP assessment, the company was draining the rinse water from its six mercerizing units, without recovery or treatment. This was burdening the factory's ETP, as the wastewater entering was high in salinity (TDS) and pH. Also, the factory was consuming large quantities of sulfuric acid (H2 SO4) to neutralize the excess caustic. The company addressed this by installing two Caustic Recovery Plants (CRPs) that concentrate dilute spent caustic (6%-7% NaOH) into concentrated caustic (22% NaOH), which can be reused in the process. Prior to the installation of the CRPs, Z&Z was consuming 700 ton H2 SO4 /month for wastewater neutralization at the ETPs. With the CRPs installed and caustic recovery in place, acid consumption significantly reduced to 300 ton/month, resulting in a 57% reduction. COD and salt levels in the effluent have also reduced. In total, Z&Z invested USD 2.3 million to set up the CRPs, resulting in combined savings of USD 3.8 million/year, and having a payback of less than one year.

Annex 7: Bangladesh Bank enlisted 52 Direct Green Products are as below:

Renewable Energy	
Bio-gas	Setting up of Bio-gas Plant in existing Dairy & poultry Farm; Integrated Cow Rearing and Setting up of Bio-gas Plant; Organic Manure from Slurry; Mid-Range Bio-gas Plant; Biomass based large scale Bio-gas Plant; Poultry & Dairy based large scale Bio-gas Plant.
Solar Energy	Solar Home System; Solar Micro/Mini Grid; Solar Irrigation Pumping System; Solar PV Assembly Plant; Solar PV Plant capable to produce 1 MW or more Power; Solar Cooker assembly Plant; Solar Water Heater Assembly Plant; Solar Air Heater & Cooling System Assembly Plant; Solar Energy Driven Cold Storage; Surface Water Purification Plant through Solar Pump
Hydro-Power	Hydropower (Pico, Micro & Mini)
Wind- Power	Wind Energy driven Power Plant
Energy Efficiency	Substitution of Conventional Lime Kiln by Energy Efficient Kiln; Substitution of Conventional lighting system, electronic material, Boiler with energy efficient alternatives on the basis of Energy Audit; Auto sensor power switches assembly Plant; Energy efficient Improved Cook Stove(ICS)/ICS Renewable / Hybrid Cook Stove Assembly Plant; LED Bulb/Tube Manufacturing Plant; LED Bulb/Tube Assembly Plant; Waste Heat recovery System.
Solid Waste Management	Methane Recovery from Municipal waste & to produce Power; Municipal waste to Compost; Hazardous waste treatment facility; Fecal Sludge treatment & Recycling plant.
Liquid Waste Management	Biological Effluent Treatment Plant (ETP) Combination of Biological & Chemical ETP Conversion of Chemical ETP to Combination type (Chemical+Biological) of ETP Central Effluent Treatment Plant (CETP) Waste Water Treatment Plant Sewage Water Treatment Plant Establishment of Chemical ETP

Alternative Energy	Production of Burnable Oil from waste Tire by the Process of Pyrolysis
Fire Brick	Setting up of Hybrid Hoffman Kiln(HHK)/Tunnel Kiln/equivalent technology in Brick manufacturing Industry
Eco Friendly Brick Production	Compressed Block-Brick. Foam Concrete Brick Manufacturing. Modern Technology based Brick((Hybrid Hoffman Kiln, Vertical Shaft Brick Kiln, Zigzag Brick Kiln, Improved Zigzag Brick Kiln, Tunnel Kiln, Conversion of Fixed Chimney Kiln into anyone of the mentioned above
Recycling & Recyclable Product	Paper Waste Recycling Plant for production of recycled paper Plastic Waste Recycling Plant (PVC, PP, LDPE, HDPE,PS) Recyclable Baggage Manufacturing Plant Recyclable Poly Propylene Thread & Baggage Manufacturing Plant PET Bottle Recycling Plant Solar Battery Recycling Plant Used Lead Acid Battery Recycling Plant
Miscellaneous	Vermicompost Palm Oil Plant Ensuring safe Working Environment in Industries
Green Project	Green Industry Green Featured Building

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